The International Scientific and Technical Organization for Gliding

COLLOBORATION WITH

OSTIV

MET PANEL 2021

17-18 February 2021
Istanbul Aydın University, Istanbul, TURKEY

The International Scientific and Technical Organization for Gliding

OSTIV MET PANEL 2021

EDITOR
Zafer ASLAN, (İAÜ)

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The International Scientific and Technical Organization for Gliding

OSTIV MET PANEL 2021
PROGRAM

17-18 February 2021
Istanbul Aydın University, Istanbul, TURKEY On-line
COLLOBORATION WITH

Istanbul Aydın University (IAU)

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Web: https://ostiv.org/sections/scientific-section/meteorological-panel.html

OSTIV/ISTUS History

An early realization of the attractive possibility for meteorologists to learn more about the structure and behaviour of the atmosphere when using sailplanes, combined with the interest of aerodynamicists, aircraft- and instrument designers, constructors and pilots for improving sailplane performance and characteristics, lead in 1930 to the forming of the first international soaring organization ISTUS (Internationale Studienkommission für den motorlosen Flug).

Having as objective the furtherance of development of soaring in science and technics as well as in sports by "exchanging experience and friendly cooperation among the specialists and pilots of all nations engaged in soaring", this objective has been changed after World War II on occasion of forming OSTIV as the successor of ISTUS in July 1948 at Samedan / Switzerland. All the sporting objectives were separated from OSTIV and were integrated within the responsibility of the Fédération Aéronautique Internationale (FAI).

The new constitution of OSTIV concentrated merely to the objectives" to encourage and coordinate internationally the science and technology of soaring and the development and use of the sailplane in pure and applied research". After years of discussion OSTIV finally found its place as an International Associate Member of FAI (Resolution of the FAI General Conference at Rome, 4 October 1977); each party having the right of representation - with voting right - in the General Conferences of the other party. Furthermore, OSTIV has the right to delegate observers to the meetings of the International Gliding Commission (IGC) and vice versa and to delegate observers to the Sailplane Development-, Meteorological- and Training and Safety Panel-Meetings of OSTIV.

A most important decision, which FAI laid down in its rules, was the acceptance of offers for world soaring championships only under the condition that they assure simultaneously the organization of OSTIV-Congresses at the same time and place as the championships.

Prof. Dr. Rolf RADESPIEL, OSTIV President

Prof. Dr. Mark MAUGHMER OSTIV, Vice President

Prof. Dr. Zafer ASLAN Chair, MET Panel

OPENING SPEECS

Prof. Dr. Zafer ASLAN

Chair, OSTI Meteorological Panel

IAU, Istanbul

Dear Presidents, Dear Rector, Dear OSTIV MET Panel Delegates,

It is a great honor for me, to deliver the opening remarks of our panel. Because of Pandemics we have online program. We will have 18 papers from 9 different countries. Istanbul Aydın University host OSTIV Met Panel again. The first one was organized at ABMYO/IAU in Istanbul in 2005.

MET Panel, 2021brings together leading scientists, pilots, researchers, engineers, directors of companies in the field of Meteorology for Soaring to exchange information on their latest research progress which covers a wide range of critically important topics.

I would like to thank OSTIV President, MET PANEL Chair, Session Chairs, authors/co-authors for contributions, I wish a successful panel.

Dear participants, I would like to give some information to OSTIV Met Panel,

The VISION of the Meteorological Panel is the worldwide exchange of ideas in the field of meteorology as a contribution to the development of air sports: gliding, hang-gliding, paragliding and ballooning.

The MISSION of the Meteorological Panel is to bring together and coordinate the people and necessary elements to create a forum for education and development.

The STRUCTURE of the Meteorological Panel is designed to offer support and networking opportunities to meteorologists, pilots and other people, who are interested in meteorology for air sports, such as: Regular meetings and seminars to discuss and exchange, ideas of new methods, models and tools and to, measure the atmosphere with gliders or motor gliders; working groups for specific projects.

Prof. Dr. Rolf RADESPIEL

OSTIV President, Germany

The objectives of the OSTIV are to encourage and co-ordinate internationally the science and technology of soaring and the development and use of the sailplane in pure and applied research, the design, airworthiness and operation of gliders of all types, and the safety and training of pilots. The constitutional objectives of the OSTIV are achieved by seeking new knowledge, by encouraging dissemination through symposia and publications and by consultation with authorities.

Therefore, OSTIV builds on continuous exchange of methodologies and knowledge through dedicated Panels of experts. These are the Aircraft Development Panel, the Training and Safety Panel and the Meteorological Panel. Today, the OSTIV Meteorological Panel will come together to discuss recent advances of science. Until very recently, the Panel meeting was planned to take place at ICTP in Italy. Unfortunately, the COVID-19 pandemic forced us to change to a virtual meeting. I am very glad that this change was made possible in an extremely short period of time. I would like to thank all participants, authors and organizing committee to make this happen. I wish everybody a great Panel meeting.

Prof. Dr. lng. Rolf RADESPlEL

President OSlTV
Institute of Fluid Mechanics,
Technische Universität Braunschweig, Germany

Volkan Mutlu COŞKUN

General Manager of the TSM Service, Ankara

Dear Prof. Mustafa AYDIN, President of Istanbul Aydin University, Dear Prof. Yadigar İZMİRLİ, Rector of Istanbul Aydin University, Dear Prof. Rolf RADESPIEL, President OSTIV, Dear Prof. Zafer ASLAN, Chair of OSTIV MET PANEL

Distinguished Participants;

Welcome to the OSTIV Meteorological Panel. It was previously held in Istanbul on 2005. Hosted by our Regional Directorates on 2011 and 2013 and now hosted by Istanbul Aydın University.

We have a team of around 600 personnel who provide meteorological support in a total number of 73 airfields across the country. 32 of these airfields Class A, 13 are Class B and 28 are Class C. Our Minister Dr. Bekir Pakdemirli, described these staff as ‘invisible heroes’. They are working 24/7 for 365 days. We provide service per regulations and guidance of International Civil Aviation Organization and World Meteorological Organization.

Turkish State Meteorological Service is a strategic institution provides weather forecasts and early warnings. Our services are essential for almost every sector. We provide meteorological services to a wide range of fields, not limited but including daily weather forecasts, mitigation of disaster risks by early warning systems, planning water resources, preventing forest fires. Additionally we do research studies on the effects of climate change on agriculture, urban planning, tourism, transportation, industrial investments. Moreover we support our Armed Forces and our Security Forces by tailored products and services. However, meteorological services for the aviation sector are of course indispensable. Turkish State Meteorological Service operates an observation network consisting of systems of different types and characteristics spread throughout the country to make an observation that is essential for meteorological products and services. Today, we are proud to operate a total number of 2047 observation systems.

We provide aviation users with the forecasts and meteorological information on Hazerfen Aviation web page. On Hazefan web page you can access the METAR and TAF reports, plus a wide range of products, such as upper air information, flight documents, satellite and radar products.

In addition, there is a particular web page for Cappadocia with wind and temperature products and numerical model outputs for the hot air balloons.

Soaring index, one of the most widely needed information regarding air sports performed with the help of thermal activity within the unstable layer is also published in the Hazerfen webpage.

For air sports, we provide in situ meteorological information and assign staff, upon request. In the coming years, we will also support the World Air Games competition organized by the World Air Sports Federation.
I wish a fruitful Panel for everybody and present my compliments to all of you.

Prof. Dr. Yadigâr İZMİRLİ,

IAU Rector, Istanbul

Honorable President of Istanbul Aydın University and Eurasian Universities Union, OSTIV President, General Director of Turkish Sate Meteorological Service, Distinguished OSTIV MET Panel Delegates!

It is with great pleasure that I open this panel on atmospheric sciences and soaring. I am very pleased to be with you at this meeting hosted by our university. Our university is hosting OSTIV Met Panel for the second time. OSTIV 2005 Panel was held at Bahçelievler Campus and was hosted by ABMYO / IAU in Istanbul. We are very happy, being together at our university and to meet with you at the virtual panel. Unfortunately we have an online panel due to the Pandemics.

We have distinguished participants from 11 different countries attending this scientific meeting and a total of 19 papers will be presented at the panel over these two days.

When we look at the profile of our participants, we see that the leading scientists in the field of atmospheric sciences pilots, researchers, engineers and managers of aviation institutions come together at the MET Panel, 2021.

I would like to underline that information and experiences will be shared about the latest developments and research studies covering critical areas in aviation, gliding and atmospheric sciences in terms of their subjects.

This work was organized in cooperation with OSTIV, EURAS Eurasian Universities Association and ITU, Club METAR. In this respect, I would like to thank EURAS President, OSTIV President, MET PANEL Chair, Session Chairs, valuable participants who contributed to the meeting, on behalf of Istanbul Aydın University for their contributions.

I wish you all a successful and a fruitful panel, with my regards.

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SESSION 1 THERMALS and WAVES **Chair: Carsten LINDEMANN/Alberto FLORES**	
7.00 – 8.00 GMT **10.00-11.00 Local**	Carsten LINDEMANN, Germany, Thermals, Wave Flying
	Henry BLUM, Germany, Thermals – Where to find them, when flying low?
8.00-8.30 GMT **11.00-11.30 Local**	**BREAK**
SESSION 2 FORECASTING **Chair: Bernd RICHTER/Henry BLUM**	
8.30 -10.00 GMT **11.30-13.00 Local**	Bruno NEININGER, Switzerland, “Status report on AlpTherm_2 and an excursion to accelerated wind across passes”
	Bernd RICHTER, Germany, " Metwatch - A Programme for the Visualization and Evaluation of Surface Observations and Aerological 'TEMP' data"
	Alberto FLORES, Lucas J. BERENGUA and Alejandro POOLI, Argentina, "Weather forecasting information for soaring Flight in Argentina".
10:00-10.30 GMT **13.00-13.30 Local**	**LUNCH**
SESSION 3 THERMALS and WAVES (Cont.) **Chair: Edward HINDMAN/ İsmail GÜLTEPE**	
10.30-11.30 GMT **13.30-14.30 Local**	Edward (Ward) HINDMAN, USA, “8051m Broad Peak ascended via paraglider – a possible analogue for the ascent of 8848m Mt. Everest”
	Peter SALAVEC, Hungary, “A possible method for forecasting mountain wave trapping”
11.30-12:00 GMT **14.30-15.00 Local**	**General Evaluation of Sessions 1 and 3 THERMALS and WAVES, Rene HEISE, Carsten LINDEMANN, Henry BLUM, Edward HINDMAN, Peter SALAVEC, İsmail GÜLTEPE, Zafer ASLAN**
12.00-12.30 GMT **15.00 -15.30**	**BREAK**

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<tr><td>M. Akif. CIFCI, Turkey, "The Importance of Chaos Theory in the Development of Artificial Neural</td></tr>
<tr><td>Semanur AYDIN, Yiğitalp KARA, Emre KARANFİL and Evren ÖZGÜR, Turkey, “Predictıon of Wind Speed By Using Chaotic Approach: A Case Study in</td></tr>
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<tr><td>İlayda KURŞUN, Göksu CANYILMAZ, Sinan ŞAHİNOĞLU and Hüseyin TOROS,
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In addition to panelist:

Dept. of Civil Aviation Management, Faculty of Eco. and Adm. Sci, IAU,

Program of Civil Aviation Management, ABMYO, IAU

Kamile YASDIMAN, Turkish Air League, THK, Instructor, Gliding School

M.Sc. Mustafa TAKAOĞLU, IAU Dept. of Comp. Eng.

M.Sc. Elis GÜLER, ITU, Graduate Prog. of Atmos. Sci. (OSTIV St. Member)

M.Sc. Kutay MIHLIARDIC, Graduate Prog. of Atmos. Sci. (OSTIV St. Member)

Semanur AYDIN, Club METAR, ITU.

Pt. Ali AÇAN, Turkish Air League, Director, Gliding School

Fırat ÇUKURÇAYIR, TMMOB, Head, The Chamber of Met. Eng.

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THERMALS, WAVE FLYING

Carsten LINDEMANN, Germany,

carstenl@zedat.fu-berlin.de

Extended Abstract

Wave Flying Experiences - Examples of Observation and partial interpretation – February 2021

This report contains experiences of thermal waves, gravity waves and lee waves in Central Europe mostly of the season 2019/2020.

The Hattingen Morning Glory

A sudden rapid wave like cloud system was observed on Christmas day in NW Germany – for discussion. Two photos and a time lapse sequence will be presented.

Thermal Waves or waves in areas of no obstacles or mountains Obstacle

Obstacle Thermal Waves

Individual waves formed at singular cumulus seem to move with the wind at top of convection. Principle of mechanism and examples will be shown.

Cloud street waves

Generally thermal waves were separated into thermal waves at isolated clouds and thermal waves connected to cloud streets, which approximately rectangular to the upper wind. The latter is indeed a very rare situation. Most of the thermal waves observed with cloud streets found and flown by glider pilots in Germany had an upper wind field with an essential wind shear but nearly a very low wind velocity within the convection layer. the upper wind field seem to form the convection streets below and not the lower (mostly about 2-10 kts) wind in these cases.

Free oscillations at different levels

By a second upper inversion

Several wave bands were found in satellite pictures and there was a convection layer below. But no flights reaching the wave clouds were documented. Two inversions were detected by radio soundings. The first inversion limited the convection layer with or without cumulus clouds and a second inversion some hundreds of meters above reaches into the wind shear.

By a humid layer

The observer is sometimes surprised when looking for satellite pictures showing parallel bands of clouds perpendicular to the upper wind and no flight report is documenting this by using such bands. Wind shear values seem to be sufficient for cloud street waves. The bands were formed at humid layers. They are more humid waves than thermal waves.

Experiences

Some shear und inversion values will be given.

Some flights were done for detecting waves but with no success.

Lee Waves

There were about 50 flyable days during the winter season of 2019/2020 in the area of Altvatergebirge/Hruby Jesenik (CZ) and at Harz mountains in Germany. Most flights are done regularly at Jesenik, because of the position of the airfield (Mikulovice) to the higher mountains, and of more favorable wind directions.

It could be found that maximum altitudes were mostly gained by classical mountain wave parameter so as published by WMO. But there were several cases with nearly no wind shear and even wind velocity decrease with altitude, the latter more at Hruby Jesenik.

Some of the cases with wind conditions decreasing with altitude had strong lower wind from ground up to altitude approximately near to the mountain heights producing a wave ***forced*** more by the by the obstacle itself and not by the oscillation ability by the atmosphere. This forced wave extended further upward for thousands of meters into layers with nearly no wind. This seems to be valid only for higher mountains and not for the lower ones. These observations results in an statement:

The lower the mountain the more the classical parameters of wind shear and temperature inversion must be fulfilled. Higher mountains can produce waves by a strong wind field in lower layers. This was detected and measured by gliders.

Models

Some characteristics of models forecasting waves will be presented for two days at Harz.

WHERE TO FIND THERMALS WHEN FLYING LOW?

Henry BLUM, (Dipl. Ing.)
Meteorologist, FI(S) and Weather Forecaster at Glider Competitions
henry.blum@gmx.net

Presented at the on-line
Organisation Scientifique et Technique Internationale du Vol à Voile (OSTIV)
Meteorological Panel Meeting, 17 -18 February 2021

Extended Abstract

When glider pilots fly cross country, they typically orient themselves at cumulus clouds to find uplift. However, when flying low or under blue conditions, it’s important to know where to find thermals without these visible signs of uplift.

Typical textbooks recommend looking for areas in the landscape, that heat up very quickly; amongst them cities, freshly harrowed land or cornfields etc. Temperature differences between various areas then are supposed to trigger the release of thermals[1]. - Forests are assumed to “work” only in the late afternoon, as it takes a long time for them to heat up and finally to release the warm air.

Unfortunately, a pilot following these recommendations won’t get very far. An experienced cross country glider pilot knows, that these tips don’t work and relies more on his experience … - But what does work instead? - To better substantiate this, I analysed successful long distance flights in 2015 and verified my findings in the years afterwards during lectures with about 250 flight instructors. In the basic analysis, I only considered flights over distances of more than 1000 Kilometers. - This had several advantages:

In the basic analysis, I only considered flights over distances of more than 1000 Kilometers. - This had several advantages:

1. Only a few days in any year provide conditions for such long distance flights in Germany.
2. One has to take off early. This is only possible in cold air masses. The first lifts would therefore provide for a good example for the development of thermals. Better than thermals during the day, this may blur the picture based on their delayed development.
3. I therefore analysed primarily the first two lifts in the morning with a gain of more than 600 meters in altitude for the pilots.
4. The cloud base on these days is typically low early in the morning. Even if pilots had most likely oriented themselves along the clouds, it would be easier to determine the corresponding trigger points for uplifts on the ground.
5. Only excellent pilots can fly these long distances. Naturally, they will only pick the strongest uplifts and if someone is able to find good lift early, it’s them. .
6. Last not least, I only had to analyse about three dozens of flights, which met these criteria.

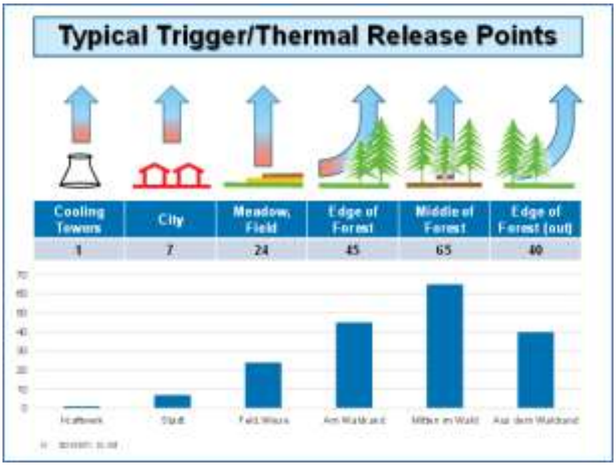


Fig. 1. Thermal Release Points

182 triggers were investigated this way (Fig.1). The results are displayed in the following graph:

More than 82% are connected to a forestry area in one way or the other. Only 13% corresponded to meadows or fields, only 3% to cities and only one out of 182 lifts was based on an industrial source.

To verify my findings, I used regular updates with flight instructors to ask them about their preferred "hot spots" near their own airfields, (Fig.2). That feedback showed an even stronger correlation with forests than my findings above. One example: The airfield of Bad Waldsee. Their number one source for lift is a marshy forest nearby.

The key question now: Why are forests by far the best release point for thermals, at least in the mid-latitudes? To understand the reasons behind, we just need to know the "structure" of warm air on the ground and a bit more about the Archimedes principle, as it is responsible for the buoyancy of thermals.

Warm air is developed in direct contact with the surface and develops a distinguishable super adiabatic layer on the ground with a clearly marked surface. It extends about 15 -20 m height above the ground. This layer is the source of our thermals, as it is much warmer, than the air above it.

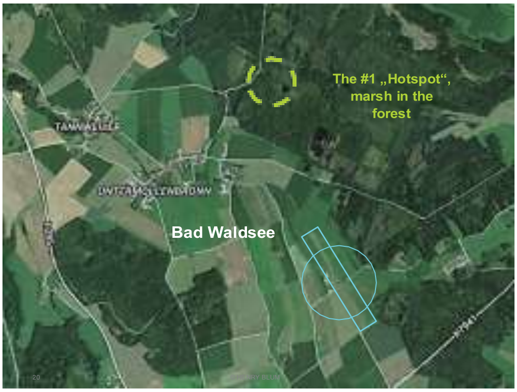


Fig. 2. Hot spots

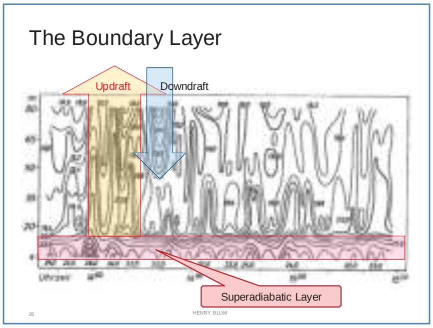


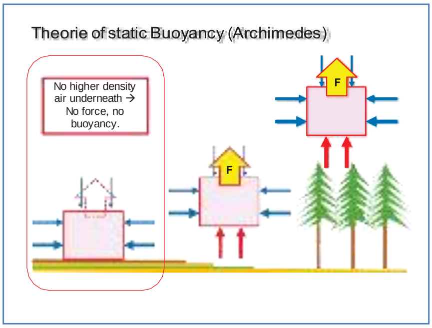
Fig. 3. General structure of the boundary layer

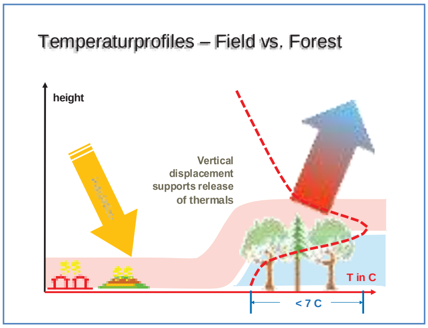
Why does this warm air not rise from the ground, despite having a lower density than the immediate layer above?

– The Archimedes principle gives us the answer, (Fig. 3). Buoyance is a result of pressure differences between top and bottom of our "lifting body". Sitting on the ground, there is no higher pressure and thus no force underneath.

– Consequently there is no buoyance and hence the warm air doesn't rise.

To trigger the lift, we need a cushion of air with higher density underneath. Forests (and/or rivers and lakes) deliver exactly that. Temperature in a forest can be up to 7 °C cooler than the surrounding air[3] and thus it lifts the super adiabatic layer. Buoyancy can set in and the air rises, (Fig 4 a and b)





(a) (b)

Fig.4 (a) and (b) Buoyancy and temperature profile

This principle of triggering lift also works in desert areas, like Namibia, (Fig.4) . Water holes and settlements with a bit of irrigation cool the air on the surface thru evaporation and provide for the best release points in an otherwise uniform landscape, mostly covered with shallow bush vegetation.

What's not covered by this paper is the source of thermals in mountainous areas. Those follow different rules.

Fig. 4. Trigging lift at desert areas

Also not included in here is the detrimental effect of warmer air masses on thermals. (Triggers are then even more orographic dependent than the ones mentioned above and thermals develop also much slower on the ground. – Lift improves with altitude however, due to improving density differences based on humidity…).

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STATUS REPORT ON ALPTHERM_2 AND AN EXCURSION TO ACCELERATED WIND ACROSS PASSES

Bruno Neininger
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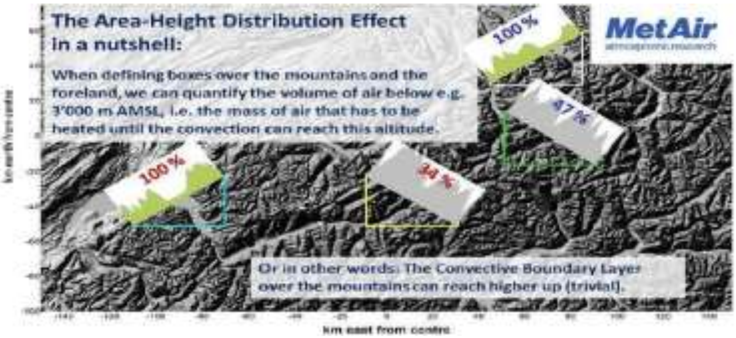
Presented at the on-line Met Panel meeting, 17 to 18 February 2021
of the OSTIV (Organisation Scientifique et Technique Internationale du Vol à Voile)

Summary of the 20 slides shown, 5 of them copied as the figures below

Why two topics, and how are they interconnected?

When Prof. Zafer Aslan and René Heise asked me to present something during this Met Panel Meeting, I mentioned that I will only talk about the convection model AlpTherm_2 again when there is substantial progress, after having introduced it at the OSTIV Met Panel Meeting in 2015 in Winterthur. Since the progress during the last years was slow, only a short update about the status was presented, hoping to present more at one of the upcoming OSTIV Congresses.

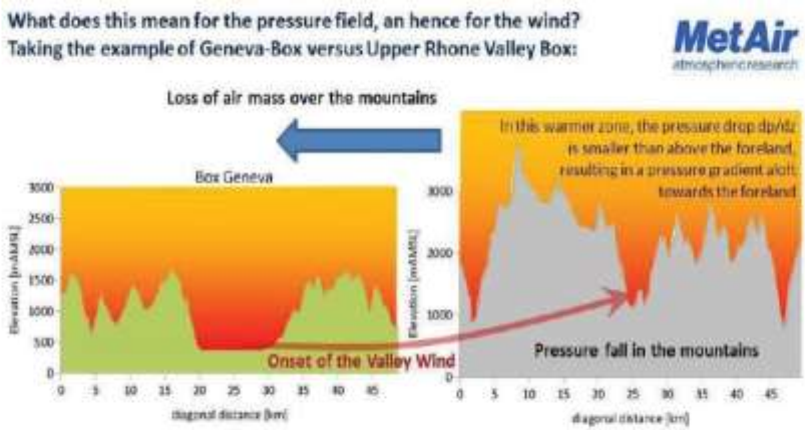
One reason for the slow progress since 2018 was the investigation of an accident of a historical passenger aircraft in the Alps in summer 2018, where an in-depth study of the meteorological conditions in a small side valley was performed. Since the findings about the nature of turbulence behind crests could be of interest for gliders and paragliders as well, the second topic was added.



Both topics are about an overarching meteorological process: The influence of the 'Area-Height Distribution' on the differential heating of air masses over mountainous terrain and the foreland. Therefore, re-visiting this process might be useful.

A comprehensive description of this 'AHD effect' was given by [1].
However, already two years earlier, the effect was published in a conference proceeding [2] and in an article with a slightly different focus [3].

It is the well-known story about valley winds, where it is important to note that the regional scale thermal winds in the mountains are not caused by local slope winds, but by inter-regional pressure gradients developing during the day.



When in summer, the Convective Boundary Layer (CBL) is reaching above the mountain peaks, the heat low and hence the pressure gradients from the foreland into the valleys can reach above the crests. Disclaimer: Abbreviations were made in these two figures (mixed up volume and mass, and cross sections with volumes). Of course, this is all correctly addressed in the model.

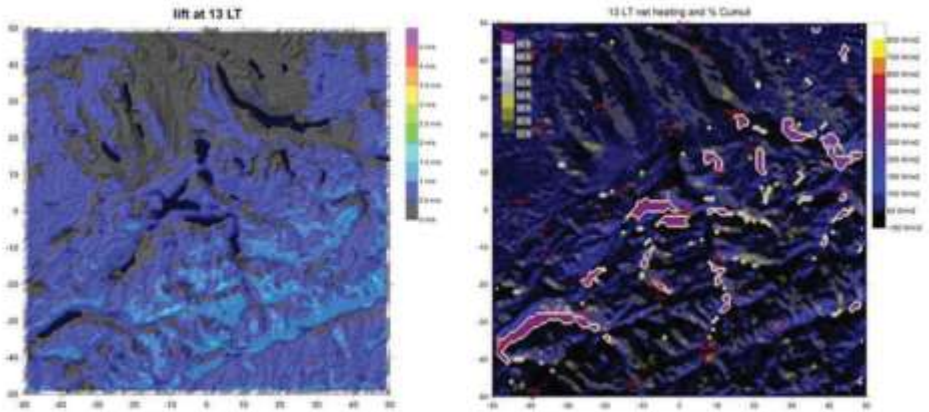
Scientific studies about meteorological conditions for gliding and the paradox valley wind system in the Upper Rhone Valley started 1978 (in the yellow box in the first figure) during the annual summer camp of the Academic Gliding Club of Zurich [4]. For several years, the valley atmosphere was measured by balloons and sensors on gliders and towing aircraft to find out more about the special atmospheric conditions in this inner-Alpine area.

About 10 years later, this inspired the development of the convection model ALPTHERM [5] which is still in service e.g. at the German Weather Service (DWD) via the online weather briefing platform 'pc_met' [6]. Another 20 years later, after having almost lost track of ‘good old ALPTHERM’ [7], I decided to write a completely new version, using today’s computing power. As mentioned above, the first presentation about AlpTherm_2 was at the OSTIV Met Panel Meeting 2015 in Winterthur, but the progress since then was slow. However, in 2018, two research projects asking for mixing heights above complex terrain in Italy and in Australia allowed to gain more experience with the existing model also outside of the Alps, allowing some improvements and verifications.

The accepted abstract for the postponed OSTIV Conference [8] and a longer status report [9] are describing more aspects. AlpTherm_2 is still intending to use a Lagrangian approach to represent thermals as individual mass exchanges between geometrically defined layers in Cartesian coordinates, reflecting explicitly the ‘Area-Height Distribution’ in a fully resolved 3-d topography and surface properties (Albedo and Bowen-ratios). It runs on a notebook PC on a grid of up to 200 x 200 km^2 with the full SRTM resolution, i.e., there is no need any more to decide about ‘regions’, where the calculations in the old ALPTHERM are running 1-dimensional. Instead, ‘catchment areas’ are determined automatically, where e.g. the cold air is accumulating during the night (realistic surface inversions in the complex topography), and thermals are following slopes until separation from the terrain at crests. Even when the main calculations are done at full resolution, the results are aggregated in cells of 1 or 2 km pixel size.

This is a recent example for the lift [m/s] on the left, and for the net heating and cloud cover on the right (axes are in km offset from the centre):

MetAir
atmospheric research



This is an updated list of implemented features on the left, and the remaining 'wish-list' on the right:

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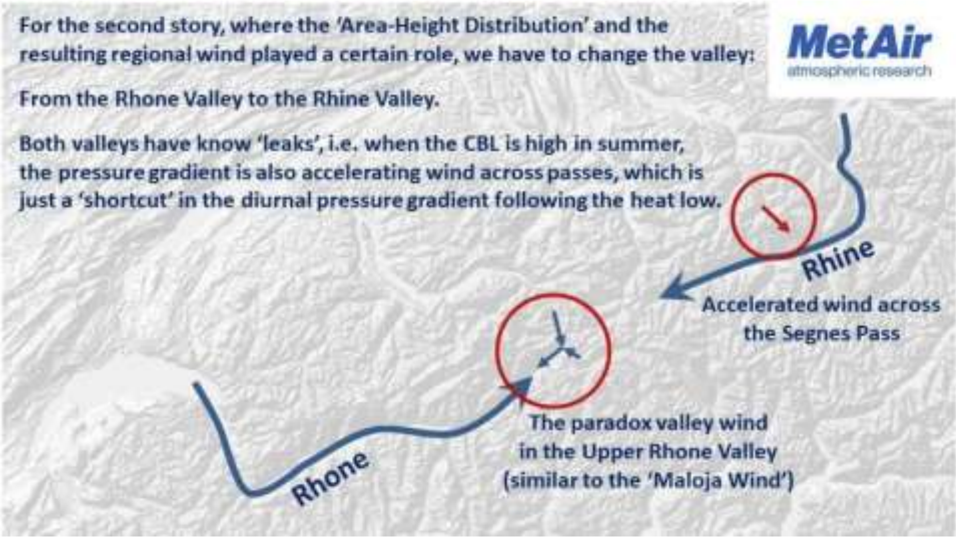
Done (implemented in present version):

- ✓ global coverage (can be adapted to any region)
- ✓ semi-automatic data download
- ✓ albedo and Bowen ratio from MODIS imagery
- ✓ flexible for other data sources (other than GFS, SYNOP stations, and MODIS imagery)
- ✓ energy budget on the 100 m-resolution
- ✓ aggregated results on a km-grid
- ✓ buoyancy is including humidity (virtual temp.)
- ✓ improved downscaling from GFS and SYNOP
- ✓ improved surface inversions in 'catchments'
- ✓ automatic detection of lakes in SRTM
- ✓ higher level advection of temperature and humidity from GFS
- ✓ parameterised horizontal exchange

To do (wish-list):

- ➢ fully Lagrangian formulation of thermals (the present version is using a shortcut)
- ➢ cloud dynamics (for the moment, only the cloud base is calculated, the cloud top and the complete venting effect will be completed when fully Lagrangian)
- ➢ thermal wind following the pressure gradients (those are already implemented)
- ➢ influence of the wind on the thermals (not a problem once the above points are done)
- ➢ energy budget over lakes and the sea (coast)
- ➢ tests for different regions



On the 4th of August 2018, a historical passenger aircraft on a scenic flight with 20 people on board crashed in a side valley of the Upper Rhine Valley. At the beginning it was totally unclear what happened. Therefore, and because the wind in the side valley was of interest for the investigation anyhow, intensive research was started. The result was not surprising: Based on lidar measurements in summer 2019, the turbulence behind the surrounding crests was according to expectations (peak vertical velocities of -6 m/s to +4 m/s). Further, the investigation allowed to confirm the effect of the 'Area-Height Distribution' on the diurnal wind regime across the Segnes Pass. All the details of this meteorological study and all the other aspects of this investigation can be found in the safety investigation report of the STSB [10].

Conclusion: Differential heating in mountainous regions is important both for the development of valley wind systems and thermal lift and for the safety of wind-sensitive activities like paragliding.

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(all the links are active and checked 1st of March 2021)

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Main entry, where also other languages can be chosen on top right: https://www.sust.admin.ch/en/stsb-homepage
Direct entry for the English version: https://www.sust.admin.ch/inhalte/AV-berichte/HB-HOT_EN.pdf
The meteorological study is in the annex A1.7:
https://www.sust.admin.ch/inhalte/AV-berichte/HB-HOT/EN/SB_HB-HOT_A1-07_E.pdf

METWATCH - A PROGRAMME FOR THE VISUALIZATION AND EVALUATION OF SURFACE OBSERVATIONS AND AEROLOGICAL 'TEMP' DATA

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Extended Abstract

Metwatch is a Windows programme that has been designed for the visualization of meteorological data, both surface observations and upper air observations. Data of WMO or ICAO -compliant codes like SYNOP, METAR f, TEMP, both in traditional alphanumeric code and in BUFR code can be decoded so that they can be used as INPUT for the visualization programme Metwatch. The data platform of Deutscher Wtterdienst (DWD, German Met Service) opendata.dwd.de will be presented. This platform opendata.dwd.de offers a wide range of data and products, both analysis and forecast. Apart from global SYNOP BUFR and TEMP BUFR observations, opendata.dwd.de offers a wide range of other data, e.g. numerical products, synoptic weather charts, climatological data and many more.

Metwach offers very sophisticated options for the TEMP evaluation, among others T_max, T_release of cu-convection, CAPE, max updraft, profiles of vertical wind shear, Richardson number for turbulence detection or T_pot, T_pspot for convective overturning. The visualization of forecast TEMPs would also be possible, but they are not made available to the public yet. A very helpful use case of Metwatch would be the investigation of operational radiosoundings as ground-truth data for a plausibility check of numerical forecasts.

This programme is a commercial product, but would be made available for free within OSTIV for glider pilot activities and education. Decoded data of SYNOP and TEMP can be made available on my personal website www.vorticity.de which is designed as a portal for synoptic meteorology. To download the decoded SYNOP and TEMP data as input files for Metwatch, a very simple little Windows script with the access data for www.vorticity.de would be necessary. This script can be requested from the author.

The data format of surface observations for the visualization by Metwatch is a binary format produced by the programme FMdecode, which reads Standard WMO or ICAO codes such as SYNOP, METAR and BUFR.

The data format for TEMP observations is a pure ASCII format which is almost self-explanatory. An example will be listed below because simulated sounding data produced by a local flight or by other means can easily be converted into this format and then be analysed by Metwatch.

The idea behind both Metwatch and www.vorticity.de is the comparison of high-sophisticated numerical products, which are typically of very high quality. Nevertheless for the interpretation of these data it is always recommended to compare them with real observations and the results of traditional evaluation procedures for radiosoundings. This could either comfirm the numerical forecast products or show that the observations do not support the development shown by the numerical forecast products thus restricting their value.

The idea behind www.vorticity.de is to offer a wide range of classic synoptic data and charts with a simple and quick access, much faster than searching them in the wide world watch of the web. Additional value for the user arises from the assembly of charts to visualize special features.

One of these features is the comparison of MSLP analysis charts from different National MET Services to judge the general situation. Another feature is the assembly of forecast charts in array for HINDCAST analysis. For MSLP forecast charts, the analysis of today 12 UTC is compared with the forecasts charts with lead times of 36, 60, 84 and 108 hours. In the case of perfect forecast´ this array would show twelve identical charts for 12 UTC: Four analysis charts from the German Met Service DWD, British UK MET Service, Austrian Met Service ZAMG and Dutch Met Service KNMI in combination with the forecast charts of lead times given above, both from DWD and from UM Met Offices.

Conclusion

The Windows programme Metwach for the visualization of surface and upper air observations is presented. It offers sophisticated evaluation procedures for TEMP data to compare them with numerical forecast data, among others release temperature for the formation of thermals, max temperature, height of cumulus convection levels, updraft speed in thermals, vertical wind shear and many more. The website www.vorticity.de offers many synoptic charts of various type and National Met Services, both analysis and forecast. They are presented for easy comparison and verification by HINDCAST. The programme is available for free for use within the OSTIV community. Any licensing or access details for the direct visualization of SYNOP and TEMP data via www.vortixty.de can be requested by bernd.richter@web.de

Example of the format of radiosounding data for visualization using the Metwatch programme

Temp 17064 19.02.21 00 UTC ISTANBUL

0000

40.55 29.09 19 202102190000 50.00

ELEV 62ft 5425/ 5/8 CL4 Sc cugen 330/650ft CM5 Ac frontal CH?

453 1542 9999.0 //// ////

1111

1023 19 4.0 2.2

12 29328 -50.9 -82.9

10 30640 -51.2 -82.4

2222

1023 240 1

1018 350 2

103 310 24

100 295 25

9999

After Temp (keyword) follows the HEADER with geographical data of the station

After 1111 all pressure values followed by Tl / Td at level, geo-potential is optional After 2222 all pressure values followed by ddd ff at level

9999 terminates the data for the station.

WEATHER FORECASTING INFORMATION FOR SOARING FLIGHT IN ARGENTINA

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Presented at the on-line
Organization Scientifique et Technique Internationale du Vol a´ Voile (OSTIV) Meteorological Panel meeting, 17-18 February 2021

Extended Abstract

The Argentine National Weather Service (SMN for its acronym in Spanish) was founded in October 1872, which makes it the 3rd oldest Weather Service in the world. [1]

Not only does the SMN site publish information for soaring flight [2] but it also provides support for local, regional and national championships through a trained team of experts. One of the authors (Berengua) is the director of this group. Their working scheme will be presented.
Another one of the authors (Pooli), issues weekly forecasts to some soaring flight clubs/associations and is currently working on a method for obtaining location based pressure, temperature and humidity measurements.

A different approach is taken by another author (Flores) who does not issue forecasts but rather focuses on teaching pilots how to interpret the meteorological maps that can be downloaded over the internet from the SMN site or NOAA Ready.
These methods are proposed as most soaring flight clubs do not have their own weather station nor are they in close proximity to local meteorological measuring sites.
Pilots tend to check out the forecasted soundings to plan their flights, often through NOAA Ready products [3]. Amongst these, the local sounding is offered. If they are not flying in a mountainous region, they usually look at the limit provided up to 400 hPa. Other apps such as Skysight [4] y XC Soar [5] are also used. Skysight provides reliable information for mountain regions. Its biggest drawback is that it does not perform well when describing inversions, which are found above the usual nocturnal one. True measurements are carried out by the sounding, either through rawinsondes with a weather balloon or similar equipment on a plane.

Argentina is a country with a very extensive territory. The area where soaring flight on thermals are carried out spreads roughly1000km x 2000km (from 28°S to 39°S). Another very special region is the Andes mountain range, stretching over 2200km from North to South. Figure 1 presents both areas. See highlighted red round circles in the Andes Range and, lower right, Argentina location in the world. Some pilots, in the semi deserted North Patagonia areas, are interested to extend thermal flights to 42°S.
Soaring flight in Argentina began in the 1930s. The first two clubs were the Albatros and the Otto Ballod. From 1948 to 1950, two of the world renown soaring flight meteorologists came to teach in Argentina: Plinio Robesti and Walter Georgii.

Most thermal flights are done in the Central Plains. In this region, ground level varies slightly from a minimum of 50m-100m above sea level (asl) to 1000m-1200m asl. There are some semi desert regions in the Northwest over 2000m asl. In the East, thermals reach altitudes of 1500m to 2000m. In the West, they can easily reach as much as 3000m asl or higher.
The Andean range offers a unique experience for soaring flight. The extension of waves, from North to South (Jachal to Calafate, round red circles in Figure 1, North and South, respectively), are the stage for setting world records. Argentine pilots have soared the Aconcagua, which stands at 6962m asl making it the tallest peak int the American Continent. In January 1989, coming from the Chilean side in Dynamic ascent, F. Repicky and J. Bobzin[6] . In October 1993 [7], M. Martino, achieved this from the Argentinean side, soaring on wave. He later invited pilots from other countries to fly and a few years later this became project Mountain Wave [8] followed by Perlan [9].

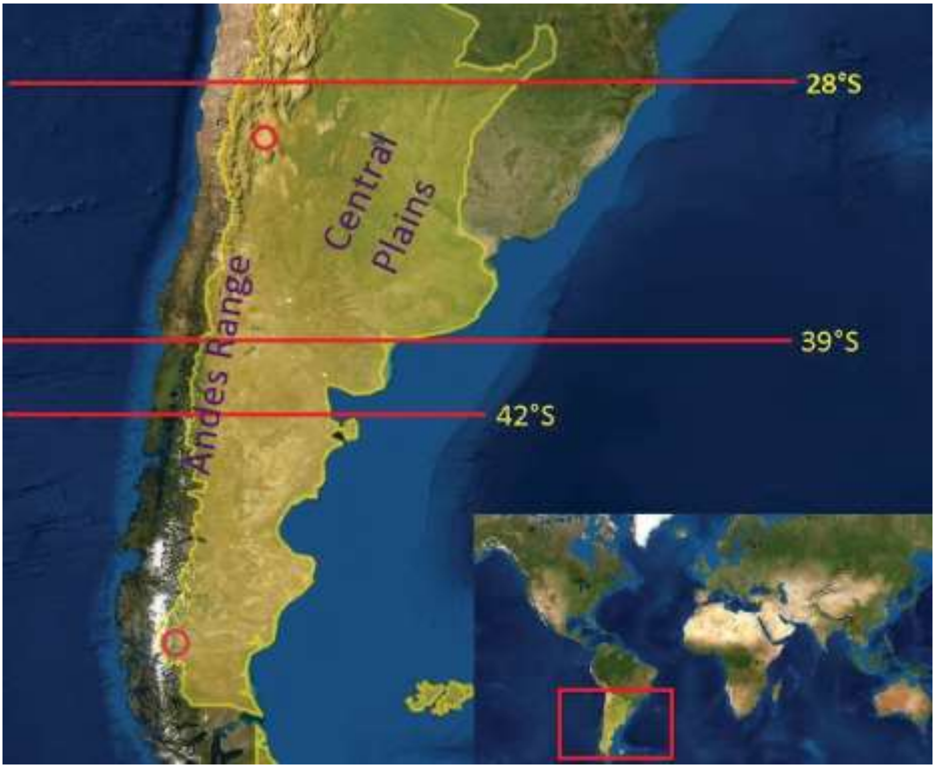

Figure 1

Central parts are the plains. Left, the Andes region. Lower right, Argentina location in the world.

In Klaus Ohlmann´s own words, awed by the unique conjugation of geography and atmospheric physics in Argentina: No place on Earth offers a blessing such as the Andean Range standing in the way of the winds blowing over a long flat surface as extensive as the Pacific Ocean. Jean Marie Clement's book “Dancing in the Wind” [10] stands as a testament to the lure of our region.

Most of the knowledge we have on soaring meteorology locally is based on the expertise and experience of the pilots.

A book on the scientific aspects of soaring flight in mountain waves has been published: Meteorología de Ondas de Montaña, by J. Lassig y C. Palese [11].

Ongoing research papers are based on the technical note “Weather Forecasting for Soaring Flight” [12] and the OSTIV meteorology Panel 2019 [13]

Acknowledgements

Most of the experiences mentioned in the presentation, where obtained thanks to the generous contribution of argentine pilots. Among them:

M. Fentanes, M. Martino, F. Repicky, E.Toselli, O. Ferraro, J. Damiano, P. Drazul, W. Lantschner, C. Holler, M. Reynoso, M.Hidalgo, J. Bobzin, M. Hidalgo.

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8051 M BROAD PEAK ASCENDED VIA PARAGLIDER – A POSSIBLE ANALOGUE FOR THE ASCENT OF 8848 M MT. EVEREST

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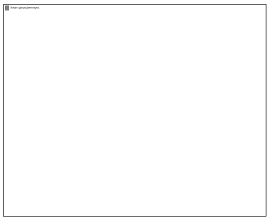
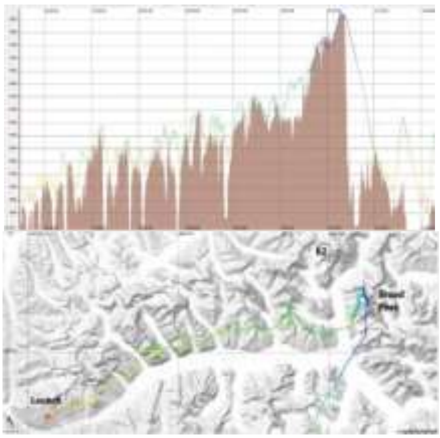
Extended Abstract

Here I report to the OSTIV, the first voluntary paraglider ascent above 8000 m, a world record for absolute altitude achieved; an ascent of Broad Peak on the border between Pakistan and China. The 23 July 2016 paraglider ascent of Broad Peak in the Karakorum Himalaya of eastern Pakistan is described and the enabling meteorological conditions are presented. The intrepid pilot, Antoine GIRARD, climbed the final meters to top the summit using lifts probably unknowns to birds, let alone humans. I apply this knowledge to a possible paraglider ascent of Mt. Everest, the ultimate ascent!

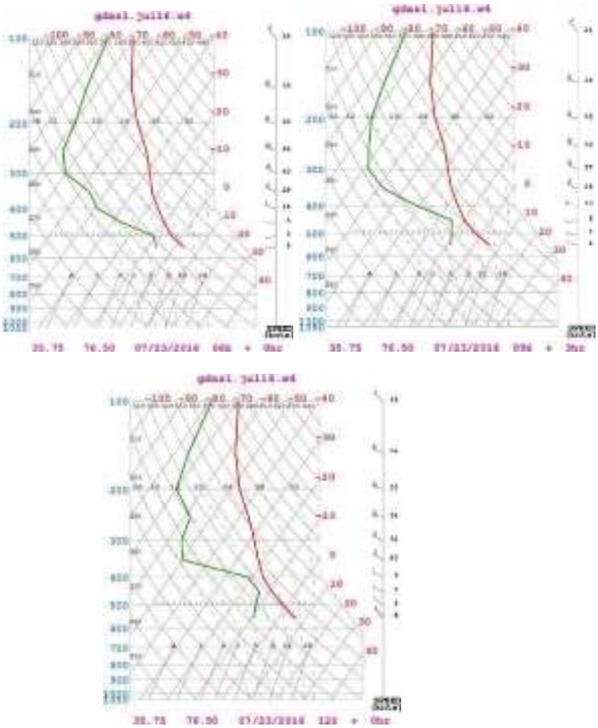
The images below show Antoine flying an Adidas CIN-GTO2 paraglider between 1400 local time (LT) (0900Z) and 1550LT on 23 July 2016: the left image illustrates the approach to the peak; the center image is Antoine above the summit ridge and the right image, taken over the peak, indicates the altitude gained from launch.

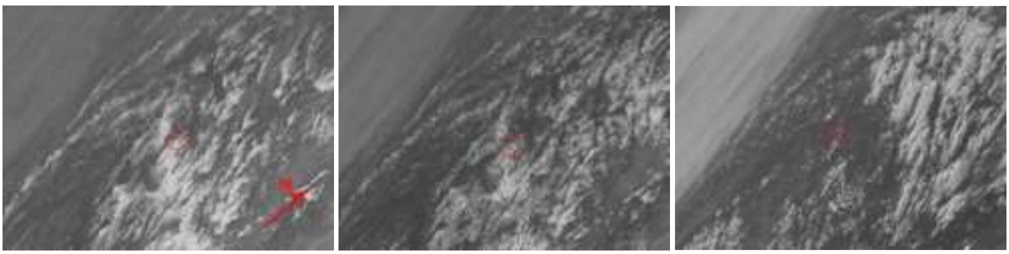

The flight recorder traces show he launched at 1120LT from 4600 m and 48km SSW of Broad Peak. He, then, 'hop scotched' along the southern slopes of the long west-east oriented Baltoro Glacier to reach the west-facing summit ridge. This flight strategy mimics the 'roller-coaster' flight of the migrating geese in the Himalayas [1]. At the ridge, locally-induced thermals were used to ascend through the occasional cloud-fragment to reach the summit. The image containing K2 shows the base of its banner cloud to be about 8000 m. The center image also shows a banner cloud downwind (to the right) of the Broad Peak summit ridge.



The sequence of atmospheric profiles below, from READY.ARL.NOAA.gov, spans the duration of the flight and are for the west base of Broad Peak. The profiles show the convective boundary layer *deepened*, *dried* and the winds aloft *decreased* during the flight, ideal conditions. The 8000 m altitude was at the 300 mb pressure level where the temperature was -28 C and the wind was from the NW at 37 kts (at 8100 m Antoine measured -9 C air temperature and verified the strong NW winds).



The sequence of visible HIMAWARI-8 images below corresponds to the flight region at the times of the atmospheric profiles. The behavior of the mountain-induced convective clouds illustrated by the sequence is consistent with the atmospheric soundings: the convective boundary layer *deepened* and *dried* during the flight. The O in the images marks the location of Broad Peak.



06Z (11LT) 09Z (14LT) 12Z (17LT)

A similar ascent, but with a sailplane, has been proposed for 8848m Mount Everest from Nepal [2] and from Tibet [3]. To date and to my knowledge, no soaring ascent has been attempted although a motor-glider has powered to the summit from Nepal [4] and a paraglider has descended from the summit [5].

Broad Peak is land-locked while the south-side of Mount Everest is open to the Bay-of-Bengal and the north-side of Everest rises from the 5000 m Tibetan plateau. This location causes lower convective cloud bases on the Nepal-side than on the Tibet-side. However, in May 2019, meteorological measuring systems were placed from the base of Everest to the South-summit on the Nepal- side. Using these data plus numerical weather predictions, for example [6], conditions similar to those during the successful Broad Peak ascent are expected to be identified in the Everest region.

Then, a thoroughly planned, properly approved and exquisitely performed paraglider expedition is expected to make the first soaring ascent of Mt. Everest.

Acknowledgements
The Broad Peak ascent information was obtained from Antoine GIRARD, paraglider-pilot Damien LACAZE, from [7] and from the video at www.antoinegirard.fr. The satellite images were retrieved by Scott Lindstrom at the SSEC, U. Wisconsin, Madison.

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A POSSIBLE METHOD FOR FORECASTING MOUNTAIN WAVE TRAPPING

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Extended abstract

A development work in the field of mountain wave forecasting at the Unit of Aviation Meteorology, Hungarian Meteorological Service is in progress. Earlier work has progressed slowly due to low priority besides the operational tasks. Former results are published in [1] and [2], and were presented also at former OSTIV Met Panel Meetings in 2018 and 2019. Plans were also formulated, some of which are important to complete before publication of new forecast products (main case studies, placement of cross-sections and time-height sections, documentation), others may give very useful results in terms of interpretation and evaluation (other case studies, evaluation of NWP model behavior, verification, etc).

The most recent progress of this work was done by [3], then graduate student at the Department of Meteorology, Eötvös Loránd University, Budapest, in her MSc thesis. Her work focused on the evaluation of several case studies, consisting mainly qualitative discussion of NWP forecast products (using the model AROME), helping to develop a user's guide for the products.

The case study of 22-23. February 2019 was a marginal MTW situation. After a cold front passed through the Carpathian basin from the north, cold and dry air mass of continental origin flowed into the basin. The rapidly decreasing cloudiness revealed lenticulars formation over the Mátra and Bükk mountain ranges (Fig. 1.). However, the model results suggested not so ideal conditions for mountain wave formation. This raised the need of more detailed quantitative evaluation the cases which was partially done for this case. A part of this task resulted in a method for forecasting wave trapping, and possibly an additional forecast product. The relevance and usefulness of this must be carefully evaluated in the near future.

The method is based on the linear theory of mountain waves [4]. This introduces some concepts with which analytical solutions can be derived for some idealized environments. In case of a two-layer atmosphere, where the Scorer-parameter is constant in both layers, waves can be reflected from the layer boundary, and some wave modes may become trapped (resonant). The amplitude of these waves becomes very high (infinity according to the linear theory) so that vertical velocities can be comparable to that of deep convection.

Theory: Given the wave equation $\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial z^2} - \ell^2\right] w' = 0$ with $\ell^2 = \frac{N^2}{\overline{u}^2} - \frac{1}{\overline{u}}\frac{\partial^2 u}{\partial z^2}$ the Scorer-parameter, $N^2 = \frac{g}{\overline{\theta}}\frac{\partial \theta}{\partial z}$ the Brunt – Väisälä frequency, $\overline{\theta}$ the potential temperature, $\overline{u}$ the mean horizontal wind, x and z the horizontal and vertical coordinate, g the gravity and w' the vertical velocity perturbation caused by the wave. Assume that the atmosphere has ℓ_L^2 and ℓ_U^2 Scorer-parameter below and above a given height Z, and the orography can be described with a Fourier-transformable function $h(x)$, and a reflection $r(k_x) \in [0,1]$ depending on horizontal

wavenumber. The general solution is then $w'_L(x,z) = u_L \frac{dh}{dx} * \mathcal{F}^{-1}_{k_x}\{(\frac{2r(k_x)}{r(k_x)-1}+1)e^{i\sqrt{\ell_L^2-k_x^2}z}\}$.

Resonance occurs when $r = 1$ but it would lead to infinite amplitude. In any other case, the amplitude will remain finite (i.e. small), which allows us to neglect every. This leads to a solution in which the Fourier-integral is reduced to a sum (and thus a solution which is periodic in horizontal).

Waves can be trapped only when they are periodic in the lower layer and evanescent in the upper layer. The condition for this is $\ell_U < k_d < \ell_L$. Defining the vertical wavelength $L_z = \frac{2\pi}{k_z}$ and letting $Z = j\frac{L_z}{2}$, where $j \in \mathbb{N}$ denotes the different modes, will lead to $0 < j < \frac{2Z}{\pi}\sqrt{\ell_L^2 - \ell_U^2}$ and the following solution in which the inverse Fourier-integral becomes a finite sum:

$w'_L(x,z) = \frac{u_L}{2\pi}\int_{-\infty}^{\infty}\frac{dh(d')}{dd'}\sum_{j=1}^{\frac{2Z}{\pi}\sqrt{\ell_L^2-\ell_U^2}} R_j \cos\frac{j\pi z}{Z}\cdot e^{i\sqrt{\ell_L^2-(\frac{j\pi}{Z})^2}(d-d')}dx'$. The finite coefficient R_j is introduced instead of the infinite term containing the reflection r, keeping the resulting amplitude finite artificially. This may be parameterized [5, 6] to model the amplitude (and thus, e.g. the lifting) of the waves.

Method: The idea is that the number $j \propto Z\sqrt{\ell_L^2 - \ell_U^2}$ may be recognized as a 'forecastable parameter' and can be calculated using the NWP model data. The case of 22-23 February 2019 was used to test whether or not the profile of this parameter may show features which can be identified as the consequence of possible mountain wave generation. The model AROME was applied with initialization at 2019-02-22 00UTC, lead of +36 hours, and output for every 1 h. An approximately north-to-south cross-section through Higher Tartas and Mátra mountains was analyzed, and features of mountain wave generation were looked for (as part of the original task).

The number of modes j were calculated over some model grid points near Mátra and Bükk ranges. Due to the coarse vertical resolution of the model, the modeled Scorer-parameter values were linearly interpolated between model levels with a 10 m resolution. For every possible height Z, ℓ_L was chosen as the lower quartile of the Scorer-parameter values from the lower layer, and ℓ_U as the upper quartile of the Scorer-parameter values from the upper layer. As of now, Gnuplot was used for these calculations and plotting.

Results: The MTW forecast products suggested moderate wave formation (Fig. 2.). The horizontal wind cross-section also revealed some larger scale secondary phenomena (most notably a downslope windstorm in the Tatras). In contrast, the Scorer-parameter suggested a marginal MTW situation (probably because the sunshine and strong winds caused the air under the cold front to become nearly adiabatic).

Qualitative analysis of the j-plots (Fig. 3.) was also carried out, and features which can be related to the cold front was found. Most notably, the stable layer around the cold front causes a sharp maximum in j which raises together with the cold front, and weakens because of the more diffuse appearance of the front in the upper layers. By the evening of 22nd, the values of j become much lower and its profile becomes having a very diffuse maximum in the middle troposphere, which seems to be a usual profile with this method in a case which is not favorable for MTW trapping.

In regarding the direct use of j in mountain wave forecasting, several questions opened up:

1. Direct interpretation of j is the number of trapped wave modes. However, the correct use of layer boundary types (fixed/free) is unclear, thus in $j = \frac{2Z}{\pi}\sqrt{\ell_L^2 - \ell_U^2}$, the constant coefficient may be anything else, and interpretation reduces to the fact that the higher the j, the more the chance of wave trapping is. In turn, the convenient feature that $j < 1$ means no trapping is lost.

2. The method uses a 2-layer case. In reality, Scorer-parameters can have a maximum somewhere higher in the troposphere. Typical example of this is a neutral boundary layer with a deeper, more stable layer above, and a less stable upper troposphere. This cannot be modeled with a 2-layer atmosphere. Generalization of the analytical theory for more layers is problematic if the layers begin to get thin.
3. The trapping phenomenon can be very sensitive to the changes in the circumstances (trapping of a new wave mode as jj passes an integer abruptly affects the stream). This causes problems when dealing with forecast uncertainties.
4. Calculation of jj would be better at model post-processing step. In this case, however, choice of ZZ is unclear: with a 10 hPa model resolution, the vertical distance is somewhere near 100 m in the middle troposphere which causes errors at around 10% in jj.
5. Choosing ℓ_{LL} and ℓ_{UU} is unclear. Minimum and maximum doesn't work as they are often the same. Choosing mean usually give unrealistically high jj values (several tens), because the high negative wind shear curvature in the PBL makes ℓ_{LL} distorted to the high values. Choosing quartiles is slow because it needs the ordering of the calculated values (however, choosing only from the model levels is not that slow because of the much less number of data). Estimation of some skewed distribution (e.g. skew-normal) and using its mode seems to be a better choice, this must be tested.
6. Interpolation can be carried out in several different ways. Other interpolation methods (e.g. cubic) can be used, but this may lead to unrealistic behavior of the jj profile. Also, interpolation of the basic parameters can be carried out, and computation of the Scorer-parameter can be done using the interpolated data. In this case, linear interpolation is not acceptable as it will erase shear curvature. On the other hand, interpolated profiles may introduce Scorer-profile artifacts between model levels (for example, a sharp change in some quantity will introduce overshoot in its derivative). Using only the available model data to calculate values between the levels will introduce a saw-tooth artifact in jj, as it depends on ZZ.
7. The real Scorer-parameter profile is continuous, thus, there is a finite layer in which change of Scorer-parameter from ℓ_{LL} to ℓ_{UU} occurs. For a wave calculated as trapped below ZZ, its 'real' layer boundary height ZZ' is unclear, and there is no guarantee for $ZZ = ZZ'$. It is thought to be the height where model Scorer parameter ℓ decreases exactly to ℓ_{UU}. But as jj depends on ZZ, recalculating with ZZ' may lead to the given wave not being trapped.

All these questions need to be answered, so plans were formulated to address these. Several other case studies were planned already for evaluation of the forecast products, which may be used to study how the number jj behaves in different conditions. In any case, this analysis led to a conclusion that using jj profiles may be helpful in MTW forecasting.

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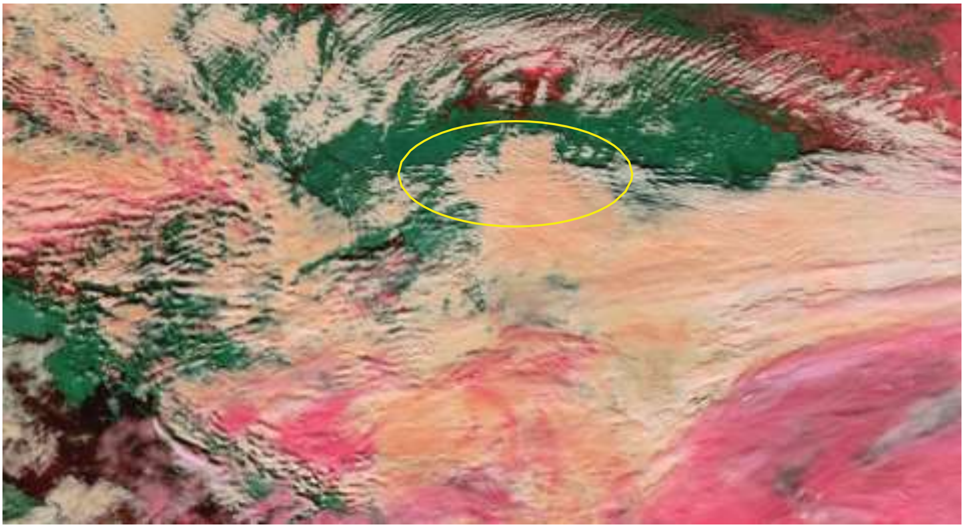


Fig. 1: Lenticular clouds near Mátra and Bükk ranges. Suomi NPP/VIIRS image on 22nd Feb. 2019.

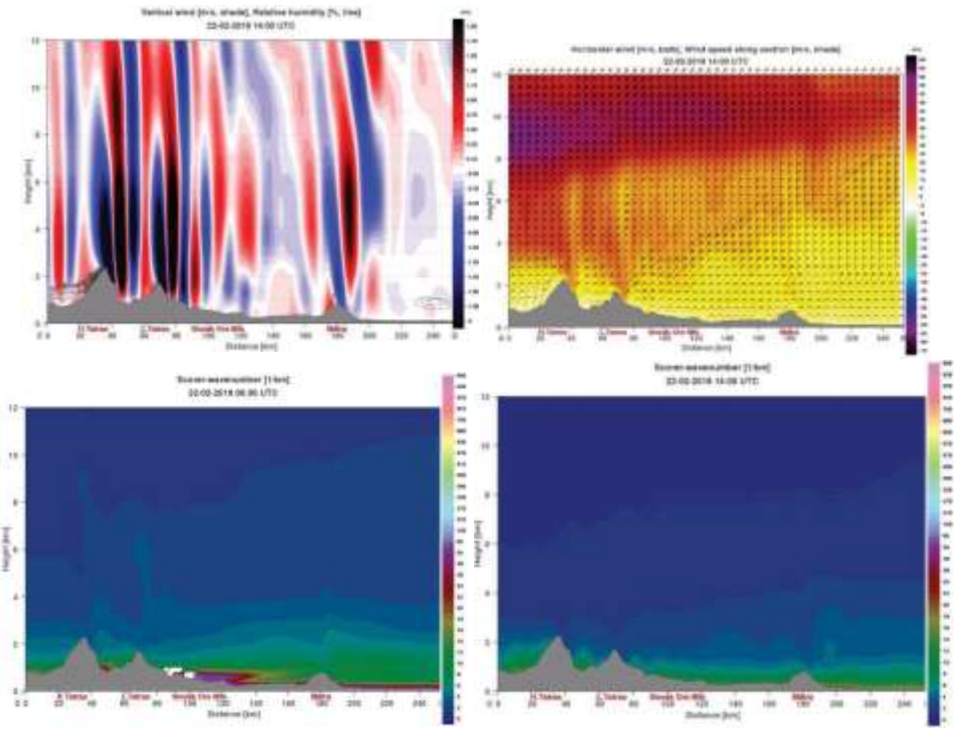


Fig. 2. Vertical velocity (top left), horizontal wind (top right) at 14UTC, and Scorer-wavenumber at 06UTC (bottom left) and 14UTC (bottom right) on 22nd February 2019, as forecasted by AROME at 00UTC. MTW formation is mainly over the mountains and a short distance on their lee side. Horizontal wind profile cross-section suggests downslope windstorms. Scorer-parameter profile shows favorable conditions in mornings but the afternoon situation is only marginal

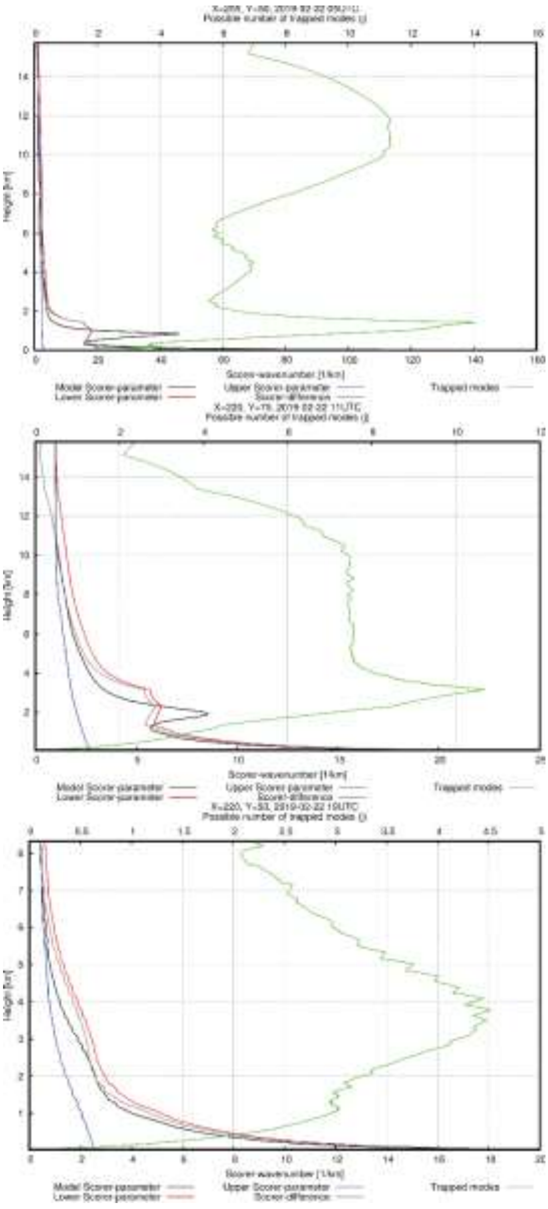


Fig. 3. The effect of cold front on the number of trapped wave modes (top row) and a usual profile in non-favorable conditions for trapping (bottom). The trapped modes graph (green) belongs to the upper horizontal axis. The cold front causes a sharp maximum due to its thin stable layer. This layer rises together with the cold front.

THERMALLY-DRIVEN WINDS OVER MOUNTAINOUS TERRAIN

Dino Zardi, Italy,

Thermally driven winds over a complex terrain are based on basic physical factors, such as, topography, heat fluxes and stability into the boundary layer. The analysis highlights typical features in the alternating patterns of diurnal up-valley winds and nocturnal down-valley winds. In particular, the wind intensity depends linearly on the along-valley pressure gradient, supporting the concept of a quasi-steady balance between pressure gradient and surface friction. Local in homogeneities in the valley cross-section, in particular near vicinity of a large basin, cause temperature and pressure perturbations that are strong enough to alter the typical cycle of down- and up-valley winds. This paper covers, role of slope winds, analytic solutions for time - periodic thermally driven slope flows, valley winds, daytime development of thermal structure, vertical temperature structure, lake, sea and air interactions, tracer gas experiment and modeling.

INTRODUCTION

Thermally driven winds over complex terrain: Basic physical factors are based on ;

- Topography
- Heat fluxes (radiation + sensible heat flux)
- Stability (gravity + stratification)

Daily- periodic thermally driven winds have been observed under the following conditions:

1. Slope winds
2. Valley winds
3. Basins/plateaus
4. Mountain-plain circulations

METHODOLOGY

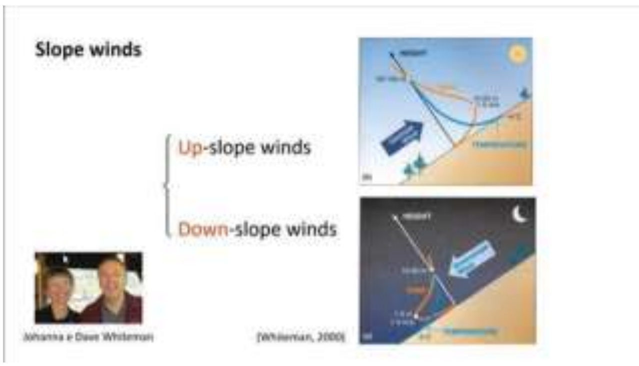


Figure 1 (a): Up-slope winds
(b): Down-slope winds

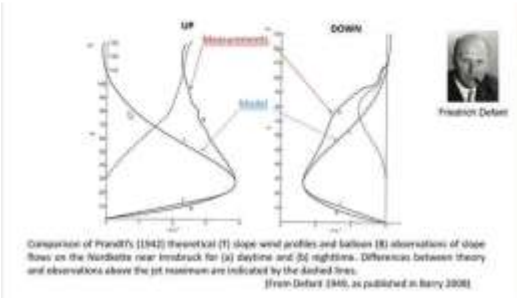


Figure 2: [1]

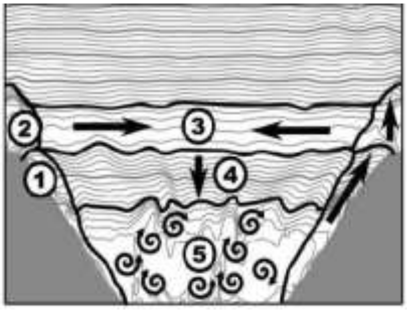


Figure 3: [2]

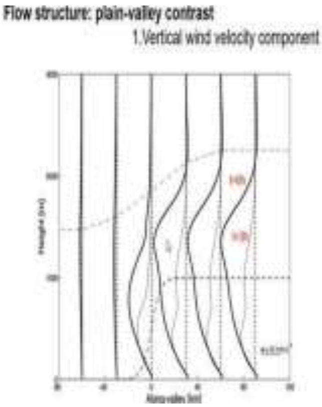


Figure 4: [3]

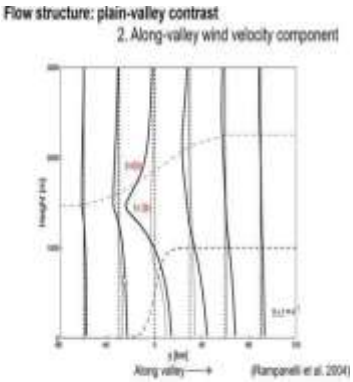


Figure 5: [3]

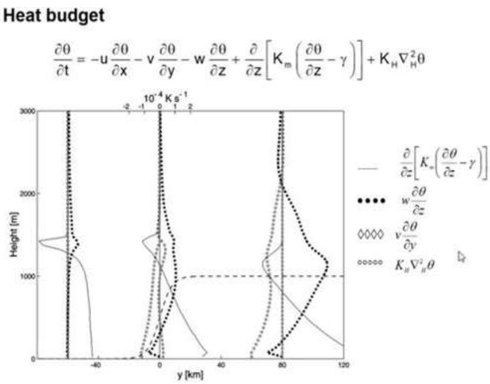
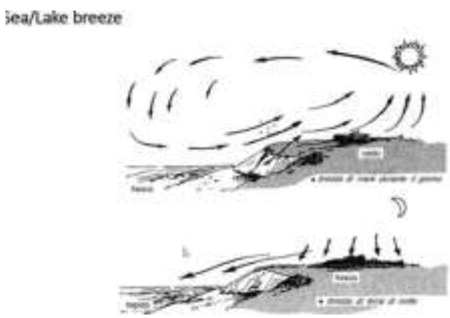


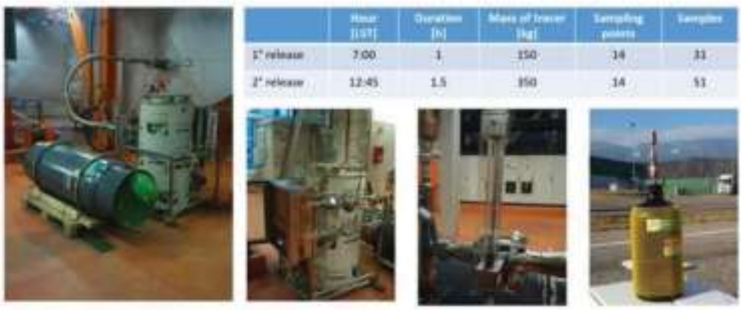
Figure 6: [3]



Observation Equipment

- 7 Surface weather stations (5 valley floor, 2 sidewalls): hourly T, WS, WD RH and P.
- Thermal profiler: T every 50 m, up to 100 m a.g.l, in the centre of the Adige Valley.
- SODAR: WS and WD every 10 m, up to 340 m a.g.l, at the incinerator plant.
- LIDAR: WS and WD every 10 m, up to 1100 m a.g.l, at the exist of the Isarco Valley.

14 Februrary 2017- VERTICAL TEMPERATURE STRUCTURE



	Hour [LST]	Duration [h]	Mass of tracer [kg]	Sampling points	Samples
1st release	7:00	1	150	14	31
2nd release	12:45	1.5	350	14	51

Figure 7

The modelling chain fort he new nowcasting

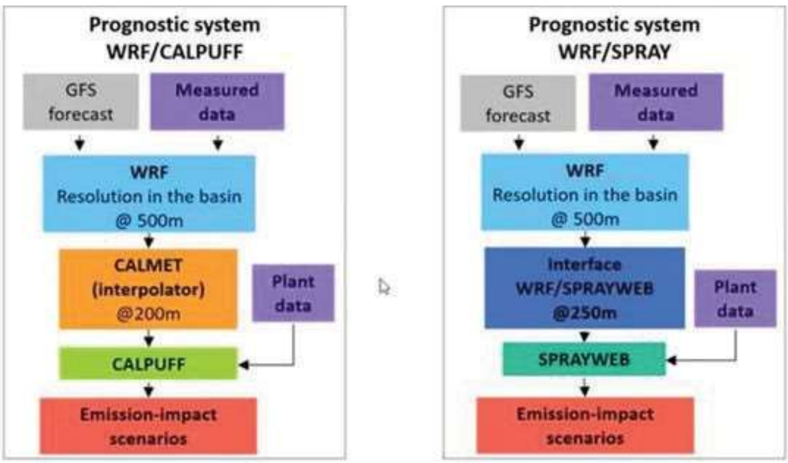


Figure 8

WRF Domains for the now casting modelling chain

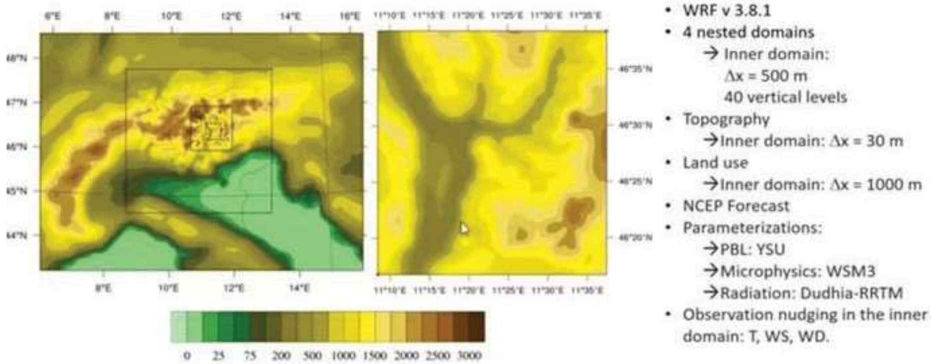


Figure 9

RESULTS

- **WRF/ CALPUFF and WRF/ SPRAY consider, emission impact scenarios. Modelling chain WRF helps for the now casing.**

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Flows_and_Turbulent_Convection_in_an_Idealized_Mountain_Valley

[2]:https://www.researchgate.net/publication/252548196_Daytime_Heat_Transfer_Processes_Related_to_Sl ope_ Flows_and_Turbulent_Convection_in_an_Idealized_Mountain_Valley

[3]: https://www.researchgate.net/publication/255667184_Mechanisms_of_Up-Valley_Winds

[4]: https://www.researchgate.net/publication/255667184_Mechanisms_of_Up-Valley_Winds

Approach Of An Integration Of Dynamic Flight Weather And Forecast Data In An Online Portal For Flight Documentation (Weglide)

Moritz Althaus, Germany

Introduction

This paper covers an approach of an integration to dynamic flight weather and forecast data in an online portal for flight documentation (weglide), Fig. 1. Mainly three parts include [1];

- International platform,
- Working with DAeC
- Para-gliders in the future.

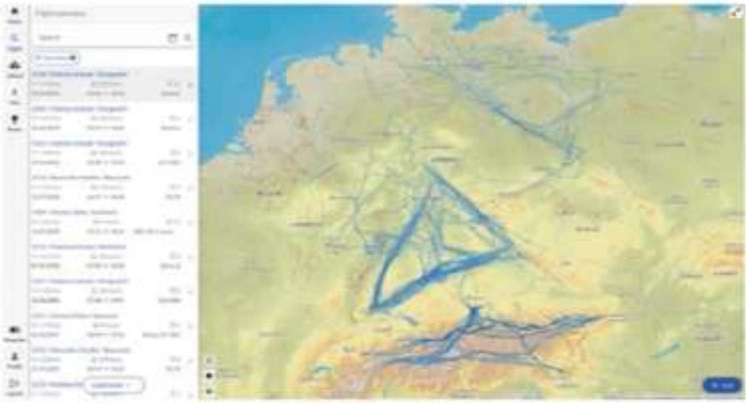

Fig. 1

Current state, static base map (elevation), airspaces, airports, waypoints and lots of dynamic data are available.

Results

Fig 2 shows a flight planning. it shows all meteorological parameters on the left to predict flight distance. it is necessary to plan to integrate more open data from DWD for planning and analysis. Data is related with vector data (wind, thermal height), synoptic predictions, local temperatures. By using input data, live weather calculates following parameters: Thermal height, thermal strength, wind, wave sports and cloud streets. As a conclusion of segment analysis, thermal and glide stats, climb rate and wind speed /direction were defined. Historical weather conditions are also one of the important parts for soaring prediction. Some archives are available, vectorized data is easily stored over layers.

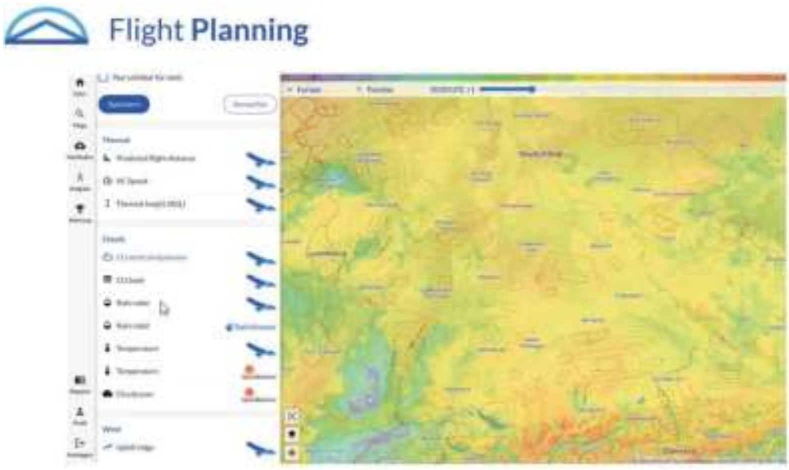

Fig. 2

Split flights into segments of approximately 100s have huge data sets. it covers speed, distance, vario, altitude, change in total energy, wave thermal ridge and glide ratio. At the moment there are 1 million chunks. In the near future, it will increase up 20 million chunks. Fig. 3 shows a wave map.

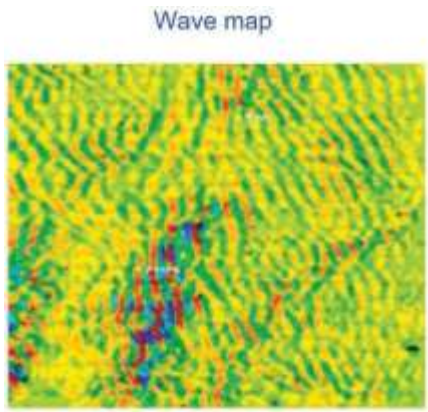

Fig. 3

In similar way, uphill ridge wind map and speed map are available.

As a conclusion, author invites all researchers, for collaboration and sharing data.

References

[1] url1: https://www.weglide.org/flight/89935

ATMOSPHERIC FACTORS ON LAND SURFACE TEMPERATURE

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Organisation Scientifique et Technique Internationale du Vol a' Voile

{OSTIV} Meteorological Panel meeting, 17 – 18 February 2021

Extended Abstract

Land Surface Temperature (LST) is the thermal manifestation of the land's internal energy. It is a fragile entity which is ever- changing due to external factors. This study will observe and determine the relation between the Meteorological Factors and LST, through data analysis. The data which will be used in this analysis will be gathered through the sources of LANDSAT. LST depends on various factors of Meteorology. This study will consider the factors of Surface Reflectance, Top of Atmosphere, Brightness and Air Temperatures. Along with this, the effect of altitude and surrounding vegetation will also be taken under consideration. Land Surface Temperature is an important factor in urban and agricultural planning. The analysis will try to establish a definite correlation between LST and the surrounding factors which can alter it.

LANDSAT 8, [1] the latest satellite from LANDSAT series, gives a lot of possibilities to study the land processes using Remote sensing. For the meteorological factors, we will be studying surface temperature, wind speed, air temperature and altitude. Their effect on Land Surface Temperature (LST) will determine the soaring time, gliding range, etc. We will use convection current paths to extend flight time.

The images below show the Brightness Temperature, and Surface Reflectance of the region. Here we have considered region around Nevada and Oregon, US. The data is taken from LANDSAT 8. Some of the results obtained are as follows. Fig.1 shows the Brightness Temperature of the region north of Nevada, US. Here, the green colour signifies the thermal pattern of the region. Fig.2 shows Surface Reflectance which is indicated in dark red colour signifying thermal waves.

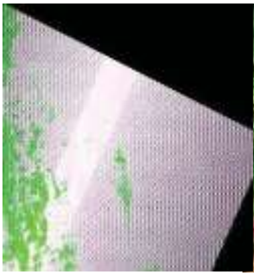

Fig.1

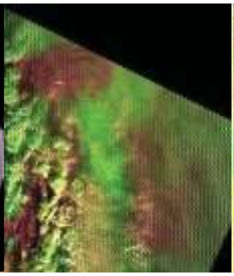

Fig.2

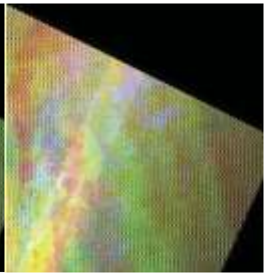

Fig.3

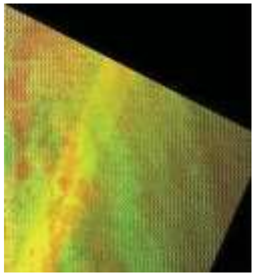

Fig.4

The region is compatible for gliding and such aviation sports. Along with these, the LST data can be used to identify paths with high convection currents. The Fig.3 and Fig.4, shows the Land Surface Temperature (LST) of the region. The red regions show the thermal patterns of the land.

The Meteorological Data for Wind Speed and Air Temperature is predicted through the graphs in Fig.5 and Fig.6 respectively. By taking into account the Meteorological Data from LANDSAT, finding optimum conditions for gliding becomes possible.

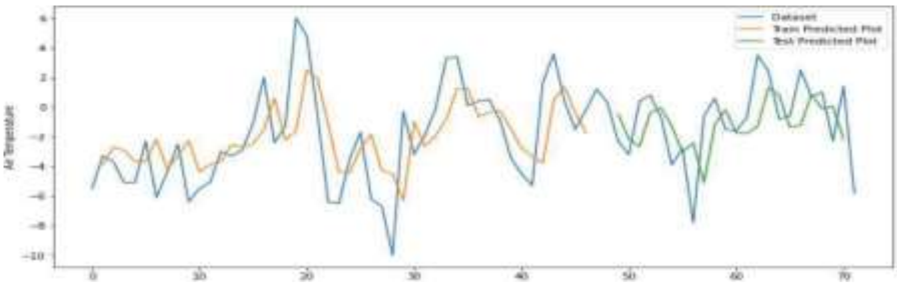

Fig. 5(a)

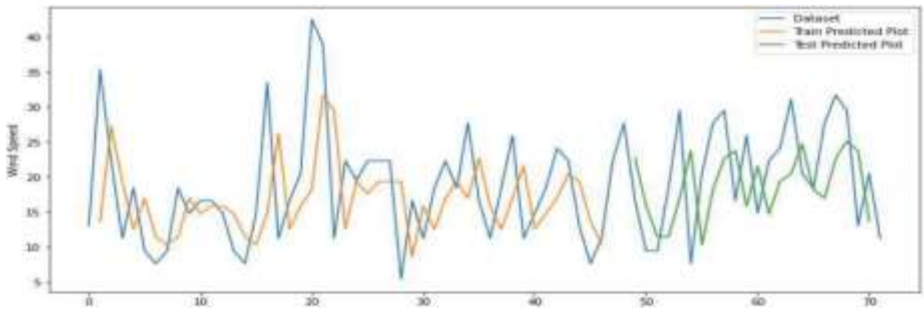

Fig. 5(b)

Fig.5 (a) Shows the predicted Wind Speed (b) Air Temperature Data

Francois et al.[1] focuses on developing an ERDAS IMAGINE image processing method using the LANDSAT 8 thermal imagery of band 10 data. Through the analysis of the Land Thermal Patterns and the Effect of the Meteorological Factors on LST, the soaring difficulty is reduced and gliding range and time of flight is increased significantly, as shown through the accounts of [2]. Mr.G.E. Collins of British Gliding Association's Summer school remained in the air, soaring up to 2,150ft and remained gliding for 27 minutes. The use of rising air, known as Thermals, is used in gliding sports over the world. The glider pilot circles the thermals to gain height, after locating them [3]. Sumit et al.[4] concludes that in any study related with spatial distribution of LST over a large area, effect of change in elevation at different locations shall also be considered and LSTs at different location shall be rationalized on the basis of their comparative elevations. Mutiibwa et al.[5] explicitly investigated the influence of key environmental, topographic, and instrumental factors on the relation between LST and measured T_{air} in the Nevada mountain region. The results explained that the relation between LST and T_{air} was found to be strongest during late summer and fall and weakest during winter and early spring. As the terrain roughness increases, the relation was found to be diminished between LST and T_{air}.

Therefore, increasing the time of flight and gliding range, as a major extent becomes possible through studying convection currents due to LST and air temperature.

Acknowledgements

The weather data was obtained from Weather Data Services (visualcrossing.com), Weather-Online (weather-online.com), and Weather Atlas (weather-atlas.com). The LST, Brightness Temperature and Surface Reflectance Data were retrieved from LANDSAT 8 (explorer.usgs.gov) for region around Nevada and Oregon, US.

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THE IMPORTANCE OF CHAOS THEORY IN THE DEVELOPMENT OF ARTIFICIAL NEURAL NETWORKS

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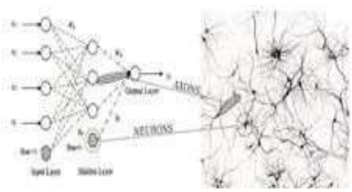
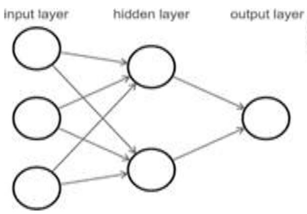
Presented at the on-line Organisation Scientifique et Technique Internationale du Vol a' Voile (OSTIV) Meteorological Panel meeting, 17 – 18 February 2021

Extended Abstract

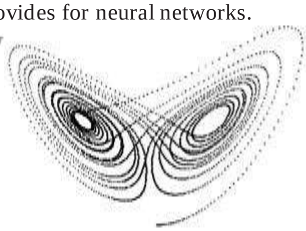
Chaos and the brain have an important place in neuroscience. It is vital to research the special bond between chaos and the brain and find similar literature studies in this regard, how chaos has affected the brain, and the importance of chaos in the development of neural networks. During the change of states in Neural Networks (NNs), sudden occurrences lead to a nonlinear process called barrier nature that divides cognitive states. This process is related to the arrival of neuron clusters. This matches the working patterns of the neurons in a unique space maneuver. This experience is intriguing about how it emerged in the brain and how neural networks with a complex structure like chaos works. Neural Networks is also one of the Artificial Intelligence techniques developed after the human brain's information processing technique. The working model of the nervous system has been modeled in the development of artificial neural networks. Artificial neural networks mimic the way the nervous system works. Imitated nerve cells are made up of neurons, and these neurons bind to each other in various ways. Chaos theory is a physically or mathematically structured technique and explains extreme physical realities as a whole. This work focuses on the similarities and differences between Chaos theory and complex neurons and the benefits Chaos theory provides for neural networks.



Artificial Neural Networks



Artificial Neural Networks Architecture



Chaos theory

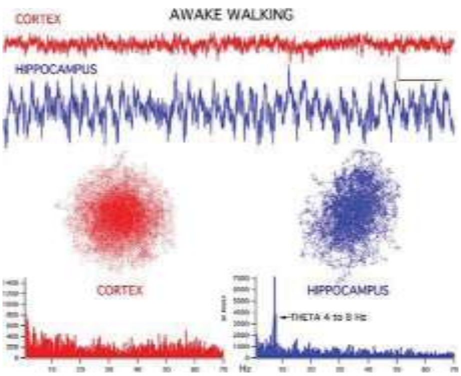
Chaos Theory, whose foundations date back to the beginning of the last century, created many tools to detect chaotic signs between deterministic signs and random signs, especially after the studies carried out in the last thirty years [1]. Many complex problems that human intelligence could not solve have been solved due to the developments provided by Neural Networks (NNs), one of the Artificial Intelligence (AI) methods developed in the last century. These solutions are obtained as a result of function approximation, on which the data obtained experimentally rather than the equation method is based [2].

Artificial Neural Networks

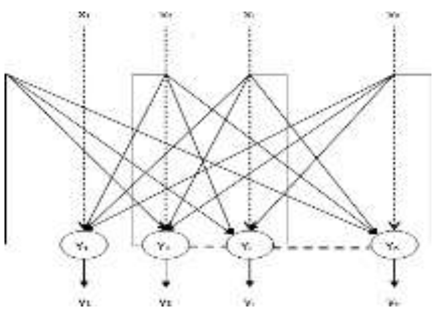
Artificial Neural Networks (ANNs) are a topic that has been discussed extensively in academic environments. Besides, the Chaos theory development goes back to much earlier dates, and it can be said that it has been of great interest to the scientific community after the 1980s [3]. However, the intersection of Chaos theory with neurobiology dates back ten years. Chaos theory in the development and investigation of ANN is a much newer stage. Chaotic self-organization provides a unique theoretical and experimental tool for a deeper understanding of dissociative phenomena. It makes it possible to examine how dissociative phenomena may be linked to epileptic-form discharges associated with various psychological and somatic symptoms [4].

Chaos theory:
The word chaos means emptiness, the bottomless pit in the underworld, and its origins in Greek mythology. However, it is mostly used in two meanings in the literature: 1. The state of the universe, lacking the form before it entered the order, incompatible and confused. 2. Confusion, turmoil. However, in this study, chaos's following meaning is emphasized: Chaos is complex and irregular looking, connected with its sensitivity to the initial conditions; It is a phenomenon that occurs in deterministic, nonlinear, time-varying systems. Chaos theory has been developed since the first studies on the subject and has shaped the future, as some researchers have suggested [5]. The contribution of [6] demonstrated the significant role of chaos in understanding what it is and its importance in the natural world. Although the study of predictable, linear systems is a large part of classical training, these systems are the exceptional exceptions. Most natural systems are based on Chaos rules. A butterfly in the meadow flaps its wings, and a storm occurs in the Pacific Ocean. This classic example of a critical aspect of chaotic systems is known as the "butterfly effect." Chaotic systems have extraordinary sensitivity to internal conditions, making them naturally unpredictable in the long run.

Chaos in Brain
The existence of confusion in the brain has been a topic of discussion among researchers only after the 2000s. At that time, this confusion was discovered at both the chaotic and microscopic (neural) levels and the brain's macroscopic level. A group of researchers working on Chaos exploration at the neural level; suggested that chaotic behavior may be responsible for schizophrenia, insomnia, epilepsy, and other disorders. This study refuted that chaos represents a possible source of a brain's harmful disorder [7]. The chaotic activity that occurs in the brain creates a bifurcation (bifurcation) that provides the basis for the gravitational force.



Chaos in Electroencephalography


Hopfield Network

While more research needs to be done, it is clear that the brain's ability to generate new information internally is critical to our creative processes. Probably, chaos is essential to that talent. Creative processes aside, the benefits of chaotic activity in the brain are many. These should be used consistently to perform their correct functions. If neurons are not used for a long time, they will die. The random functioning of dormant neurons creates a suitable mechanism for maintaining neuron health. Hence, chaos is essential for normal brain functioning. What was previously thrown out as random sound is biologically significant. As a thought, background noise in the brain is not stable, stable, and controllable. Electromagnetic impulses in the brain operate chaotically at random, allowing the brain to become involved and learn new things. Chaotic activity in the brain provides rapid transitions. Such transitions are necessary for information processing. Some researchers think that this kind of chaotic background behavior must enter continuous learning for the brain.

Chaos in Neural Networks
Freeman, W. J. (2014) emphasized Chaos' similarity to neural networks after demonstrating that chaos may be the main feature that makes the brain different from an artificial intelligence machine. Besides,

Freeman is working on simulations to monitor biological models with electroencephalography as a closer and continuous activity. According to [8], they created a simple artificial neuron model in which individual neurons exhibit chaotic behavior, which models biological neurons' behavior. However, at this point, macroscopic chaotic behavior can be designed with more traditional artificial neural network models, although the utility of single neuroses with chaotic dynamics is unknown. [9] showed in their studies that chaos could exist due to the neutralization of nerves and stimulation to specific neuroses rather than inhibitory of weighted connections. Some of the earliest studies of macroscopic chaotic A Hopfield network operating in a separate line mode, or other words, can be said to be a discrete vector whose input and output patterns can be binary (0,1) or bipolar (+1, -1) in nature.

Artificial Neural Network with Chaos on Aviation

As we mentioned in the first paragraph, ANN has been used by the aviation industry for a long time in subjects such as flight management systems and autopilots. The world's leading airline companies have already been using ANN to increase operating efficiency, avoid costly mistakes and increase customer satisfaction. Many major countries and brands today prioritize digital investments. Virtual Assistants: One of the things expected to happen in the near future is virtual assistants. ANN-based virtual assistants help pilots increase their productivity and efficiency by providing position information as well as changing radio channels, reading wind forecasts, and providing location information on demand. New applications and market opportunities such as crewless aerial vehicles launched for military use, the establishment of emergency communication networks, advanced cargo distribution, and market opportunities gradually show civilian potentials. Aerial photography has been recognized as an evolving and promising technique in the industry for its superiority in UAV-assisted communication, flexibility, and autonomy. Such robots, which can be used in the air, on the ground, or underwater, theoretically, can perform their tasks independently with ANN.

Results

ANNs are designed to capture some useful brain functions by modeling the brain's working. Research into the brain's function has led researchers to conclude that the chaotic dynamics of information processing and the maintenance of chaotic activity are essential elements of the biological nervous system. It can be said that the problems of Chaos theory are whether it is necessary for ANNs trying to increase the abilities of the brain and to what extent chaos can be used to increase the performance of artificial neural systems. What is concluded from the study is that chaos is crucial to brain activity, and it is a survival-aware trait between a creature with a brain in the real world and a robot that cannot work outside of a controlled environment. Researchers like Freeman believe that systems that settle in equilibrium states or low-level oscillations rather than wells of chaotic activity are doomed to failure. It is similar to biological nervous systems in which non-chaotic behaviors indicate coma, seizure, or death. Although chaos is seen as an understandable by-product of complex systems such as the brain or ANNs, Chaos can be considered as the beginning of a system's activity and life and thought system in itself. The study shows that the benefits of chaotic systems in ANNs can be obtained in other ways, such as producing new algorithms from brain working styles to the machines; thus, chaos is indispensable for the nervous system. After all, the most critical function that separates those who can think from the average machine is provided. Without such a mechanism, the system cannot avoid generating previously learned activity patterns and can only evolve into previously learned behaviors.

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PREDICTION OF WIND SPEED BY USING CHAOTIC APPROACH: A CASE STUDY IN ISTANBUL

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Extended Abstract

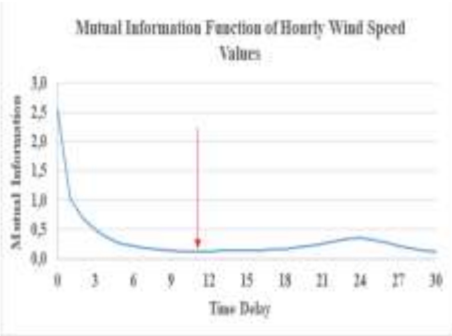
In this study, the prediction of the hourly and daily wind speed at the location of Istanbul Florya was made with a chaotic approach. Wind energy having stochastic nature is more sensitive to the extreme values of wind speed varying spatially and temporally. In this context, making accurate wind speed estimation may be challenging. Therefore, various approaches such as chaotic methods can be implemented in order to forecast wind speed.

In the study, hourly and daily wind speed data which belongs to Florya meteorological station were used. The observation period was taken to be from July to August in 2015 for hourly dataset. In addition, the daily wind speed dataset period covering 5 years is taken as 2011-2015. The location of the station is seen as 40.9758 N and 28.7843 E. The location of the station where the prediction was made on Istanbul is shown in Figure 1.

Figure 1. Map of Istanbul and the location of the station

In this study, TISEAN 2.1 program containing nonlinear time series analysis methods based chaotic approach is used [1]. In order to reconstruct the phase space, two different phase space parameters must be determined: Time delay (τ) and minimum embedding dimension (m) [2]. The Mutual Information Function (MIF) is used instead of the Autocorrelation Function measuring linear dependence. Also, Fraser and Swinney have suggested that MIF gives better results compared to autocorrelation [3].

Time delay was calculated as 11 by using the mutual information function method for hourly wind speed data. For daily wind speed data, time delay was calculated as 4.



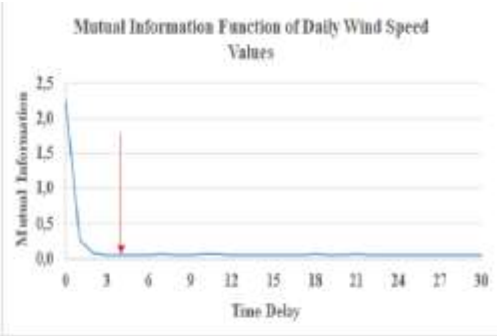
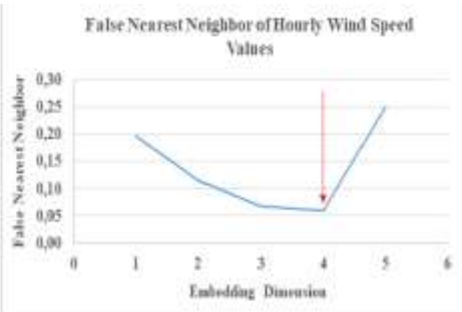


Figure 2.a. MIF of Hourly Wind Speed Data

Figure 2.b. MIF of Daily Wind Speed Data

Embedding dimensions are calculated by using the False Nearest Neighbor (FNN) method by using the time delay of the observed variables. Embedding dimensions were found as 4 and 3 for hourly and daily wind speed data, respectively.



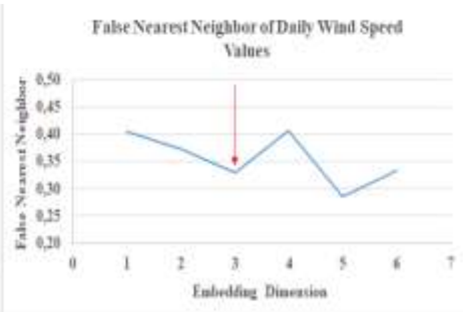
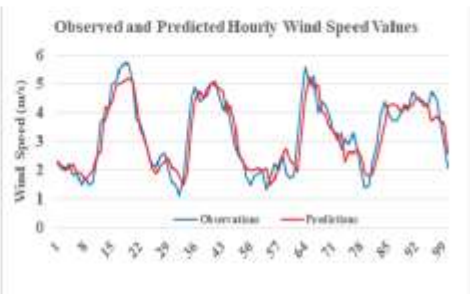


Figure 3.a. FNN of Hourly Wind Speed Data

Figure 3.b. FNN of Daily Wind Speed Data

By using predetermined time delay and embedding dimension information, predictions have been carried out. It can be clearly seen that in Figure 4.b, the Pearson correlation coefficient was found as 0.92. In this context, this value shows a high relationship between the observed and the predicted data. In addition, according to Figure 5.b, correlation coefficient was found as 0.59. It can be considered a lesser relationship compared to hourly wind speed data.



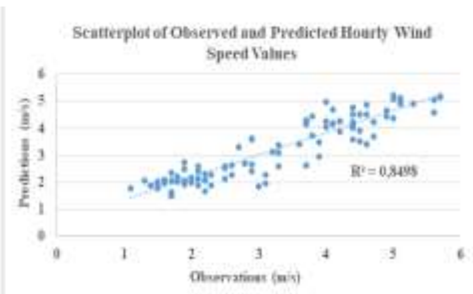


Figure 4.a. Observed and Predicted Hourly Wind Speed

Figure 4.b. Scatterplot of Obs. vs Pre. Hourly Wind Speed

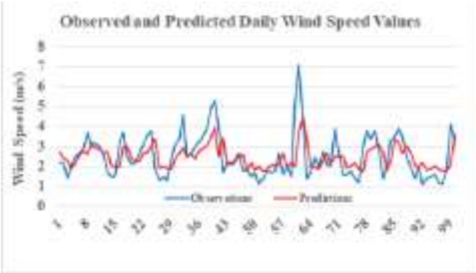


Figure 5.a. Observed and Predicted Daily Wind Speed

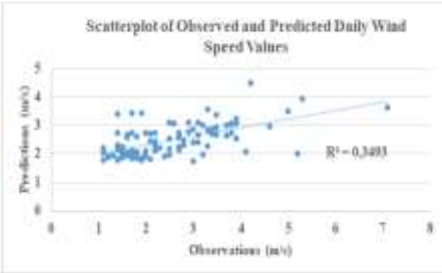


Figure 5.b. Scatterplot of Obs. vs Pre. Daily Wind Speed

Typically, wind speed is a difficult variable to predict as it is affected by complicated processes in the atmosphere and is susceptible to sudden changes. Based on the high relationship between data created using chaotic methods and observation data, chaotic approach can be considered to be successful in terms of forecasting wind speed.

Acknowledgements

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AVICHAINDB: BLOCKCHAIN INTEGRATION ON AVIATIION DATABASES

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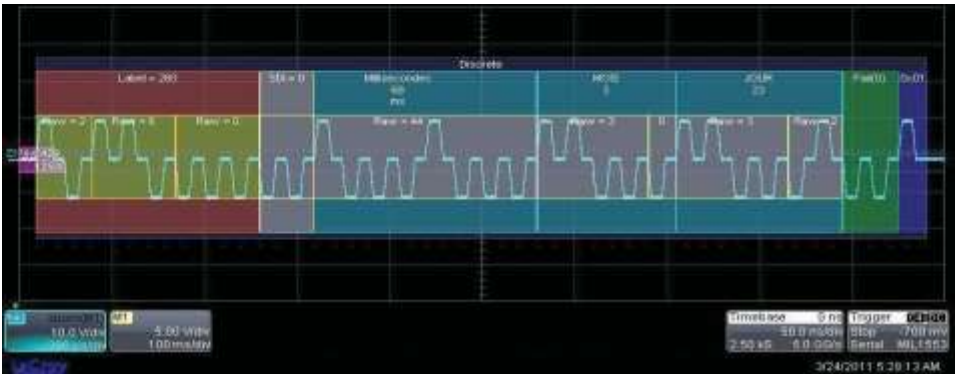
Extended Abstract

This is an introduction to AviChainDB system presented at the OSTIV Meteorological panel. AviChainDB is designed to save the data generated in the Aeronautical Radio, Incorporated (ARINC) standards also known as “Mark33 Digital Information Transfer System (DITS) “to a special blockchain network developed on the Ethereum [2] platform. The data is also preprocessed and saved into the MySql database to get more secure hibrit model [5]. We use Byzantine Fault Tolerance consensus algorithm to avoid mining. Because of the smart contracts [8] developed in our project, the data produced in the ARINC 424 (ARINC 424-13, ARINC 424-15, and ARINC 424-18) or ARINC 429 standard [11] were firstly recorded in the blockchain system and then in the MySql database. Keeping data in a blockchain in addition to a relational database serves as a tamper-proof back up if any malicious attempt is made to modify the data in the relational database [3]. Figure 1 below shows an ARINC 429 Word, viewed as a signal, with overlaid decoding.



Figrue 1. An ARINC 429 Word, viewed as a signal, with overlaid decoding

Aviation management software is mostly provided by Jeppesen and AeroNavData companies. Both companies offer navigation database solutions using ARINC standards. Today, there is some few comprehensive research on blockchain technology developed or proposed for use with ARINC

standards. For this reason, it is of great importance to investigate the possibilities that blockchain technology can provide for storing aviation data produced in ARINC standards on blockchain systems. To our knowledge the AviChainDB project is the first blockchain-based aviation database proposed [1] [10].

Blockchain technology is an innovative and decentralized [6] secure database applied in many areas other than crypto currencies and finance with the advent of Blockchain 3.0. Its rapid growth in terms of diverse applications is made possible by the fact that blockchain technology can be added to existing systems as a layer. To name a few non-financial applications: Secure sharing of medical data, music royalties tracking, cross-border payments, real-time IoT operating systems, personal identity security, anti-money laundering tracking system, supply chain and logistics monitoring and voting mechanism. Figure 2 summarizes different blockchain application areas [12].

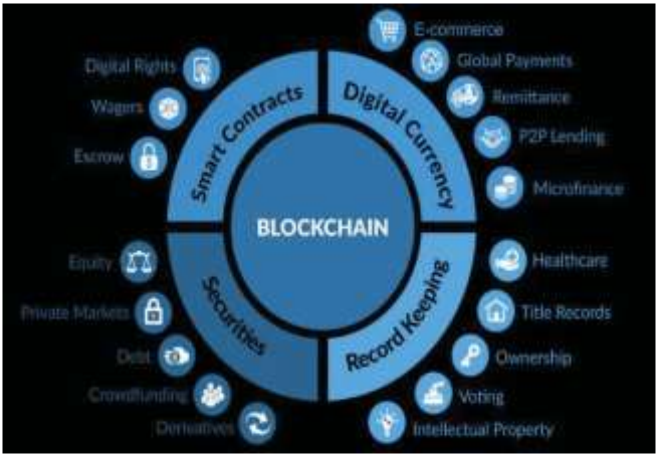


Figure 2. Blockchain application areas

Blockchain creates and shares a tamper-resistant digital transaction book, ensuring transparency [4]. Any modification of data in the blockchain either by malicious attacks or mistake could be detected because of the consensus algorithm used unless the majority of the nodes in the network is compromised. For this reason, a blockchain can be defined as a distributed and invariant data structure managed by a consensus algorithm that runs on a network [7]. Securing the ARINC data using the blockchain technology will add another layer of security [9].

One of the ARINC standards widely used today is the ARINC424. ARINC 424 files are ASCII text files with a fixed length of 132 characters per line. One line represents one record. Optional continuation records may be used for additional information to primary record. Depending on the record type, each column has a well-defined meaning. The data included in an airborne navigation database is organized into ARINC 424 records. These records are strings of characters that make up complex descriptions of each navigation entity. There are 132 columns or spaces for characters in each record. Not all of the 132 character-positions are used for every record — some of the positions are left blank to permit like information to appear in the same columns of different records, and others are reserved for possible future record expansion.

The AviChainDB project is a hybrid blockchain-based aviation database currently under development. AviChainDB works only on the storage of data produced in ARINC standards from a wide range of aviation devices. AviChainDB is designed to take the security of the existing aviation databases to the next level. The image below also shows the differences between AviChainDB and other comparable systems.

	Bitcoin Blockchain	Distributed Database	AvichainDB
Immutability	✓		✓
No Central Authority	✓		
Assets Over Network	✓		✓
High Throughput		✓	✓
Low Latency		✓	✓
Rich Permissioning		✓	
Query Capabilities		✓	✓

Comparison of AviChainDB with other systems

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PERFORMANCE of TWO LIGHTNING SCHEMES OVER KUWAIT

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Extended Abstract

Forecasting of Thunderstorms occurrence can help in decreasing the annual loss of lives and properties. This study aims to compare the performance of two lightning schemes in forecasting cloud to ground flashes. Two simulations have been performed one for lightning potential index (LPI) and the other for flash origin density (FOD) by using the electric version of WRF (E-WRF). The results show that the two schemes are spatially correlated with the observation while FOD provide better performance than LPI.

Keywords: WRF; E-WRF; FOD; LPI

INTRODUCTION

Lightning is a typical feature of severe weather that raises significant concern for public safety. Meteorologist in the past used some indices as indicators for thunderstorm occurrence. K-index (KI), convective available potential energy (CAPE) and cloud physics top temperature (CPTP) are thermodynamic indices used for lightning prediction. Yair et al. (2010) introduces a new advanced index evaluating potential for lightning activity based on the dynamics and microphysics of clouds. LPI can serve as a valuable early warning tool for lightning prediction as it can be produced in a regular operational run of short-range forecasting) Lynn and Yair (2010). Using E-WRF reduces the false alarms of lightning activity (FOD) both over land and sea compared to a well-documented diagnostic lightning prediction scheme Lagasio et al. (2017). This study aims to compare between the performance of two lightning schemes in forecasting cloud to ground flashes.

DATA AND METHODOLOGY

Two numerical simulations were performed using the first release of electrification WRF (E- WRF) to predict FOD and LPI respectively over north east part of Arabian Peninsula near Kuwait region on 14 November 2018. E-WRF is the first release of electrification scheme of WRF (https://sourceforge.net/projects/wrfelec), with ARW core version 3.9.1.1 (Skamarock et al., 2008), which is a non-hydrostatic, compressible model. In the recent study WRF-ELEC 3.9.1.1 version is used. Two nested domains were configured with the coarse domain with grid spaces at 18 km for coarse one(d01), 6 km for first nest (d02) and 2 km for second nest (d03) containing Kuwait region figure 1.

The two simulation were performed using the same configuration schemes except for microphysics scheme. For LPI WSM6 scheme was used as it shows the best performance in terms of total interest Lagasio et al, (2017). NSSL microphysics scheme was used only for E-WRF for obtaining FOD. The Rapid radiative transfer model (Mlawer et al., 1997) with the Dudhia scheme (Dudhia, 1989) was used to simulate the long- and short-wave radiation, respectively. The Monin-Obukhov scheme was used to simulate surface layer fluxes (Janjic, 1996) and the Mellor-Yamada-Janjic turbulent kinetic energy (TKE) scheme was used to simulate boundary layer fluxes (Mellor and Yamada,
1982; Janjic, 1994). The land surface fluxes were obtained from NOAA model (Chen and Dudhia, 2001, modified by Liu et al., 2006), The Kain-Fritsch scheme was used on the two first domains to parameterize moist convection (Kain and Fritsch, 1993).

The NCEP Final Operational Global Analysis dataset (FNL) was used as the initial and lateral boundary conditions for the meteorological fields, with spatial resolution of 0.25-degree x 0.25 degree and temporal resolution of six hours (FNL dataset is available on: (https://rda.ucar.edu/datasets/ds083.2/). Lightning Imaging Sensor (LIS) datasets used for evaluation the two lightning schemes. Our case study event is observed twice during day 14/11/2018 one at 03:00 UTC and the other at 18:00 UTC so the E-WRF output was evaluated at the same corresponding observation hours.

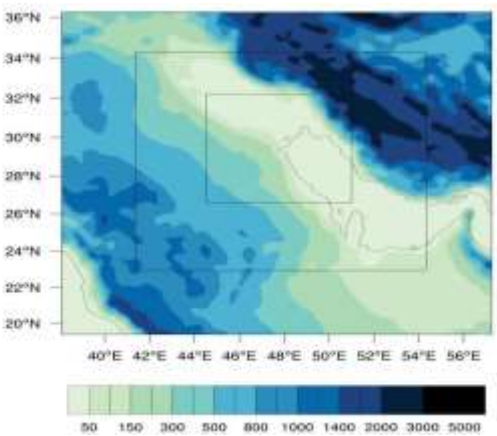

Figure 1: Domains of study area with Topography height

RESULTS AND DISCUSSION

Figure 2 shows that There is a good spatial consistency between FOD and LIS patterns with an obvious distance between them but, the model does not create false forecasting pattern. LPI shows also spatial agreement pattern with observation one but overestimation patterns are generated specially at the 31 and 33 Latitude. FOD shows better performance in this case than LPI g

0300

1800

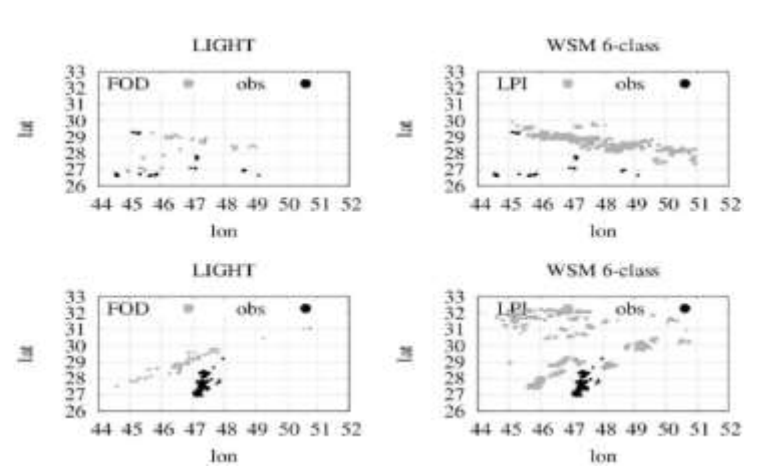

Figure 2: Scatter plot of FOD and LPI versus observation at 03:00 and 18:00 respectively versus LIS observation, black dots indicate LIS observation and grey for FOD and LPI.

Proposed FUTURE WORK

It is not recommended that one case study can be used to evaluate such performance, but this due to limited computational power. Next step is to complete the study with more simulations for different cases.

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INVESTIGATE LIGHTNING EVENT OVER MIDDLE EAST USING WRF ELEC

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INTROUCTION

Lightning is a naturally occurring electrostatic discharge during which two electrically charged regions in the atmosphere or ground temporarily equalize themselves, causing the instantaneous release of as much as one gigajoule of energy.

Figure 1: Lightning

ABSTRACT

Lighting is a typical feature of severe weather that raises significant concern for public safety.

METHODOLOGY

- KI (K-index) is a measure of thunderstorm potential in meteorology

$$K = (T_{850} - T_{500}) + T_{d_{850}} - (T_{700} - T_{d_{700}})$$

- Cape is an indicator of atmospheric instability in any given atmospheric sounding as Positive CAPE will cause the air parcel to rise, while negative CAPE will cause the air parcel to sink.
- **CPTP (Cloud Physics Thunder Parameter)** implies that the convective updraft must be strong enough to ensure super cooled liquid water is replenished and grapuel is lifted above the charge reversal temperature zone (- 15°C to -20°C) Bright et al. [2005]

Lightning Potential Index (LPI)

- Lightning Potential Index (LPI) : is an advanced index for evaluating the potential for lightning activity is introduces by Yair et al. (2010) recently, which is based on the dynamics and microphysics of clouds.
- LPI is estimated Within the charge separation zone of clouds, between 0°C and- 20°C, where the non- inductive mechanism involving collisions of ice and grapuel particles in the presence of super- cooled water is dominant (Saunders et al., 1991)

$$LPI = \frac{1}{V}\iiint \varepsilon w^2 \, dx\,dy\,dz$$

$$CPTP = (-19^{\circ}C - T_{BL})(CAPE_{-20^{\circ}} - K)/K,$$

- TEL : where is the equilibrium temperature.
- CAPE- 20°: is the CAPE between the 0°C isotherm to -20°C
- K is a constant with a value of 100 J kg -1
- KI, CAPE and CPTP are based only on thermodynamic instability parametrs.7

Where:

V: is the model unit volume

w: is the vertical wind component in ms -1

Ɛ: is a dimensionless number which has value between 0 and 1

- ➢ LPI can serve as a valuable early warning tool for lighting prediction as it can be produced in a regular operational run of short- range forecasting (Lynn and Yair) 2010
- ➢ There is no single threshold LPI for various parameterizations as a criterion for the occurrence of lightning flashes as the maximum index values are shown to depend significantly on the type of parameterization Dementyeva et all (2014)

E-W RF

- Is the first release of electrification for NSSL microphysics scheme in WRF (WRF- ELEC), with ARW core version 3.9.1.1, which is a non- hydrostatic, compressible model. For more information about E-WRF physics formulas it is recommended to Mansell et al (2005) and Fierro et al (2013)
- Flash origin density of the hurricane is in reasonable Agreement with observations Fierro et al (2014)
- Using E-WRF reduces the false alarms of lighting activity (FOD) both over land and sea compared to a well- documented diagnostic lightning prediction scheme Davis et al (2018)

Lighting Case Study over Kuwait

- Kuwait country located in the North West part of Arabian Peninsula.
- Kuwait is oily country so forecasting thunder storm occurrence especially cloud to ground one CG is very critical for save lives and economic.
- On 14/11/2018 Kuwait is affected by deep convective system producing extreme rainfall and heavy thunders storm
- Rainfall pattern is widely and most of its intensity over Kuwait
- Some rain gauge observation exceed 100 mm/day as

Model Configuration

- WRF- ELEC was simulated using reanalysis data fnl 0.25 x 0.25 at resolution 18 km for the coarse domain, 6 km for the first nest and 2 km for the inner most second domain

Two simulations between done to

1- Compare flash origin density FOD with Light imaging sensor (LIS) satellite data
2- Compare Lightning potential index LPI with Light imaging sensor (LIS) satellite data.

Satellite Observation Data

- Lightning Imagine Sensor (LIS) datasets were collected by the LIS instrument mounted on the ISS used to detect total lighting occurring in the Earth's tropical and mid- latitude regions.
- Obtained from orbital satellite with a swath width of about 550 km of the Earth's surface
- Detect lightning with a storm- scale resolution is changing 4 km to 8 km
- Each earth location to be observed continuously every 2 milliseconds for about 90 seconds.
- Our case study event is observed twice during day 14/11/2018 one at 03:00 UTC and the other at 18:00 UTC
- According to two detected hours the WRF output was evaluated at the same corresponding observation hours.

RESULTS

- FOD shows better performance in this case than LPI
- More simulation of different cases with different microphysics schemes will be performed
- Objective analysis will be done rather than subjective one for more accurate judgment on model performance.

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RECENT DEVELOPMENTS IN GLIDING AND GENERAL SPORTIVE AVIATION

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Extended Abstract

About Turkish Aeronautical Association

The leader of sportive aviation in Turkey is Turkish Aeronautical Association. The Turkish Aeronautical Association (THK), which supports the aviation industry and undertakes the mission of ensuring the development of military, civilian, sports and touristic aviation has been carrying out its activities since 1925 by focusing on the sustainability and continuous development of the Turkish aviation industry. THK, Turkey's aviation industry role model, is the authorized and exclusive representative for International Aeronautical Federation (FAI). The trainings given by the institution are organized according to the International Civil Aviation Organization (ICAO) publications, the International Aviation Federation (FAI) rules, the relevant Civil Aviation Laws and the publications issued by the Joint Aviation Authority (JAA).

Sportive Aviation Part of THK

THK has 6 different large training centers for sportive aviation as well as commercial flights. The most popular sportive aviation branches are gliding, paragliding, hang gliding, aeromodelling and unmanned aerial vehicles. The other four branches can be done almost anywhere. However, in order to perform the glider branch, compliance with many instructions issued by the Civil Aviation Authority is sought.

The Glider Flight School is currently operating in İnönü, Eskişehir Training Center. Unfortunately, Glider Flight School was the first and only flight school in Turkey until 2019. The reason for this is the controlled airspace application by the Turkish Air Forces. However, thanks to the permits received and new instructions published, new flight clubs have started to be established. Not only glider, but also paragliding and unmanned aerial vehicle training is spreading rapidly.

New Sportive Regulations of Civil Aviation Directory of Turkey

The instructions issued by the General Directorate of Civil Aviation for two years include special headings for the development and popularization of sportive aviation. Especially lowering the age limit for glider flight trainings, providing facilities to increase the number of flight clubs, and abolishing the demanding health report requirement for amateur trainings is an important undertaking.

The Role of the Covid-19 Pandemic

As worldwide pandemic Covidien-19 also has a negative impact on aviation in Turkey. Especially sportive aviation activities have been completely stopped since 2020, 17th March. Turkish Aeronautical Association, which invited young people from around Turkey is a guest in their private student hostel. However, trainings were stopped suddenly as the coronavirus epidemic prevented collective living. With a new order issued by the General Directorate of the Turkish Aeronautical Association, it is predicted that the trainings will be opened at the end of May.

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THE POLITICAL ECONOMY OF AVIATION SPORTS AMONG UNIVERSITY STUDENTS

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Extended Abstract

The aim of research is to analyse the university student's attitudes for sportive activities, especially aviation sports. In the fields of economics, the political economy involves ideas, norms, identities, belief in construction of economic production or consumption. When Adam Smith introduced the book, named the An Inquiry to the Nature and the Causes of Wealth of Nations for the first time in 1776(1), one of the first revolutions in economy thought occurred, the individual had been replaced with the role of state in the markets as the core of the economic orders in liberal economic thought. However, later specifically, after the industrial revolution, when the labor theory of value changed and a new concept of capital was added to the theory. The importance of labor changed significantly. Even though it was expected that the labor's burden would decrease due to an increase in use of capital in terms of technological development, labor's working hours increased at unfavorable working conditions of the workplace during the industrial revolution period. Marx(1867) is the first who criticizes the long working hours and unfavorable working place, changing the dominance of technology with the state authority(2).However, it was not enough to change the policies of either state or liberal capital owners.

Only after the end of the 19th century and early 20th century, the governments recognized the need for leisure and sportive activities. Following policies for the wellbeing of citizens, youth became an important integral part of government policies through sportive activities, building sports centers. Individuals started to become important again in the early 1900s. Throughout the first globalization wave, technological change, individual attitudes for their health and wellbeing in leisure time have been the main concern(3)(4). Sportive activities ranging from walking, running to gliders, aviation sports, adventure sports from Antic Greek civilization to current time, become a significant bridge in structuring formal and informal society as social capital in the economy (5). The supply of all kinds of sports materials, equipment, organization of sportive activities, Olympiads, multinational companies supplying materials and arranging these operations have been subject to the political economy for a number of years. In this paper, the one another future of sportive activities social inclusion and social equation concepts will be analysed from the perspective of social capital in constructivism. Considering sports are the games and competitive leisure activities which need physical effort and skills, within the constructivist approach of the political economy, the attitudes of university students for aviation sports are important. Specifically, demand for aviation sports, and access to aviation sport equipment, knowledge, training are critical questions and the subject of the political economy since the equipment, training programs including promotion activities are considered as related to personal income. People

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who have less income do not prefer these sportive activities requiring expensive equipment or training programs.

The Research

In this study, the study concerns the attitude of university students for sportive activities and leisure time. The questionnaires have been answered by the students of the Faculty of Economics and Administrative Sciences, Yalova University at January- February 2021 under the pandemics of Coronavirus COVID 19. 200 students answered among 300 students due to the accession to the students only via online communication environment. The first hypothesis is that students do not prefer sports for their leisure times. The second hypothesis is that students do not have access to aviation sports equipment because of economic reasons. Third hypothesis is that students do not have a habit in their families.

Results

Gradually, governments begin to play a more active role in sport and leisure for the masses. Beginning in the mid-nineteenth century, many local governments, through legislative intervention, funding and administrative control, began setting aside large areas of land and building city parks and playgrounds for the use of their citizens

1. 72 percent of students listen to music every day regularly
2. 57 percent of students read books other than course books, every day.
3. 85 percent of students do not follow news from the newspapers?
4. 93 percent of students have social media accounts.
5. Only 97 percent of students spend time on social media more than 30 minutes. However, 27 percent of them spend more than 2 hours in a day.
6. However, 70 percent of students do not prefer to sport every day, 30 percent of them do regularly.
7. 50 percent of the students who do not play sports said that they did not have habits, 18 percent of them reported that they did not have income. Only 1 percent of the students argued that they do not have enough training at all.
8. Only 24 percent of students who play sports are interested in parachuting, 3 percent gliding, 2 planour, 9 of them are in other types of aviation sports.
9. 46 percent of them do not plan to play aviation sports.

Conclusions

The sports became very important part of international economics due to supply of sportive materials, news, broadcast, sports clubs, players international transfers, monopolies of sport' wear and equipment, tv broadcasting rights in last decades. However, especially, in the globalized World, social inclusion, human wellbeing became an important subject of the political economy, also. The results of the survey show that students do not prefer sportive activities. They spend their time on social media more. The university students' attitudes for sports are not proper to the concept of social capital as an important bridge in the well-functioning economy at 21st century.

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Keywords: *aviation sports, youth attitude, political economy, liberalism, constructivism*

Jel Code: F68

COMPARING WRF MICROPHYSICS SCHEMES: CASE STUDY OF SIMULATING A SEVERE RAINFALL OVER İZMİR

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meeting, 17 – 18 February 2021

Extended Abstract

Here I report to the OSTIV, the severe rainfall event, which took place in Izmir on 2 February 2021, was simulated with two different microphysical options which are Conus and Goddard microphysics schemes to find out which option better represents this event. Izmir province is a city in the middle latitude zone and has a coast to the Aegean Sea. The provincial lands are between 37 45'- 39 15 'north latitudes and 26 15' 28 20 'east longitudes. Its altitude is 30 meters, and its surface area is 12012 square km. Izmir on the site of the 2018 governorship for Turkey's Izmir province with a total population of 4,320,519, is the third-largest province [1].

In Izmir, a mesoscale convective system, which is called the squall line, has caused a severe sea flood explicitly in Konak, Bayrakli, Menderes, Balcova, Bornova, and Foca. Squall lines comprise deep moist convection, thunder, and sustained precipitation areas. Squall lines occur in the deep wind shear, moist environment, and high convective available potential energy (CAPE) in the vertical profile of the troposphere. In the 2 February 2021 rainfall event, the cold front moved to the east and became stationary due to the convergence area around Izmir and the Aegean Sea on 1 February. On February 2, as seen in Figures 1, the heavy rain line that affected the center of İzmir caused floods. Ceylan et al. in their study, they stated that flood disaster was experienced more in cities with high population density such as İzmir and Balıkesir [2]. End of the event on 3 February 2021, the squall line started to dissipate and at 08:00 UTC it was completely dissipated.

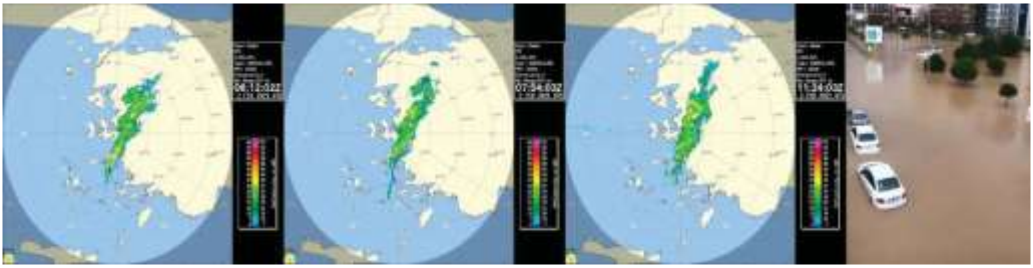

Figure 1: Figures shows the radar PPI images at different times of the 2 February in İzmir, and the image of the event.

Weather research forecasting (WRF) is a highly preferred model for simulating meteorological events by offering a variety of options in many physical areas to its users. WRF can be used to determine the sensitivity of different options over different events [3,4,5,6].
All time models were initialized at 00 UTC 01 February 2021 and the simulations were performed by final data (FNL) at 1°x1° resolution from the National Center for Environmental Prediction (NCEP) which updated every six hours and had 26 vertical layers [7]. The integrations were implemented over a 72 hour period and involved two domains, which one was nested. In the present study, grid distances of domains were 12 and 4 km, respectively. Since domain 2 was run with higher resolution, more accurate results were obtained compared to domain 1.

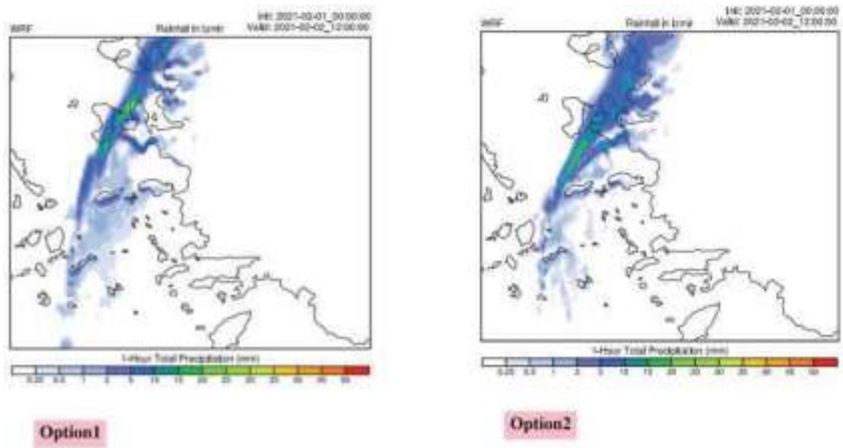

Figure 2: Figure shows visualized rain maps for options 1 and 2.

According to Figure 2, there are differences in rainfall maps of two different options drawn for the same time, their amounts and the areas they affect.

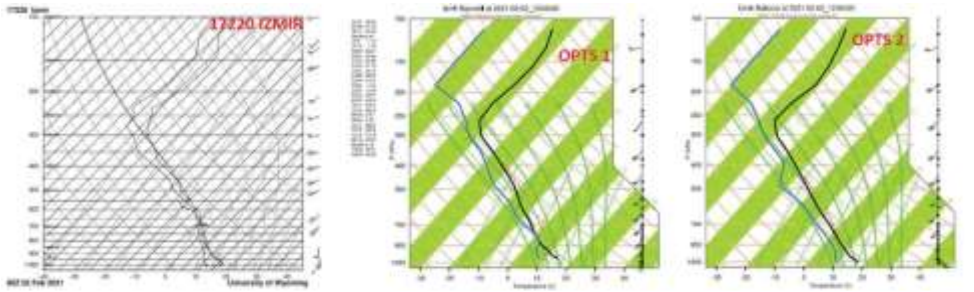

Figure 3: The combined figure is the Skew-T log-P diagrams visualized from WRF outputs run for different options and the atmospheric sounding images taken from the closest station to the location of the flood disaster.

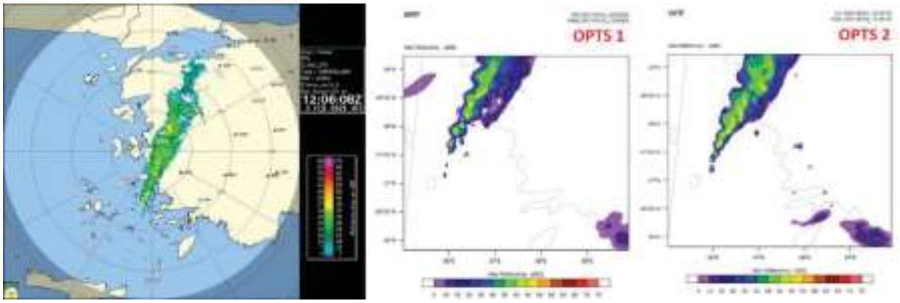

Figure 4: The combined figure contains the reflectivity images visualized from the WRF outputs run for different options and the radar image of the event day.

Figures 3 and 4 show that although two different options catch the event without being much different from each other in time and space, their values change. In addition, despite both options predict the event to the west of the real squall line, it can be said that both microphysics options are successful in simulating the event since there is not much slipping in this space.

Finally, for option 1 and option 2 values, mean absolute error (MAE) and root mean square error (RMSE) calculations were made, and by comparing the observation data, it was examined which option gave a closer result to the event.

Acknowledgments

Special thanks to Ayhan Erdogan from the Turkish State Meteorological Service for providing observation data.

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ROLE OF LAI, EVI, AND ATMOSPHERIC PARAMETERS ON LST AND THERMALS

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OSTIV MET Panel, Feb. 17-18, 2021

Extended Abstract

In this study, the role of LAI (Leaf Area Index), EVI (Enhanced Vegetation Index), atmospheric parameters on LST (Land Surface Temperature) and thermals examined by using satellite data and atmospheric variables. Surface temperature plays a governing role on formation of thermals. In the vegetation analysis, multi-time index values obtained from TERRA-MODIS satellite were taken into account. Temperature and precipitation were selected as the atmospheric variables. The expected variations of LAI and EVI values of İznik, a district of Bursa, with the one of highest rates of population increase, was analysed. Fig. 1, shows the study region.

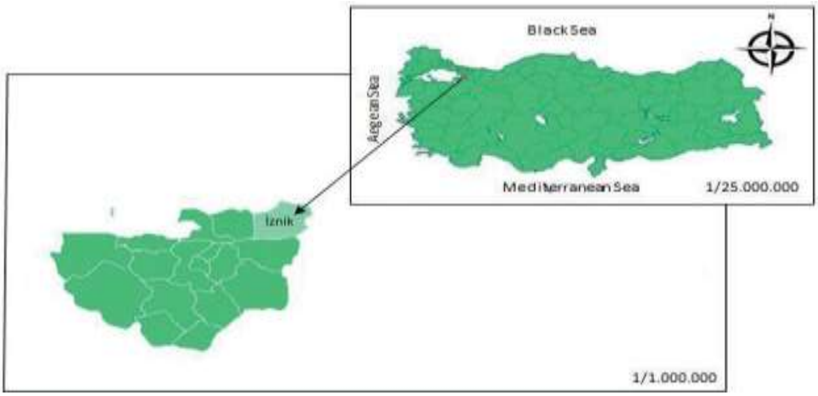


Fig. 1 Study Region

MODIS provides different spatio-temporal resolutions based on data. Here, LAI has 500 m spatial and 8-day of temporal resolution while EVI has 250 m spatial and 16-day of temporal resolution and LST has 1 km spatial and 8-day of temporal resolution [1].

In Iznik there is a negative correlation between LAI and precipitation (R=-0.48). In provinces where population density and number of buildings are high, precipitation relationship with LAI has been found with the significance level of alpha = 0.05 [2] which supports previous study proving an inverse relationship between urbanization and vegetation [3]. It can be due to the delay in the transfer of water in the soil to the plant members. Other than this, biophysical or misled data collection is also important factors [4]. This causes 5-month shift between LAI and precipitation in Bursa. Box plots below show that LAI reaches its maximum value on month of June (Figure 2).

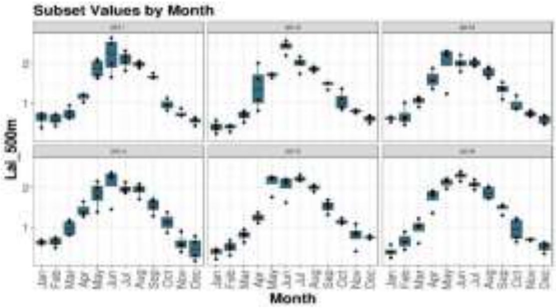
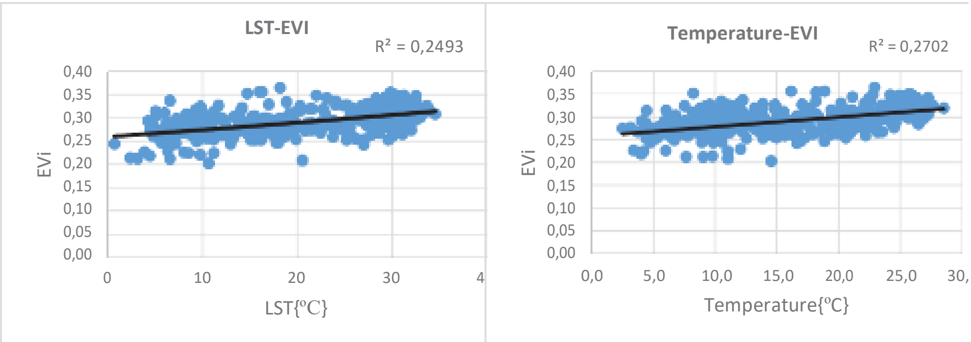


Fig. 2. Monthly variation of LAI in Iznik

Figure 3 shows that there is a positive correlation between EVI and LST, and a positive correlation between EVI values and Temperature. This study demonstrates the relationship between thermal structures, role of temperature and surface characteristics along with precipitation. Thermal intensity and flight behavior (flight altitude) are closely related with land surface classification [5][6]. In general, stronger thermal updrafts and the species with larger wing loading are associated with dry areas [7].

Fig. 3. Relation with EVI and LST in İznik



The results have shown that satellite derived LST values and vegetation cover indexes are good indicators for surface condition of the region. LAI and EVI provided valuable results for the study region. This study brings out an idea of surface temperature, which is, in the absence of meteorological data, we can find out the surface temperature using satellite thermal data. Thus, it informs that the studies attempted will be merely an estimation of LST in correlation with vegetation parameters.

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FINAL DECLERATION

At the end of the closing session, delegates discussed on the working groups and following topics to extend their experiences in this field. To build some working groups on the following topics:

Building Working Groups on:

1. Training
2. Measurements, data sharing
3. Modeling, Now casting
4. Joint research Project
5. Collaborative papers
6. Student and staff mobility for Training and research (Erasmus Exc. Programs.)
7. Submitting papers to TS Journal
8. EU and NSF supports

Following Table shows, there were 20 valuable contributions from 11 different countries.

TABLE – Number of Paper and Contributions

No	Country	Number of Papers/Contribution
1	Argentina	1
2	Canada	Chair
3	Egypt	1
4	Germany	4
5	India	1
6	Italy	1
7	Hungary	1
8	Switzerland	1
9	The Netherlands	Honorary President
10	Turkey	7
11	United States of America	1
TOTAL	11	20

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