



Overview

PITHIA-NRF Project

PITHIA-NRF is a Research Infrastructure project funded by the European Commission Horizon 2020 Programme, aiming at building a distributed network that integrates into a unified research environment all key observing facilities, data collections, data processing tools, and prediction models dedicated to ionosphere, thermosphere and plasmasphere research. Through the integration of different assets, the project offers R&D services to expert and early-career researchers and to software and instrument development professionals, enabling leading edge research and fostering innovation.

PITHIA-NRF has the ambition to become the European hub that will act as facilitator for coordinated observations, for data processing tools and modelling advances, and for software and data-products standardization, and will advise on the transitioning of models to operations providing e-Science supporting tools so that models can reach the desired accuracy and standards.

This e-newsletter aims at communicating to all stakeholders the project developments, specifically regarding the TransNational Access programme, the e-science services, the Training, Dissemination and Communication Activities and potential for collaboration within the Innovation Framework of the project.

- Dr. Anna Belehaki, Coordinator of the PITHIA-NRF project

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Imprint

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**Plasmasphere Ionosphere
Thermosphere Integrated
Research Environment and
Access services: a Network of
Research Facilities**

PITHIA-NRF Project

PITHIA-NRF aims at building a European distributed network that integrates observing facilities, data processing tools and prediction models dedicated to ionosphere, thermosphere and plasmasphere research.

PITHIA-NRF Newsletter

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First Project Review Meeting

PITHIA-NRF results achieved within the first eighteen months' period (April 2021 to September 2022) were evaluated by the European Commission, in a review meeting held on 18 December 2022. The overall assessment reports that the project has fully achieved its objectives and milestones for the period.

It was noted that training activities, in spite of Covid-19 difficulties, have been well executed, achieving the stated objectives. The first Innovation Day was held, to promote the project's activities to other organisations and industries. Dissemination of the report on socioeconomic effects of the upper atmosphere was done to highlight the importance of these effects in the daily life and for citizen's safety. The significance of the PITHIA-NRF nodes for technological experimentation and development was also demonstrated. For the next Innovation Day, it was recommended to do more promotion in other countries to produce larger project impacts. More analysis on potential synergies with similar infrastructures outside of the PITHIA-NRF project could be positive to enhance collaborations and enlarge impacts.

The review report recognizes that Transnational Access (TNA) is also progressing well, although the number of access is not so high within the first period, due to different problems (Covid-19, Russian invasion of Ukraine). It is recommended that for the TNA, more visibility or publicity of the activities could result in a more extensive use of the facilities. Other types of calls – for example, a continuously-opened call – could be an option to be considered for a higher use of the facilities. On the other hand, some improvements to the website could potentially drive to an easier view of the different facilities and services. More information on the criteria for project selection should be included in the website.

The consortium works to carefully address the recommendations for the future work and already implements the necessary adjustments in the programme, aiming at the wider use of PITHIA-NRF nodes through intense collaboration with the academia and the space industry.

A Week of PITHIA-NRF Project Meetings

On March 13–17, a full week of project meetings and workshops took place at the Planetarium in Brussels. These events were organised jointly by the Royal Observatory and the Royal Meteorological Institute. On Monday, the second General Assembly of the project took place. Tuesday and Wednesday were dedicated to interactions with external stakeholders, with the first High-Profile Meeting and the second Innovation Day.

Finally, there were the fourth Training for Partner Workshop – dedicated to the ongoing efforts to register data and models in the e-Science Centre – and the third Workshop on Optimisation of Observational Strategies – discussing the Trans-National Access programme and joint measurement campaigns.

During the High-Profile Meeting, opportunities were discussed for collaboration of the PTHIA-NRF project with academic and private sector organisations, as well as with other European Commission-funded projects. Also, some first discussions were held on how to sustain the PITHIA-NRF research infrastructure after the end of the project in 2025.



Consortium members and external stakeholders holding extensive discussion on space weather impacts.

The second Innovation Day was a success, with 76 attendees. Among the participants were external stakeholders from a variety of backgrounds: academic and governmental research institutes, NGOs, private sector companies, military, etc. The morning was dedicated to presenting the various aspects of the PITHIA-NRF project to the external stakeholders. In the afternoon, there were six presentations by various users affected by space weather conditions, posing their problems and challenges to the attending experts.



The (on-site) participants in the second Innovation Day at the Brussels Planetarium.

Project Achievements

Trans-National Access: Two Years in, and the User Meeting

During the first three calls for Trans-National Access (TNA) projects, a total of 29 applications were received of which 26 were accepted. Thirteen of these projects have been completed so far, while four projects involving scientists from Russia and Ukraine had to be terminated due to the ongoing war. Of the accepted projects, 21 involved on-site, physical access to a PITHIA-NRF node by the visiting researcher, with the others being entirely remote collaborations. This illustrates the usefulness of the PITHIA-NRF TNA programme in making access to space weather research facilities available.

The first PITHIA-NRF TNA User Meeting was held in February 2023. It was organised online using Zoom, and its purpose was to both support and promote the TNA programme of PITHIA-NRF. During this meeting, the participants of the first two TNA calls had a possibility to present their projects to an audience consisting of other researchers participating in the PITHIA-NRF TNA programme, members of the PITHIA-NRF nodes, and other interested attendees.

There were in total nine presentations made by TNA users outlining the work that was facilitated through the TNA programme:

- Anna Morozova introduced her work done on Portuguese regional ionosphere maps.
- Andres Calabia Aibar worked on the characterisation of plasma depletions and their effects on geodetical applications.
- Nataliya Porayko presented her work with the LOFAR node about validating GPS-driven models of the ionosphere.
- A feasibility study of a data-driven autonomous service for the prediction of ionospheric scintillations was presented by Simon Mackovjak.
- Ashik Paul presented his study of the characteristics of ionospheric irregularities at high and low latitudes through observations made by the EISCAT facilities and by the VHF radar in Haringhata, India.
- A study of ionospheric disturbances due to space weather in LOFAR data was introduced by Rositsa Miteva.
- Wojciech Jarmolowski talked about the sensitivity of ionospheric disturbance detection by the Swarm satellites during times of strong earthquakes in Aegean region.
- Haixia Lyu presented her work on the study of ionospheric response to a space hurricanes as observed by GNSS and ionosonde.
- Saioa Arquero Campuzano introduced her storm-related study of ionospheric irregularities over southern Europe using Digisondes and GNSS data.

In addition to the presentations by the TNA users, the four hour event also included presentations made by PITHIA-NRF members about different aspects of the project. In particular, the e-Science Centre was introduced to the users, and the possibility of performing multi-nodal research – i.e., research projects using more than one PITHIA-NRF node – was strongly emphasised.

Outreach activities

On behalf of PITHIA-NRF, Ben Witvliet (Universiteit Twente) visited Médecins sans Frontières (MSF) in Brussels, a volunteer organisation that delivers basic healthcare in underserved areas and conflict zones.



Working in places with limited infrastructure presents unique problems to communications as well as to travel.

In previous years, MSF was slowly shifting from HF (ionospheric) radiocommunication to VHF networks and satellite communication. However, they soon realised that independence of communication systems is critical, especially in conflict zones. Therefore HF radio has once again become very important, for example for their work in Ukraine and the DRC.

We reached out to MSF to provide knowledge transfer and to invited them to share their challenges concerning ionospheric radio and space weather during the PITHIA-NRF Innovation Day on 15 March 2023.

Four MSF volunteers were present at the Innovation Day. They presented two main challenges:

1. Propagation prediction tools for HF radio frequency selection;
2. The dead zone at certain distances, possibly caused by a mismatch between the antenna pattern and the propagation mechanism.

This was followed up with face-to-face discussions with PITHIA-NRF experts and experts from other guests. Now that the connection has been made, the cooperation will continue.



Presentation from Médecins San Frontières at the second PITHIA Innovation Day.

On November 13, 2022 a conference by J. Nomen, responsible for the DEIMOS Sky Survey Observatory, was organised at the Ebre Observatory. The DEIMOS Sky Survey Observatory is dedicated to the observation and data provision of tracked satellites and space debris.

The talk was addressed to general public and explained methodologies to monitor satellites and space debris and mechanisms to mitigate possible problems caused by space debris.



Recent publications

Here we list only the articles published since the last issue of this newsletter. A full list of publications, presentations and reports related to PITHIA-NRF can be found on the [project website](#).

- B.A. Witvliet, R.M. Alsina-Pagès, D. Altadill, E. van Maanen, and G.J. Laanstra: "Separation of Ambient Radio Noise and Radio Signals Received via Ionospheric Propagation," *Atmosphere* 14(3), 529, doi:10.3390/atmos14030529.
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- G.O. Jerez, M. Hernández-Pajares, G. Olivares-Pulido, M.M. Hoque, F.S. Prol, D.B.M. Alves, J.F.G. Monico, and M. Schmidt: "Two-way assessment of ionospheric maps performance over the Brazilian region: Global versus regional products," *Space Weather* 21, e2022SW003252, doi:10.1029/2022SW003252.
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- T.G.W. Verhulst, D. Altadill, V. Barta, A. Belehaki, D. Buresova, C. Cesaroni, I. Galkin, M. Guerra, A. Ippoliti, T. Herekakis, D. Kouba, J. Mielich, A. Segarra, L. Spogli, and I. Tsagouri: "Multi-instrument detection in Europe of ionospheric disturbances caused by the 15 January 2022 eruption of the Hunga volcano," *J. Space Weather Space Clim.* 12, A35, doi:10.1051/swsc/2022032.

Upcoming Events

First Release of the e-Science Centre

The first version of the PITHIA-NRF e-Science Center will become publicly available in the very near future. Look forward to an announcement!

EGU 2023

The General Assembly of the European Geophysical Union will take place in Vienna on 23–28 April. Various partners of the PITHIA-NRF consortium will take part in this conference. Come discover the possibilities to access European space weather research facilities through the project by visiting poster nr. EGU23-9013 on Tuesday 25 April.

First PITHIA-NRF Training School

The first training school of the project will be held at the headquarters of the National Institute of Geophysics and Volcanology (INGV) in Rome. It will consist of four days of training for young scientists, from May 29 to June 1. Registrations are now closed and being evaluated.

Fourth TNA Call

The fourth call for Trans-National Access projects has been opened on January 15. This is an open call, with applications being evaluated and accepted as they come in. The call will end on June 15. Further information, as well as the application form, can be found on the website.

AOGS 2023 20th Annual Meeting Session

At the 20th annual meeting of the Asia Oceania Geosciences Society there will be a session “AS52 – Ionospheric Space Weather Monitoring and Forecasting.” This meeting will take place in Singapore from July 30 to August 4.

Imprint

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