# Access to NOA node

## WP7: Access to PITHIA-NRF facilities

### Description of the infrastructure (I)

The National Observatory of Athens (NOA) conducts ionospheric sounding measurements providing data and products to research community.

Athens Digisonde-Portable-Sounder-4D (DPS4D)

URSI code: AT138

Location: Penteli (Athens) Greece (GEO 38.0° N, 23.5° E)

Control and Data Platforms: LINUX and Windows 8.1, respectively

Transmitter Cards that support the signal processing of short-pulse waveform and long-pulse waveform

Frequency scan: 0.5 – 30 MHz

Data archiving: SAO, SAOXML, RSF/SBF, SKY, DVL, TLT

http://195.251.202.49/

### Build-in Software

- ARTIST 5.0 – ionogram scaling
- DFT2SKY – Skymap calculation
- DDAV – Calculation of drift velocity
- DRGMaker – Calculation of directogram
- TILT – Calculation of ionospheric tilt
- Online image tools – production of images



*Geometry of the Athens DPS4D installation*

# Access to NOA node
## WP7: Access to PITHIA-NRF facilities
### Description of the infrastructure (II)



*DCART (Digisonde Commanding and Acquisition Remote Terminal) application allows the selection of the sounding parameters*

### Athens DPS4D experiments

Standard mode
- Vertical soundings every 5 min (carried out routinely): scanning ionogram; F-region drifts

Special modes
- Vertical soundings: fixed-frequency ionogram; E-region drifts.
- Bi-static oblique soundings jointly with one or more Digisonde systems (Digisonde-to-Digisonde operation)
- Programmable selection of frequencies or frequency bands
- Flexible scheduling of sampling cadence

# Access to NOA node
## WP7: Access to PITHIA-NRF facilities
### Products/Models (I)

## Digisonde related data and products

- Ionospheric echoes parameters: Amplitude, phase, direction of arrival, virtual height, Doppler frequency & spread, ordinary & extraordinary wave polarization identification.
- Ionospheric electron density profiles; ionospheric characteristics including foF2, foF1, foE, foEs, MUF(3000)F2, hmF2, hmF1, hmE and the IRI parameters B0, B1 and more (49 in total). *Data archiving: SAO, SAOXML*
- Ionosphere visualization products: Ionograms; Skymaps; Drift velocity plots; Directograms
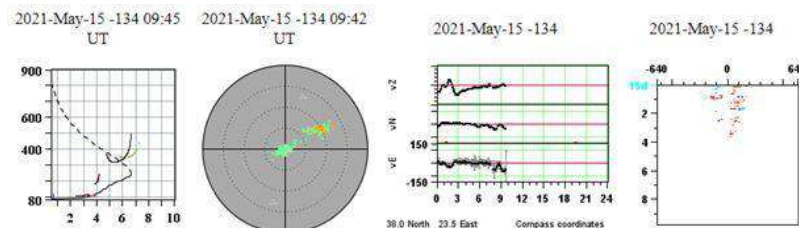
- Near-by GNSS (Global Navigation Satellite System) data:

PENT Equipment TOPCON Net-G3, sampled with 30 or 1sec, with data, in tps, RINEX or RTK
NOA1 sampled at 30sec, in daily RINEX

Athens Digisonde distance from PENT and NOA1 at 200m at an azimuth of -170°. Other close stations include:

| GNSS | Distance (km) | Azimuth (°) |
|------|---------------|-------------|
| MET0 | 9.5 | -80 |
| DION | 6.7 | 62 |
| DYNG | | |
| RAFI | 13 | 105 |
| ATHI | 19.4 | -131 |
| KERT | 29.1 | 160 |

# Access to NOA node
## WP7: Access to PITHIA-NRF facilities
### Products/Models (II)

## Ionospheric predictions

The **European Digital Upper Atmosphere Server (DIAS)** e-infrastrure operated by NOA delivers nowcasts, as well as short- and long-term predictions of ionospheric characteristics over Europe based on the implementation of ionospheric prediction models. The DIAS database contains data and model results from 2005 until today.
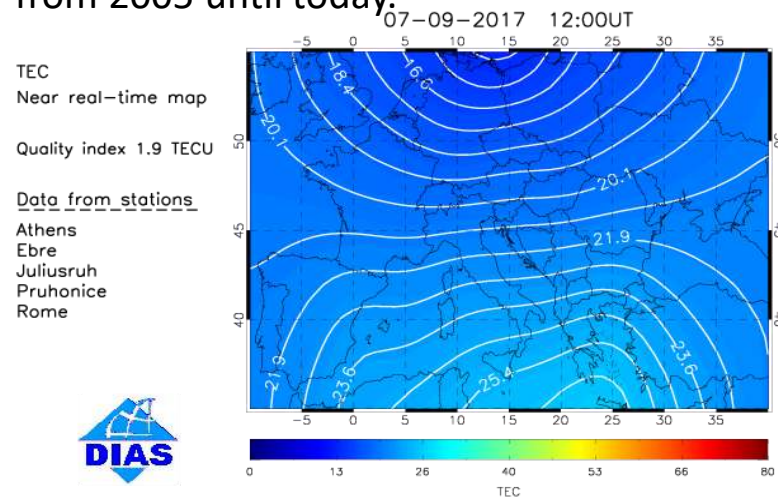


*An example of DIAS TEC maps*

http://dias.space.noa.gr
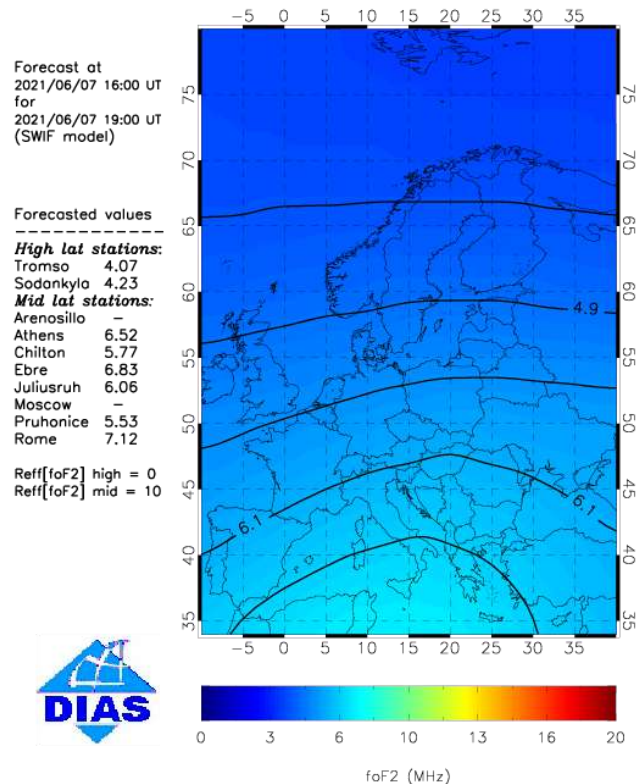


*An example of DIAS forecasting maps*

## Detection and prediction of TIDs



The **TechTIDE-EC H2020 warning system** e-infrastructure provides detection and prediction of Travelling Ionospheric Disturbances (TIDs) over Europe and Africa, based on several complementary methodologies. The TechTIDE database contains data and model results from 2017 onwards.

http://www.tech-tide.eu/

# Access to NOA node
## WP7: Access to PITHIA-NRF facilities

NOA node is open to experiment proposals in the following fields:

**Ionospheric modeling for nowcasting and forecasting purposes.** Indicatively:

- Modeling formulation of ionospheric storm effects at middle latitudes driven by solar wind input;
- Data - driven ionospheric specification models, using different training data sets and/or deep-learning techniques ;
- Ensemble modeling for ionospheric predictions using heliospheric forecasting models;
- Reconstruction of electron density profile by ingesting ground and space-based observations.

**Validation of ionospheric specification models** compatible with international practices, such as the recommendations by Community Coordinated Modeling Center (CCMC) of NASA and Space Weather Service Network of ESA.

**Ionospheric data control:** development of higher-level data-products based on ionospheric autoscaled data filtering algorithms.

**Ionospheric irregularities and travelling ionospheric disturbances (TIDs).** Research and application activities on:

- Identification and propagation patterns for TIDs
- Bottomside and topside ionosphere interactions
- Identification of post-seismic effects in the ionosphere

**Digisonde experiments**

- Vertical Soundings
- Joint experiments/special campaigns with bistatic HF sounders' operations.

Contact: Dr Anna Belehaki (belehaki@noa.gr)
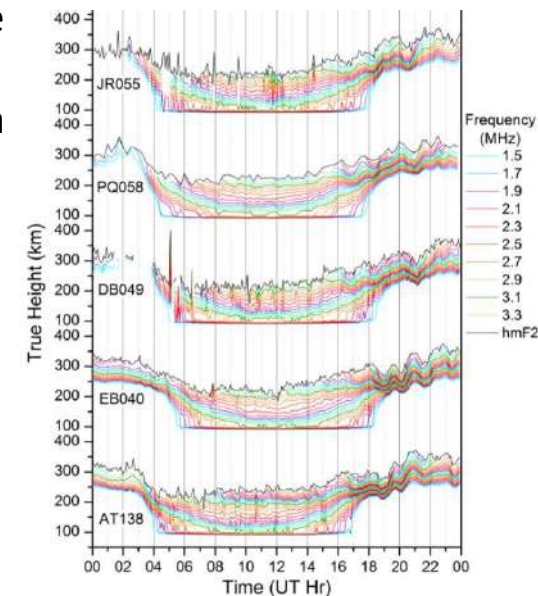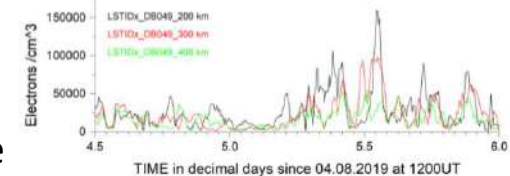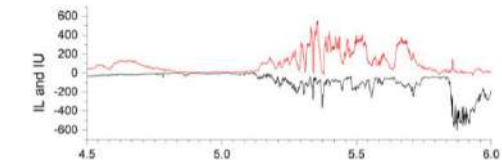
# Access to NOA node
## WP7: Access to PITHIA-NRF facilities

## Commitments for granted TNA projects

### NOA commitments

- Physical access
  - Offering travel to the site location and one week of accommodation.
- Remote access
  - Weekly scheduled interactions during one month
- Hands-on support at site for running experiments, analysing, database searching etc.
- Remote support during the whole project

### User commitments

- Present scientific results and findings in a written report at the end of the project, maximum 6 months.
- Submit an evaluation of the project experience.