newsletter TechTIDE

09/2018

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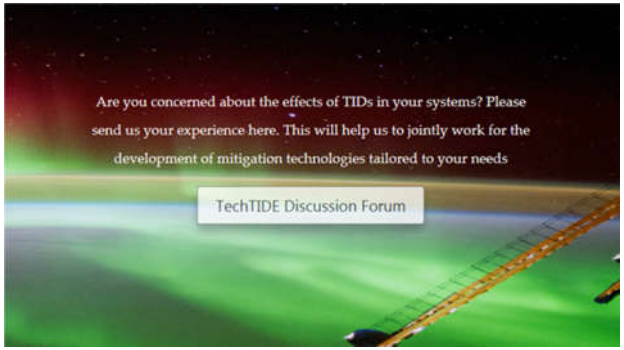
Project News

TechTIDE Forum

The TechTIDE website now maintains a forum, which is a platform where users and developers can exchange information on latest events and developments. On this platform, users can communicate with the TechTIDE community to learn and inform about the impact of Travelling Ionospheric Disturbances (TIDs) on their applications. By the time, TechTIDE product become available, the forum will be used to support the usage and discuss their applicability.

Everybody who is interested to follow latest discussions in the TechTIDE project is welcome to register in the TechTIDE forum on the TechTIDE website http://tech-tide.eu.



Open Access Codes

Codes relevant to the TechTIDE detection methodologies appear gradually in the TechTIDE repository and are openly available. The repository will be populated with more codes within the next months.

7th IAGA/ICMA/SCOSTEP Workshop, July 2-6 2018

This workshop on Vertical Coupling in the Atmosphere-Ionosphere System took place at the Helmholtz Centre Potsdam, GFZ, Germany, July 2-6, 2018. TechTIDE results were presented by:

- Koucka Knizova, P., D. Kouba, Z. Mosna, D. Buresova: Solar terminator and corresponding variability within ionospheric plasma

Warning and Mitigation **Tech**nologies for **T**ravelling **I**onospheric **D**isturbances **E**ffects

TechTIDE Project

The overarching objective of TechTIDE is to design and test new viable Travelling Ionosphere 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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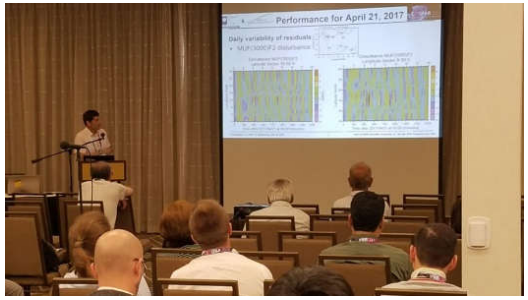
COSPAR 2018, 42nd Assembly, 14-22 July 2018

The COSPAR 42nd Assembly took place on 14-22 July 2018 in Pasadena USA. The TechTIDE project was participating with the following contributions:

- C1.1-0027-18, TechTIDE: warning and mitigation technologies for travelling ionospheric disturbance effects, Ivan Galkin, Bodo Reinisch, Anna Belehaki, Claudia Borries, David Altadill, Jaume Sanz, Dalia Buresova, Tobias Verhulst, Jens Mielich, Zama Katamzi, and Haris Haralambous

- PSW.3-0007-18, AATR an ionospheric activity indicator specifically based on GNSS measurements and tailored for GNSS users, J. Miguel Juan, Jaume Sanz
- C1.1-0002-18 Characterisation of large scale TIDs by analysis of classical ionospheric data in the European region, David Altadill, Estefania Blanch, J. Miguel Juan, Vadym Paznukhov, Anna Belehaki, Ivan Galkin, Dalia Buresova, Tobias Verhulst, Jaume Sanz



Project collaboration meetings

Recently, the South African colleagues John Bosco Habarulema and Jean Claude Uwamagoro from the SANSA Space Sciences visited IAP in Prague at 1-8 April, 2018. During this meeting, joint investigation of the atmospheric wave dynamics using CDSS and Digisonde data from the Czech and South African sites were discussed and discussions on possible hemispheric differences of ionospheric response to space weather events took place.

Furthermore, the collaboration between IAP and colleagues from the Research Centre for Astronomy and Earth Sciences, GGI, Hungarian Academy of Sciences is ongoing. The technical support and training (spring-summer 2018) after the installation of DPS 4D in Sopron, which has been started a few weeks ago, continues. Recently, the Hungarian colleagues visited the IAP, where they took part in a joint workshop and visited the Pruhonice observatory.

Latest Achievements

TID Algorithms Definition

TID detection methodologies have been improved in response to design principles and have been tested in the lab environment. Verification against measurements taken during quiet and disturbed periods of time, benchmarking for their transition to operations, and final validation to the user requirements of accuracy, timeliness, and coverage have been reported. The current status and capabilities of the TID detection methodologies have been reported jointly with the design of adjustments and upgrades. Different methods tried to adopt the initial requirements gathered among users affected by TIDs according to the current monitoring capabilities. A degradation with what one actually plans to achieve in TechTIDE is provided by given methodologies for those requirements that cannot be fully achieved. Such a “no fulfillment” is mainly due to the limitation of available network sensors for probing the ionosphere and due to the limitation of

TechTIDE Project Members

- National Observatory of Athens (NOA), Greece
- Deutsches Zentrum für Luft- und Raumfahrt (DLR), Germany
- Ustav Fyziky Atmosfery AV CR (IAP), Czech Republic
- Institut Royal Meteorolgique 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 Politecnica 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

available measurements and data of the existing sensors for probing the ionosphere. A major constraint, especially for the methods that are based on HF measurements, is the time resolution; The operational soundings are currently obtained with a cadence of five minutes. Tests have been done demonstrating the feasibility of decreasing the sounding interval to 2.5 minutes, depending on the future roll-out of both hardware and software upgrades. This will allow for the detection of smaller scale TIDs. This is still under experimentation.

Another major “non-fulfillment” results from the requirement for early forecast of TID activity. This requires the development of models whose drivers, in the solar radiation environment and in the solar wind, can be forecasted few days in advance. This to be done requires the combined exploitation of measurements from L1 and L5 vantage points as well as from Earth orbiting satellites and from ground-based solar radio monitoring systems. This is far beyond the objectives of the current project, but we consider carefully these requirements to design a follow up research programme.

In the frame of the TechTIDE effort, a set of value-added products are presented targeted to nowcasting methodologies providing also the probability for TID detection over certain areas for the next hours. These products are planned to be released in order to satisfy the majority of requirements of the user. The results of all TID detection methodologies will be cross-validated and evaluated based on the assessment of current geospatial and lower atmosphere conditions. The algorithms for the intermediate products will be released in January 2019 and their capabilities will be demonstrated in the first release of the TechTIDE warning system in April 2019.

TID Activity Metrics Parameter Identification

The specification of LSTID and MSTID drivers is based on data from European and South African Digisondes and D2D data repository. We are continuing our analysis of the wave activity exited by different drivers, actually CIRs, HSSS, Solar eclipse, severe tropospheric convection (e.g. medican Numa from November 2017, passages of cold and worm tropospheric fronts) considering different solar, auroral, geomagnetic activity indices and meteorological characteristics. The aim is to identify most sensitive indicators of the enhanced wave dynamics. The team is also evaluating capability of different techniques of wave detection and analysis applied on the events listed in the project catalogue, including HELCATS and EGNOS events. We continue our investigations of the ionospheric background conditions and of an interference of LSTIDs excited in both auroral zones. In addition, we are investigating ionospheric reaction to different levels of solar wind - magnetosphere coupling.

Assessment of TID impact in Aerospace and Ground Systems

During these months we have started to build the data base with events affecting EGNOS and NRTK. This data base consists on the events reported by the project team plus the events where some degradation was found in EGNOS. Apart from the AATR results this data base will include the results from other methodologies. In this sense GFP and IAP provided their results with D2D.

We have discovered that there are some events of short duration (minutes) that have a remarkable impact on EGNOS availability. Due to this short duration, the effect of such events cannot be seen in the daily availability maps therefore we have started to build hourly availability maps where the effect of such events is enhanced.

We have started to analyse the data of the CATNET network in order to quantify the impact of MSTIDs on NRTK. As part of this analysis, we have developed a strategy in order to establish reference navigation solutions clean from ionospheric perturbations. This strategy includes a new technique that slows us to work with unambiguous carrier phases.

We are starting now in comparing the NRTK navigation solutions with the reference values in order to quantify the degradation. This degradation shall be related with the MSTID index that is routinely computed.

Dissemination, Exploitation and Communication

TechTIDE has been presented at two conferences in the last 3 months, which are announced in the “Project News” section. On Twitter, TechTIDE is constantly updating about recent activities https://twitter.com/Tech_TIDE. Recently, the project team has established a TechTIDE forum allowing a close contact to an active and interested user community (c.f. “Project News”). Furthermore, we are taking first steps in the preparation of the first user workshop which will take place in Neustrelitz (Germany) next year.

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Consortium Member Presentation

German Aerospace Center (DLR)

DLR is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany's space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation's largest project execution organisation.

DLR is leading workpackages 1 and 7. Workpackage 1 deals with the generation and documentation of user requirements and workpackage 7 TechTIDE with the dissemination and exploitation.

Being coordinator of the Ionosphere Expert Service Center in the SSA space weather network, DLR maintains a broad knowledge about the activities there. Furthermore, DLR operates the Ionosphere Monitoring and Prediction Center (IMPC, https://impc.dlr.de), which is the successor of the widely known Space Weather Application Center – Ionosphere (SWACI). With SWACI and IMPC DLR has more than 15 years experience in the operation of near real-time services for ionospheric weather.

DLR contributes to TechTIDE with its knowledge on the SSA space weather network requirements and on the requirements to the IMPC. TechTIDE will also benefit from DLR's close contact to users of the SSA space weather network and IMPC.

Additionally, DLR is contributing to workpackages 2, 3 and 5 with its scientific expertise in monitoring and forecasting the state of the ionosphere. In the recent years, DLR generated an enhanced knowledge on monitoring and analysing large scale travelling ionospheric disturbances (LSTIDs) which will be contributed to TechTIDE.

Upcoming Events

1st General Assembly Meeting of TechTIDE, 8-10 October 2018

The General Assembly is the ultimate decision-making body of the TechTIDE consortium and is responsible for efficient and effective scientific and technological leadership in the project. The first General Assembly Meeting (GAM) of TechTIDE will be organized by NOA. It will take place on 8-10 October 2018 in Athens, Greece. In conjunction with the GAM, the first External Expert Advisory Board (EEAB) meeting will take place.

Ciènciaprop®, Program of Dissemination Science and Technology, 18th Conference, 26 October 2018

The Ciènciaprop® is a conference in a program to popularize and promote Science and Technology among society. This is a local and public event scheduled for 26 October 2018 and will take place in Spain. It is expected an attendance about 40 persons.

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

15th European Space Weather Weak, 5-9 November 2018

The ESWW15 will take place on 5-9 November 2018 in Leuven, Belgium. The TechTIDE team will provide the following presentations:

- Sessions 12:
  - Belehaki A. and the TechTIDE consortium, TechTIDE Horizon 2020 project: Warning and mitigation technologies for travelling ionospheric disturbances effects
  - Buresova, D., J. Chum, A. Belehaki, D. Altadill , E. Blanch , D. Kouba , I. Galkin, Z. Mosna, and J. Urbar, TIDs triggered by CIR/HSSS-related storms

In addition, a Topical Discussion Meeting: "Characterizing the Ionosphere, Recent Advances and Challenges" is organized on Tuesday 6/11 from 14.00 to 15.15 in the ESWW15 venue.

23th Science Week at Ebro Observatory, November 2018

Conference to popularize and promote Science and Technology related to the activities of the Ebro Observatory team among society. This is a local event and public event scheduled for November 2018. It is expected an attendance of about 100 persons. The TechTIDE project will be presented at the Conference for Open Day.

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1st TechTIDE user workshop at DLR in Neustrelitz, 14-15 May 2019

The first TechTIDE user workshop will take place on 14-15th May 2019 in Neustrelitz, Germany. Users are invited to participate the workshop and learn about the capabilities of the TechTIDE system.

Imprint

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