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- TechTIDE Interim Review Meeting, Brussels, Belgium, 7 February 2019
- EGU General Assembly 2019, Vienna, Austria, 7–12 April 2019
- First TechTIDE User Workshop, DLR, Neustrelitz, Germany, 15 May 2019
- Second TechTIDE General Assembly Meeting and User Workshop, Prague, Czech Republic, 8-11 October 2019

Imprint

Project News

1st TechTIDE User Workshop

The 1st TechTIDE user workshop shall bring together users and developers of the TID monitoring and warnings. The first release of the TechTIDE system will be demonstrated. Users are invited to present their applications and explain the impact and mitigation of TID effects in their systems. Following user contributions addressing ionosphere impact are anticipated:

- RTK services
- Radio astronomy
- Radio communication and geolocation applications
- GBAS & SBAS applications



The workshop will be organized in two main sessions and a round table discussion:

1. Presentation of the TechTIDE system - Developers of the TechTIDE system will present the capabilities and functionalities of the TechTIDE system
2. Presentations of TechTIDE use cases - Users are invited to present their applications and explain the impact and mitigation of TID effects in their systems.
3. Round table discussion - How mature is the current status of the TechTIDE system? What additional requirements and development needs can be identified? What are the next steps to be implemented?

The workshop is expected to start on **15 May 2019** at 8:30 am and will end at 4:30 pm. The detailed Workshop Program will be released 2nd April 2019, after the submission of the abstracts is completed.

More Informations and Registration on <http://smodeil.besl-eventservice.de/YwwiXLIZNwsS/>

Warning and Mitigation **Technologies** for **Travelling Ionospheric Disturbances** Effects

TechTIDE Project

The overarching objective of TechTIDE is to design and test new viable Travelling Ionospheric Disturbances (TID) impact mitigation strategies for the technologies affected and in close collaboration with operators of these technologies, to demonstrate the added value of the proposed mitigation techniques.

TechTIDE Newsletter

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1st General Assembly Meeting of TechTIDE

The TechTIDE project organised its 1st General Assembly Meeting (GAM), 8-10 October 2018, in Athens, Greece. The whole TechTIDE consortium and the advisors of the TechTIDE project participated in the 1st TechTIDE GAM. The meeting was arranged in three main parts.

- Technical discussion on each workpackage,
- Presentation of the current project status to the advisors
- Feedback from the advisors



The TechTIDE consortium demonstrated the good quality of their work and being well in schedule. This was acknowledged by the advisors.

TechTIDE at the ESA SSA Thematic Workshop

The ESA Space Situation Awareness Space Weather Network organized a Thematic Workshop on 15-19th October 2018 in Frankfurt, Germany. The workshop was attributed to assess the current gaps in the service provision and screen the European landscape for appropriate assets, which are suitable and mature to contribute to the ESA Space Weather Network service provision in future. TechTIDE has been present at the workshop and presented its objectives and status.

- A. Belehaki, I. Tsagouri and the TechTIDE consortium: Warning and Mitigation Technologies for Travelling Ionospheric Disturbances Effects - TechTIDE

Ciènciaprop®

Ciènciaprop®, Program of Dissemination Science and Technology, 17th Conference, 26 October 2018

The Ciènciaprop® is a conference cycle in a program to popularize and promote Science and Technology among society. This was a local and public event that took place on 26 October 2018 in Vinaròs, Spain. About 40 person participated in the conference. Local TV published this public event.



- Perturbaciones Ionosféricas Itinerantes: Origen, Efectos Tecnológicos y Mitigación (Traveling Ionospheric Disturbances: Origin, Technological effects and mitigation). David Altadill, Estefania Blanch and Antoni Segarra.

TechTIDE presentations at the ESWW

The 15th European Space Weather Week took place November 5-9th 2018 in Leuven (Belgium). The TechTIDE consortium contributed to the conference with the following 3 presentations and 2 poster presentations:

- The use of Space Weather information as part of EGNOS Performance Monitoring Activities, S. Magdaleno, C. de la Casa, R. Roldan, J. Gómez
- TechTIDE Horizon 2020 project: Warning and mitigation technologies for travelling ionospheric disturbances effects. Anna Belehaki and the TechTIDE consortium.

TechTIDE Project Members

- National Observatory of Athens (NOA), Greece
- Deutsches Zentrum für Luft- und Raumfahrt (DLR), Germany
- Ústav Fyziky Atmosféry AV ČR (IAP), Czech Republic
- Institut Royal Meteorologique de Belgique (RMI), Belgium
- Observatorio del Ebro Fundacion (OE), Spain
- Borealis Global Designs Ltd. (BGD), Bulgaria
- Leibniz Institute of Atmospheric Physics, Rostock University (L-IAP), Germany
- Universitat Politècnica de Catalunya (UPC), Spain
- European Satellite Services Provider (ESSP), France
- South Africa National Space Agency (SANSA), South Africa
- Watermann Juergen Friedrich Wilhelm (JFWCONSULT), France
- Frederick University (FU), Cyprus
- German Federal Police (GFP), Germany

- TIDs triggered by CIR/HSSS-related storms
Dalia Buresova, Jaroslav Chum, Anna Belehaki, David Altadill, Estefania Blanch, Daniel Kouba, Ivan Galkin, Zbynek Mosna, and Jaroslav Urbar
- Solar terminator and corresponding variability within ionospheric plasma
Koucka Knizova, P., Katerina Potuznikova, Daniel Kouba, Josef Boska, Zbysek Mosna, Dalia Buresova (Obrazova)
- Surprising phenomenon in ionospheric response to geomagnetic storm of 15 August 2015
Lastovicka, J., and Ilya Edemskiy

7th IAGA/ICMA/SCOSTEP

TechTIDE has also been presented at the Workshop on Vertical Coupling in the Atmosphere-Ionosphere System, the Helmholtz Centre Potsdam, GFZ, Germany, July 2-6, 2018

- Solar terminator and its signatures in the ionospheric plasma
Koucka Knizova, P., D. Kouba, Z. Mosna, D. Buresova

Collaborations

UPC is collaborating with the Institute of Cartography and Geology of Catalonia (ICGC). This institute is a NRTK service provider and serves as advisor for the TechTIDE consortium.

The director of the SANSA Space Sciences, Hermanus, South Africa, Dr. Lee-Anne McKinnell and Dr. Rendani

Ndanganeni have been visiting the IAP on 27-30 October, 2018. They discussed latest results of the joint investigation of the atmospheric wave activity using African and Czech CDSSs and Digisondes and hemispheric differences of ionospheric response observed during CME and CIR/HSSS events.

Papers

Accepted for publication in the AGU Space Weather journal:

- Model evaluation guidelines for geomagnetic index predictions
Michael W. Liemohn, James P. McCollough, Vania K. Jordanova, Chigomezio M. Ngwira, Steven K. Morley, Consuelo Cid, W. Kent Tobiska, Peter Wintoft, Natalia Yu. Ganushkina, Daniel T. Welling, Suzy Bingham, Michael A. Balikhin, Hermann J. Opgenoorth, Miles A. Engel, Robert S. Weigel, Howard J. Singer, Dalia Buresova, Sean Bruinsma, Irina S. Zhelavskaya, Yuri Y. Shprits, and Ruggero Vasile
<https://doi.org/10.1029/2018SW002067>
- Assessment of current capabilities in modeling the ionospheric climatology for space weather applications: foF2 and hmF2
Ioanna Tsagouri, Larisa Goncharenko, Ja Soon Shim, Anna Belehaki, Dalia Buresova, Maria M. Kuznetsova
<https://doi.org/10.1029/2018SW002035>

Conference 10th Anniversary of CZ in ESA

D. Buresova and PhD student J. Urbar participated at the Conference on the 10th Anniversary of the Czech Republic in ESA, held in Prague, 13 November 2018 in the frame of the Czech Space Week. During the meeting we discussed with the program managers of the Czech Honeywell Aerospace Advanced Technology and with the Deputy Director of the Communication and Information Systems Agency of the Ministry of Defence of the Czech Republic. The consortium is looking forward to follow up discussions in the Neustrelitz and Prague meetings in 2019.

Latest Achievements

TID Algorithms Definition

Currently, the TechTIDE consortium is working to provide TechTIDE software codes available for open access. The software codes that generate the TechTIDE products are checked for consistency with the specifications and will be stored in the TechTIDE repository in tech-tide.eu. The teams responsible for each algorithm will develop full documentation that will be available to the users together with the codes.

TID Activity Metrics Identification

The magnetospheric response during magnetic storms and isolated substorms has been studied to identify LSTID drivers. A record for the different magnetospheric response under each level of solar wind – magnetospheric-ionosphere coupling has been established.

The comparison of the Medium Scale TIDs (MSTIDs) detection results with data from ARISE data base (particularly for the supportive analysis of the atmospheric dynamics and atmospheric infrasound sources) was carried out to identify MSTID drivers.

In preparation of the development of the algorithms for the calculation of the ambient electron density and relevant key ionospheric characteristics (e.g. foF2 and hmF2), an assessment of state of the art methodologies during specific time intervals (selected through the TechTIDE event catalogue) has been performed. Based on the requirements, the running medians/averages were considered as the most preferable approaches for the representation of the background conditions.

For the analysis of quantitative information on the likeliness and morphology of interhemispheric circulation of Large-Scale Traveling Ionospheric Disturbances (LSTID) 13 time periods with sufficient data coverage in both hemispheres have been identified.

Studying the correlation of TID occurrence and geomagnetic indices (the Dst and SYM-H storm-time indices, the IL and IU local Scandinavian auroral electrojet indices, and the northern and southern Polar Cap indices PCN and PCS), we found that the enhancements of the auroral electrojet and polar cap indices could reach high values during the TID time periods, but there is in general no clear temporal

coincidence between increasing magnitude of indices and launch of TID.

The reports on TID drivers, models for the specification of ionospheric background and methodology for the identification of the interhemispheric circulation were submitted to the European Commission. All reports will be released soon with open access and we will send a notice to all our registered users.

Assessment of TID impact in Aerospace and Ground Systems

Numerous events selected from the TechTIDE TID catalogue are studied in order to establish links between the different monitors and the geolocation/navigation services.

-The following the relationships are currently under investigation:

- The relation between degradation in the EGNOS service and the outputs of some of the monitors (e.g. AATR or TEC gradients).
- The relationship between the degradation in the NRTK service and the occurrence of MSTIDs in the region.

A methodology for defining and measuring the degradation in the navigation has been established in preparation of statistical analysis about the degradation in the positioning using different techniques (PPP, RTK or NRTK).

Dissemination, Exploitation and Communication

During the last three months, TechTIDE activities were presented at the Ciènciaprop®, the ESA SSA SWE Thematic Workshop and at the 15th European Space Weather Week.

Recently, TechTIDE contacted their supporters and users, to stay in touch and enhance the communication. TechTIDE informed them about the current project status and the means of communication and information, which are offered by the project.

In preparation of the 1st TechTIDE user workshop, TechTIDE started to raise attention for this event. Flyers advertising the workshop have been printed and were distributed on the European Space Weather Week in Leuven. The workshop has also been advertised in two of the TechTIDE presentations at the European Space Weather Week.

Stay tuned!

- Follow our Tweets @Tech_TIDE
- Register as a user to participate in the TechTIDE Discussion Forum and receive updates on our developments

Forthcoming Milestones

- TechTIDE open access codes (February 2019)
- TechTIDE warning system 1st release (April 2019)

Consortium Member Presentation

Institute of Atmospheric Physics

The IAP
ASCR was
established
in 1964 as a



INSTITUTE OF ATMOSPHERIC PHYSICS
CAS

continuation of the former Laboratory for Meteorology of the Geophysical Institute. The main research focus was on the processes taking place in the troposphere.

In 1994, the former Ionospheric Dept. of the Geophysical Institute joined the IAP, thereby expanding the research domain. Recently the principal activity of the IAP is scientific research of the Earth's whole atmosphere from the boundary layer to the magnetosphere and the exploration of its space environment, monitoring and special measurements, their processing and transfer into worldwide data networks, and the development of special instruments. The IAP acquires processes and disseminates scientific information and issues scientific publications (monographs, journals, proceedings, etc.). It provides scientific assessments, professional opinions and recommendations, consulting and advisory services. In cooperation with universities, the IAP carries out doctoral study programs and provides training for young scientists. Within the scope of its activity, the IAP promotes international cooperation, including the organization of joint research projects with foreign partners,

participation in exchange programmes for scientists and the exchange of scientific information. The IAP organises scientific meetings, conferences and seminars at the national and international levels and provides the infrastructure for research. To realize the complex atmospheric research the IAP joins together five observatories: three meteorological observatories (one of them, the observatory Milesovka is in operation for more than 110 years), Pruhonice ionospheric observatory, which is in operation since 1958, and one satellite telemetry station) and operates network of microbarographs and five CDSS networks. IAP also operates mirroring facility of the World Digisonde Database (DIDBase), and HPC facility Amalka.

Royal Meteorological Institute of Belgium

The Royal Meteorological Institute, RMI (<http://www.meteo.be/>), founded in 1833, is the Belgium's leading research and services centre for meteorology and climatology, with also long-time observation and research traditions in geophysics, including ionospheric and space physics, atmospheric physics, and geomagnetism. The institute employs about 200 people working in six departments at two locations in Belgium—Brussels and Dourbes. The RMI Ionosphere and Space Weather (ISW) section



(<http://ionosphere.meteo.be/>) carries out regular ionospheric and space observations by means of an own vertical incidence sounder (digital ionosonde), GNSS signal receivers located in Belgium, and a cosmic ray detector. The ISW research activities are currently focused on the ionospheric disturbances and their effects on the technological systems dependent on radio wave propagation. The RMI research expertise, broad experience, and modern infrastructure are well recognised and the institute is regularly being involved in various international projects sponsored by the EC, ESA, GJU, and NATO.

The institute has a long history in ionospheric research and modelling, and runs a real time model reconstructing the local ionospheric electron density profile. In addition, the ISW group has developed both nowcast and short-term forecast systems for the local magnetic activity driving the ionospheric perturbations. In the Tech-TIDE project, the RMI is primarily involved in work-packages 2, the development of TID detection and characterisation methodologies, and 3, concerning the investigation of TID drivers. Within these work-packages, the institute is closest involved with the development and use of those detection and characterisation techniques that are based on ionosonde data, doing validation and cross-testing of different methodologies.

The RMI is also heavily involved in the operational functioning of these detection techniques. Being centrally located and having a top quality

ionosonde station installed in the Geophysical Center in Dourbes makes the RMI an important contributor to the ionospheric monitoring in Europe. The expertise developed at the institute is exploited for instance for the purpose of the design of operational sounding schedules and for testing of new ionosonde hard- and software. Within the Tech-TIDE consortium the RMI also shares this expertise to help other partners optimise their operations.

Upcoming Events

TechTIDE Interim Review Meeting, Brussels, Belgium, 7 February 2019

In February, the TechTIDE Executive Board is going to present the current status of the project to the EU.

EGU General Assembly 2019, Vienna, Austria, 7–12 April 2019

TechTIDE will be present at the EGU General Assembly 2019 in Vienna, Austria. An open session on the Ionosphere and Thermosphere is organized by Dalia Buresova and the co-conveners David Altadill, Anna Belehaki.

The TechTIDE contributions are currently prepared for submission.

First TechTIDE User Workshop, DLR, Neustrelitz, Germany, 15 May 2019

The first TechTIDE user workshop will take place on 15th May 2019 in Neustrelitz, Germany. Users are

invited to participate the workshop and learn about the capabilities of the TechTIDE system.

Please register here: <http://smodell.besl-eventservice.de/YwwiXLIZNwsS/>

Second TechTIDE General Assembly Meeting and User Workshop, Prague, Czech Republic, 8-11 October 2019

The second TechTIDE General Assembly Meeting and user workshop will bring together the consortium members and users from all operational activities concerned with Travelling Ionospheric Disturbances activity. The Second Release of the TechTIDE Warning System will be presented and assessed by the users. More details will be made available with the next issues of our newsletter.

We wish you all a Merry Christmas and a Happy New Year!



Imprint

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