



KTIMATOLOGIO S.A.

# National Report of Greece

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**KTIMATOLOGIO S.A. (Hellenic Cadastre)**



# Outline

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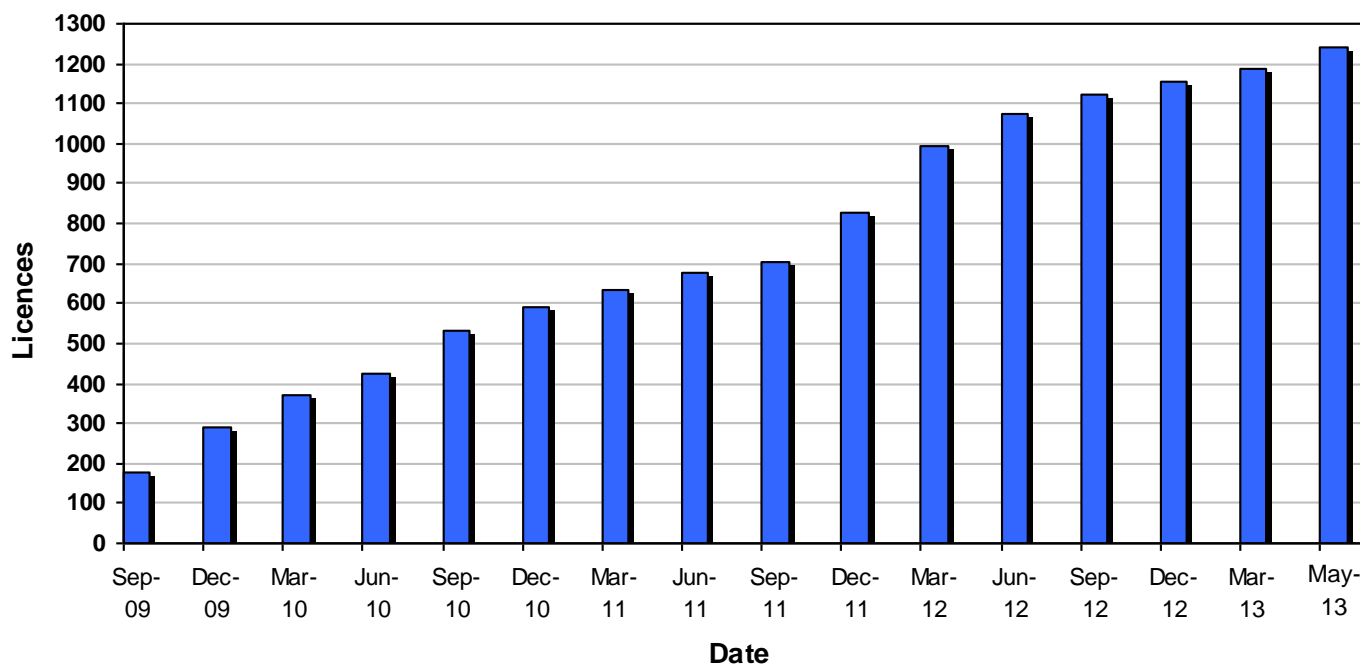
1. **Maintenance of HEPOS**
  - **Hardware**
  - **Reference Frame**
2. **Evaluation of HEPOS transformation model**
3. **Evaluation of HEPOS geoid model**
4. **Monitoring of ionospheric activity**



# 1. Maintenance of HEPOS



**As the number of HEPOS users increases, the maintenance of the system becomes more important.**





# 1. Maintenance of HEPOS

## Hardware maintenance

In order to keep the availability and reliability of HEPOS services on the highest level possible, the following hardware components at the reference stations have been preventively replaced in 2012:

- **All (97) battery packs for the UPS systems**
- **All (97) routers** (the replaced routers remained on site as backup)





# 1. Maintenance of HEPOS

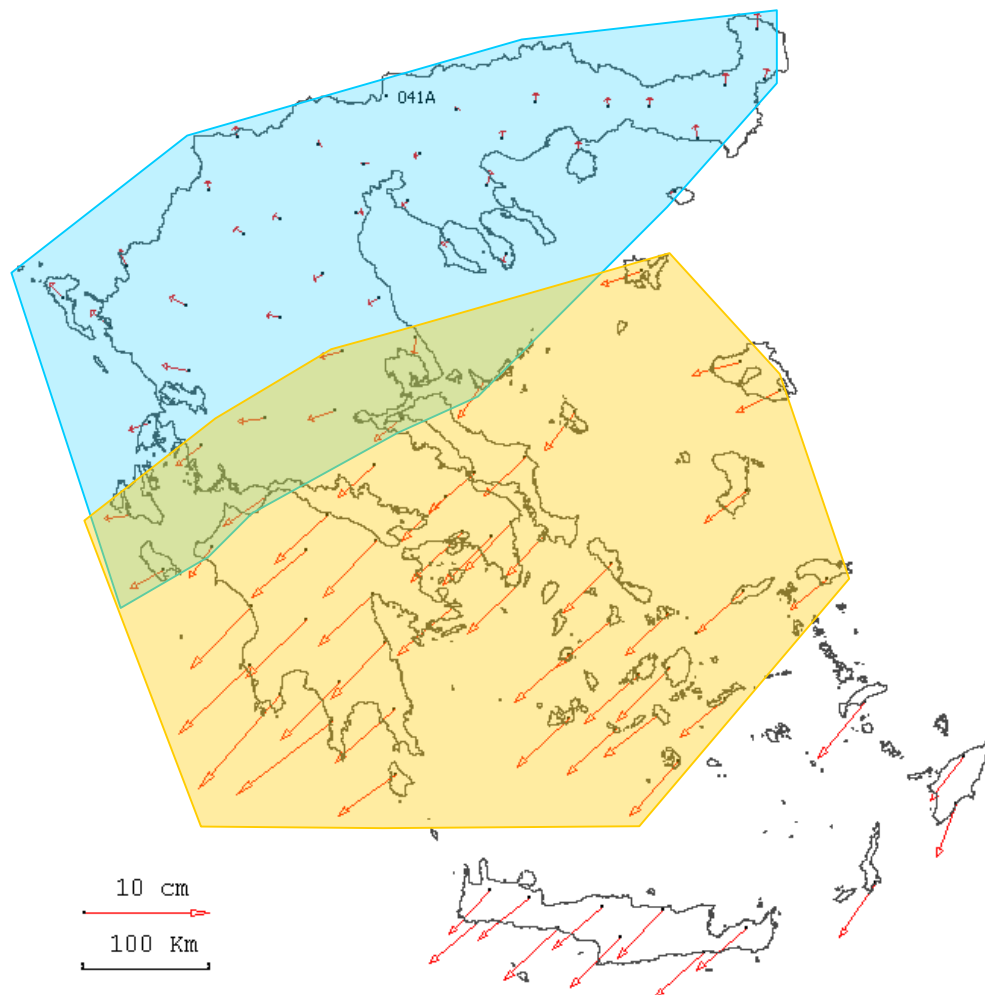
## Maintenance of Reference Frame: tectonic movements

- The tectonic velocity field in Greece is inhomogeneous.
- This fact has to be considered in the operation of HEPOS.
- By using data from the HEPOS network a detailed deformation field for the complete country has been computed.
- From a strictly scientific point of view, the solution would be the regular update (e.g. every 1-2 years) of the stations coordinates, leading to a dynamic or semi-dynamic geodetic datum.
- However, taking into account all the practical purposes as well as the specific deformation pattern of the country, an alternate approach is currently followed in HEPOS.



# 1. Maintenance of HEPOS

## Maintenance of Reference Frame: tectonic movements



**Based on the tectonic characteristics of the stations, two sub-networks\* (with an overlap zone) have been formed.**

**The first results of this approach are quite encouraging in terms of network performance.**

\* Crete has always been treated as a separate network.



## 2. Evaluation of HEPOS transformation and geoid model

Continuation of the project for the evaluation of :

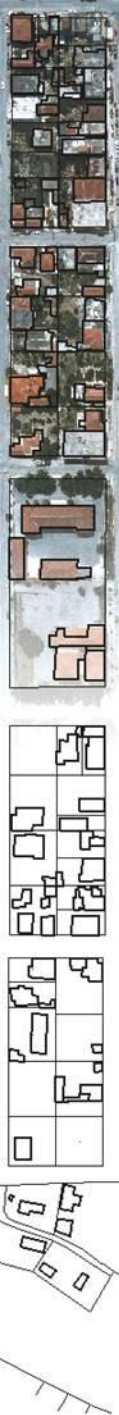
- the transformation model from ETRS89 (HTRS07) to the national system (GGRS87)
- the HEPOS geoid model

The evaluation is based on measurements on benchmarks of the national triangulation and leveling networks.

Up to now, we evaluated measurements on 727 points, originating mainly from KTIMATOLOGIO S.A. projects, but also from academic institutions (AUTH, NTUA, TEI of Athens, TUC).

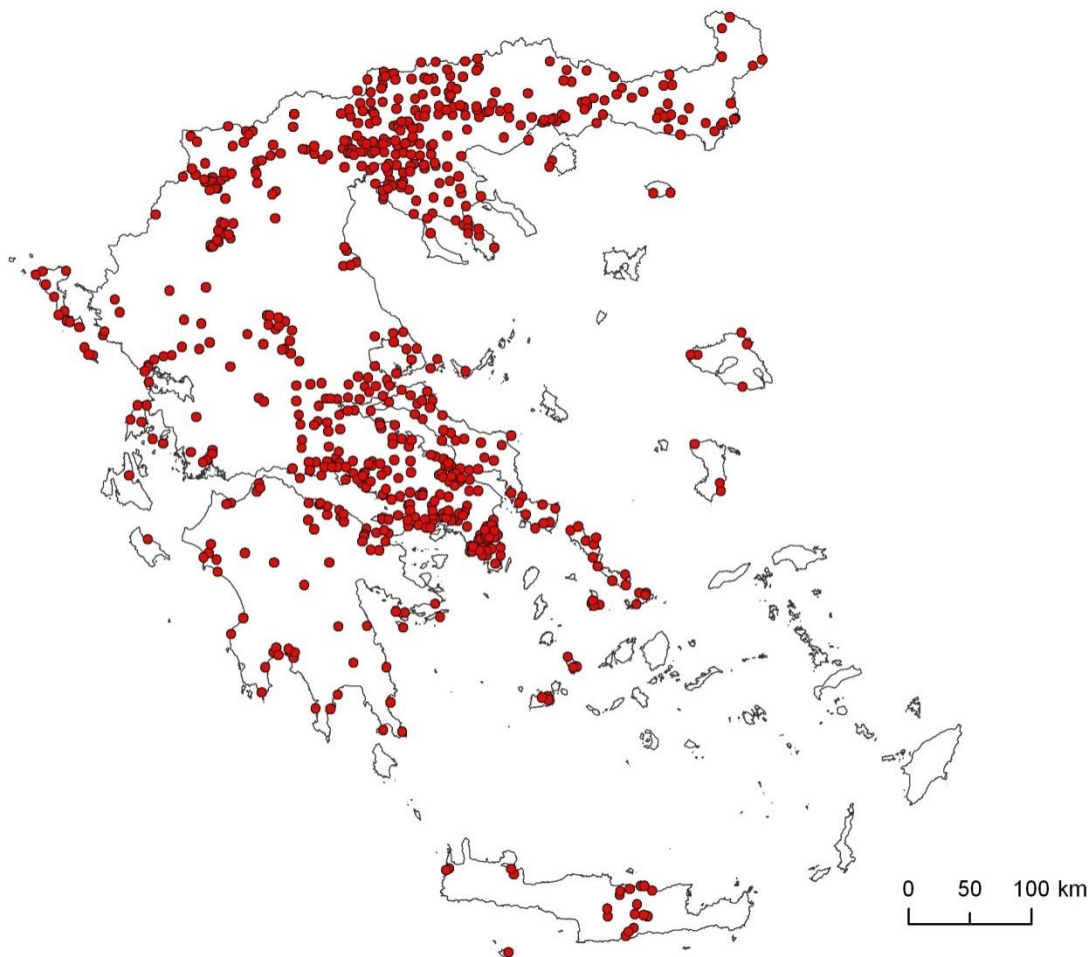
In the following, the intermediate results are given.





## 2. Evaluation of HEPOS transformation model

For the evaluation of the transformation model,  
700 points were used.

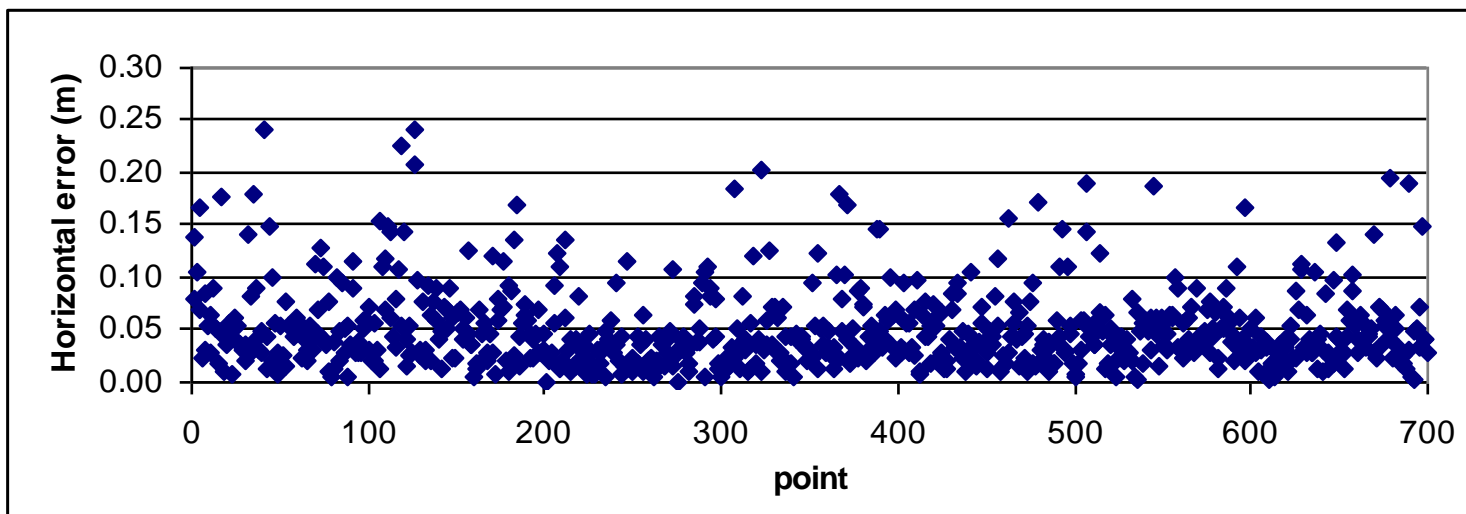






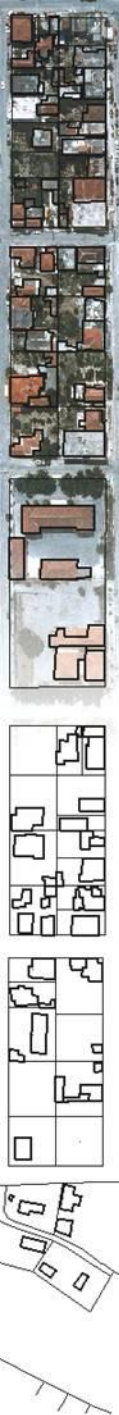
## 2. Evaluation of HEPOS transformation model

### Horizontal errors



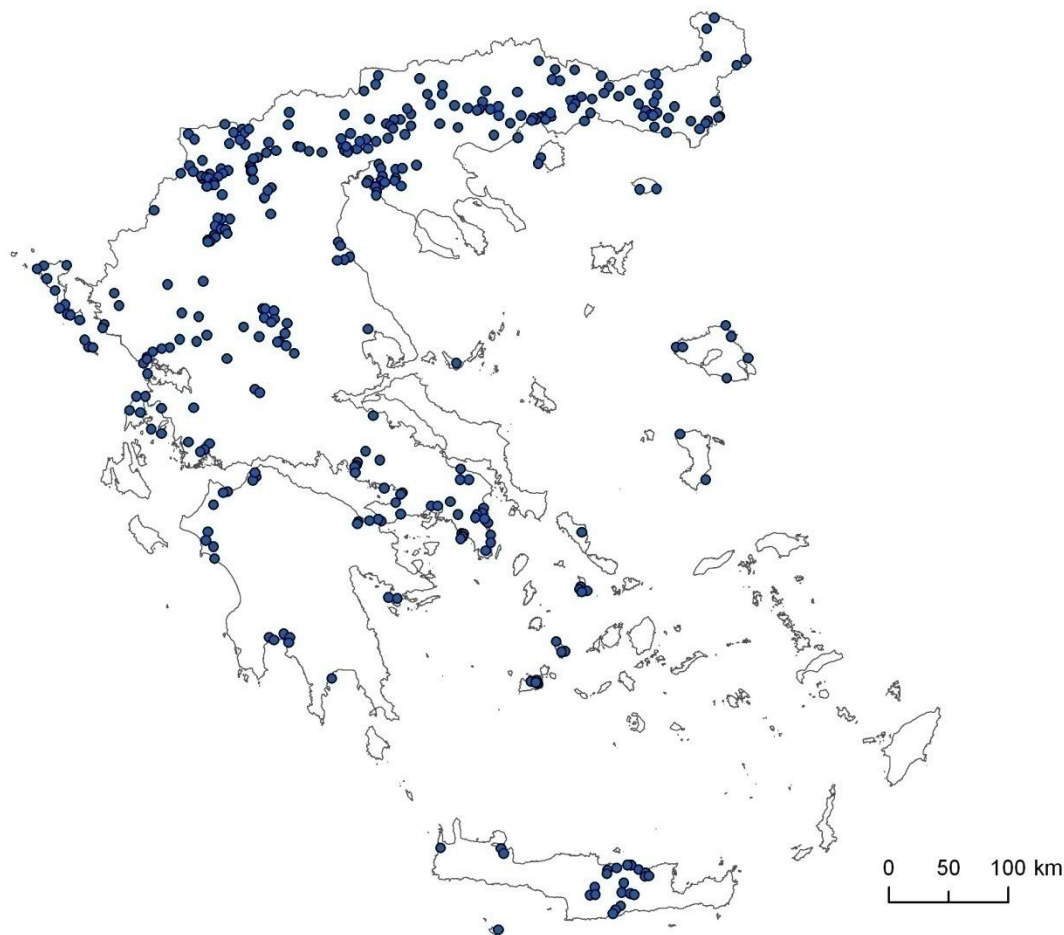
Statistics of horizontal errors (m)					
Min	Max	Percentiles			
		50th	90th	95th	99th
0.000	0.242	0.041	0.097	0.133	0.191

(\*) Big errors are mainly due to problematic points, rather than model deficiencies



### 3. Evaluation of HEPOS geoid model

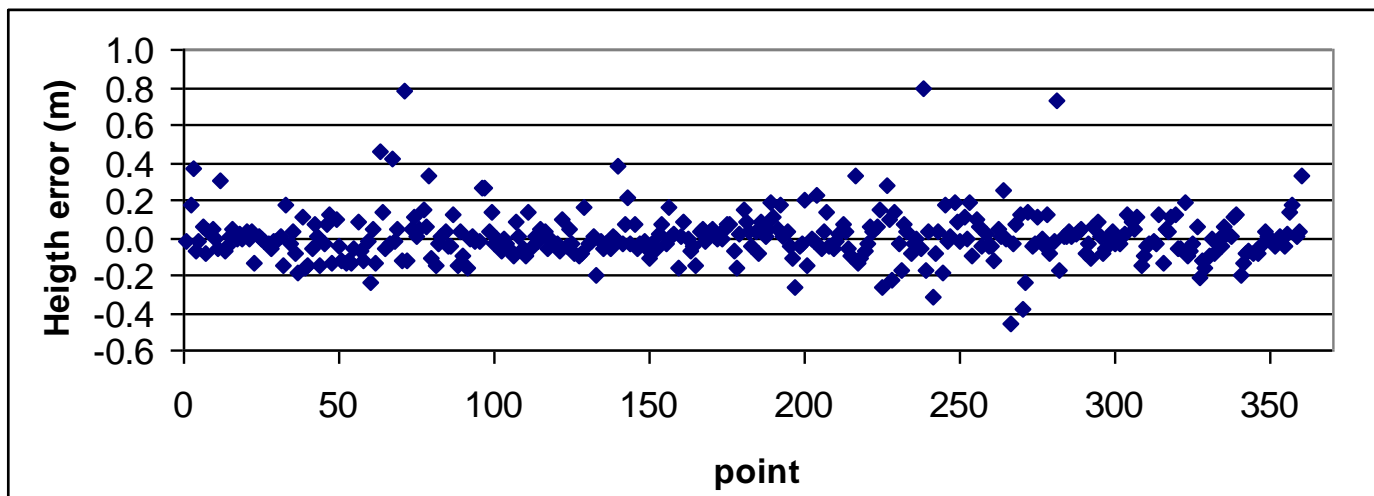
For the evaluation of the HEPOS geoid model,  
360 points were used.





### 3. Evaluation of HEPOS geoid model

#### Height errors



Statistics of height errors (m)					
Min	Max	Percentiles			
		50th	90th	95th	99th
0.000	0.793	0.056	0.176	0.260	0.455

(\*) Big errors are mainly due to problematic points, rather than model deficiencies



## 4. Monitoring of ionospheric activity

### Motivation

During 2011 and 2012 intense ionospheric activity, seriously affected RTK applications in Greece, mainly in the Southern part of the country.

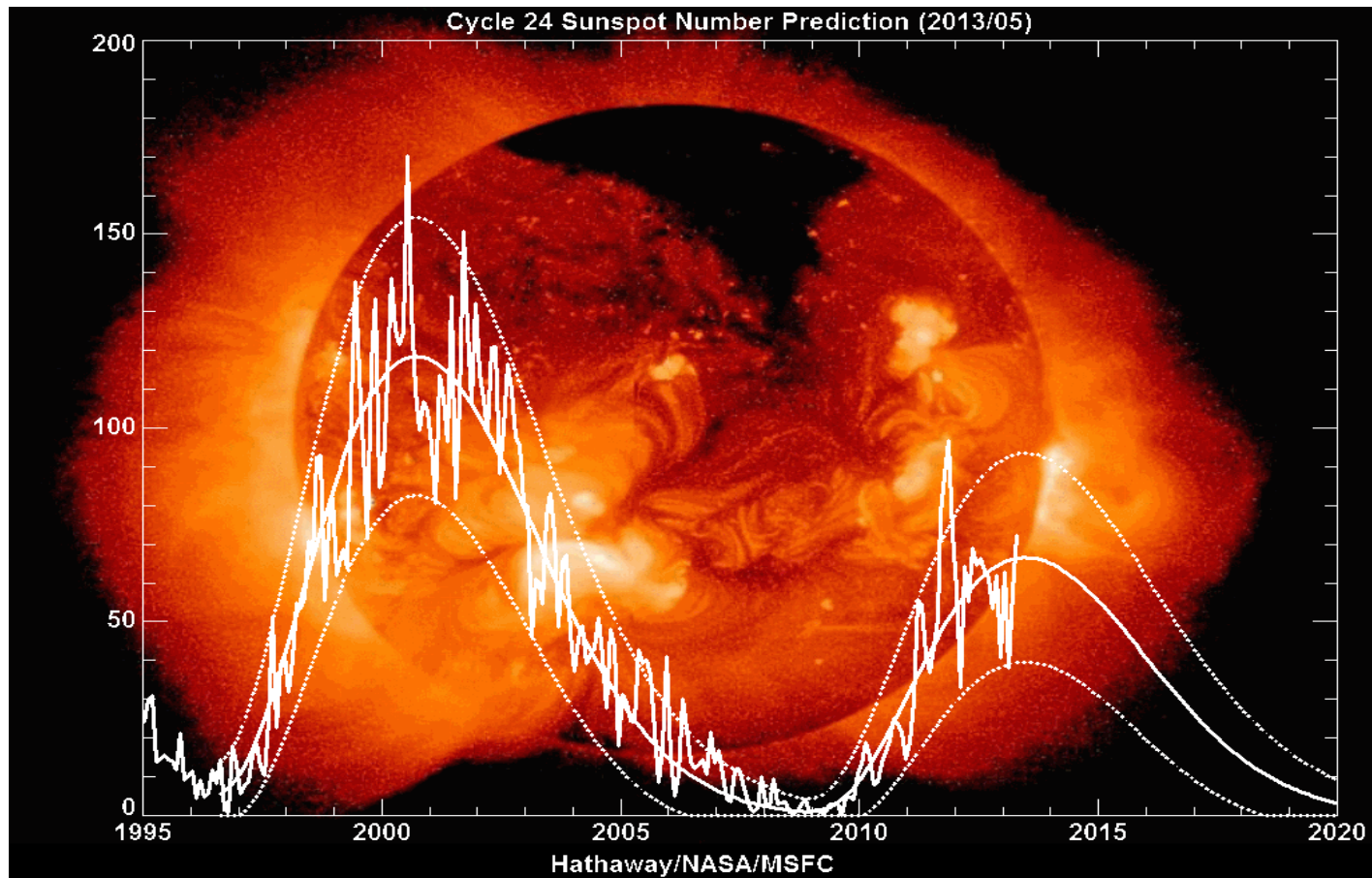
As the maximum of the 24<sup>th</sup> Solar Cycle was (initially) expected in 2013, the ionospheric activity is carefully monitored for the operation of HEPOS.

So far, the monitored ionospheric activity in 2013 seems to be lower than expected. This is in agreement with the latest prediction for the sunspot number, according to which *the current predicted and observed size makes Cycle 24 the smallest sunspot cycle since Cycle 14 (1906).*

<http://solarscience.msfc.nasa.gov/predict.shtml>

## 4. Monitoring of ionospheric activity

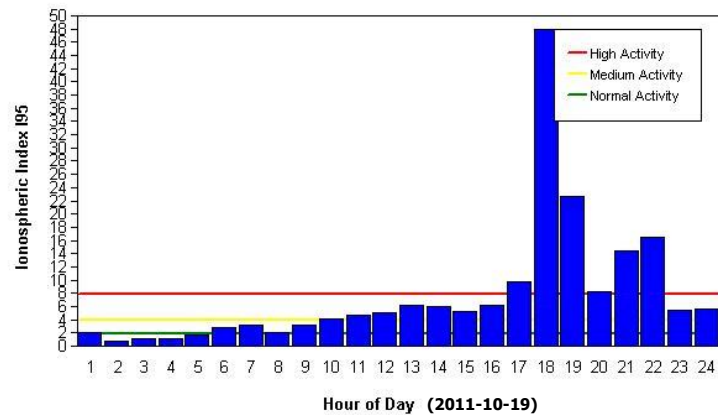
### Sunspot Number Prediction, May 2013 (NASA)



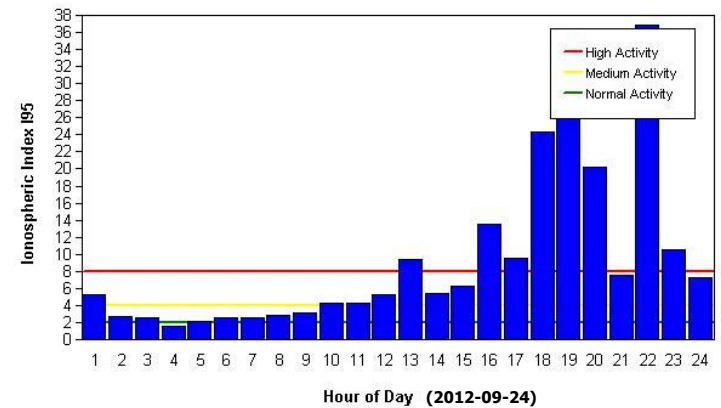
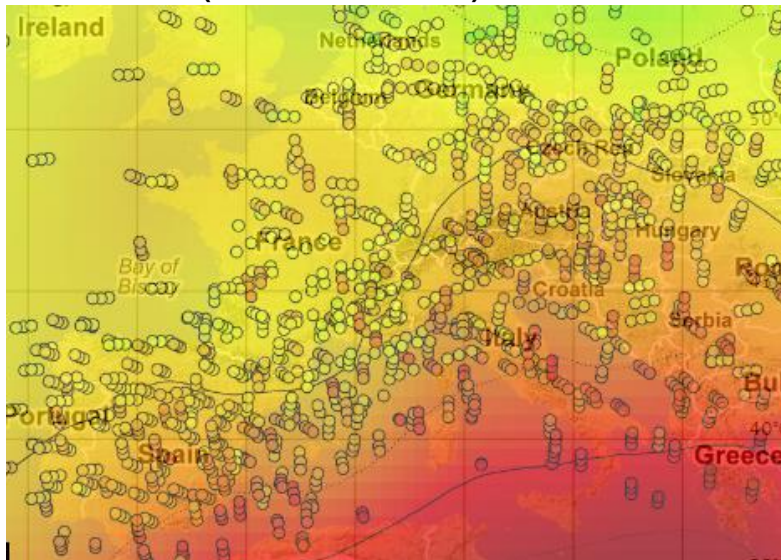


# 4. Monitoring of ionospheric activity

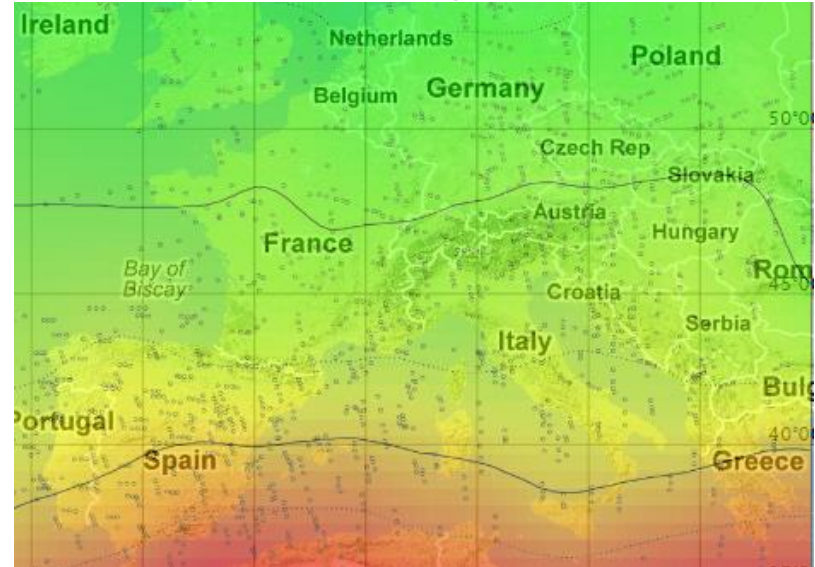
## I95 values (HEPOS Crete) and VTEC maps (ROB)



2011-10-19 (13:30 to 13:45 UTC) - max VTEC: 55 TECU

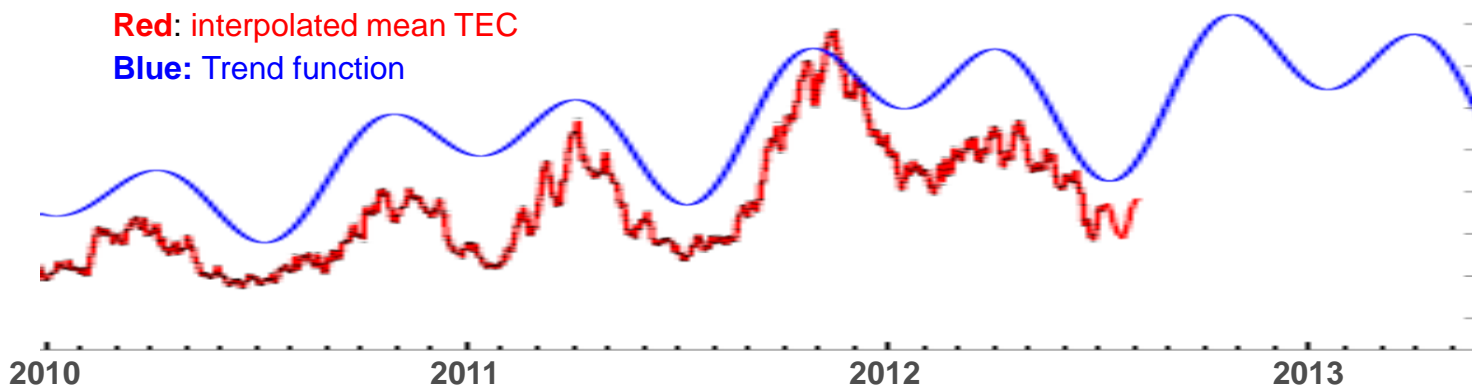
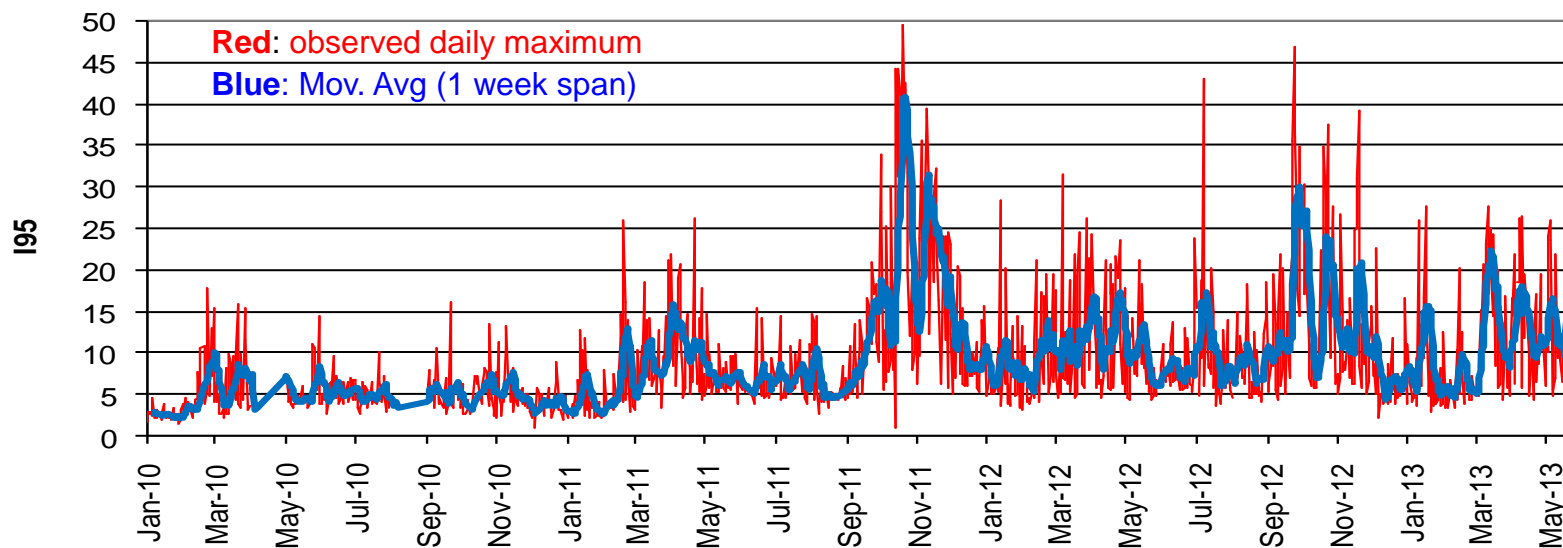


2012-09-24 (13:30 to 13:45 UTC) - max VTEC: 48 TECU



## 4. Monitoring of ionospheric activity

### I95 values (HEPOS Crete) and Mean TEC (CODE)





# Acknowledgments



The HEPOS project is part of the Operational Program “Information Society” and is co-funded by the European Regional Development Fund.

