



# The UPA LAC Status and Contribution to the EPN Densification



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# Introduction

The Italian GNSS Network attempts to densify the European Reference Frame:

- Must be compatible with the requirements of the National Cadastre, Geodetic and Mapping Agencies,
- Must serve to the geophysical community to monitor crustal deformations.
  - EUREF processing standard
  - Bernese 5.2 from GPS week 1784
  - 13 regional clusters (36/89 are the min/max numbers of sites for the clusters).
  - Soln's from latest EPN cumulative solution for class A reference sites

Since GPSW 1934 we use IGS14 orbits and PCVCs. IGB08 datum is still used to align the solutions until the new EPN A release (IGS14-based) is available.

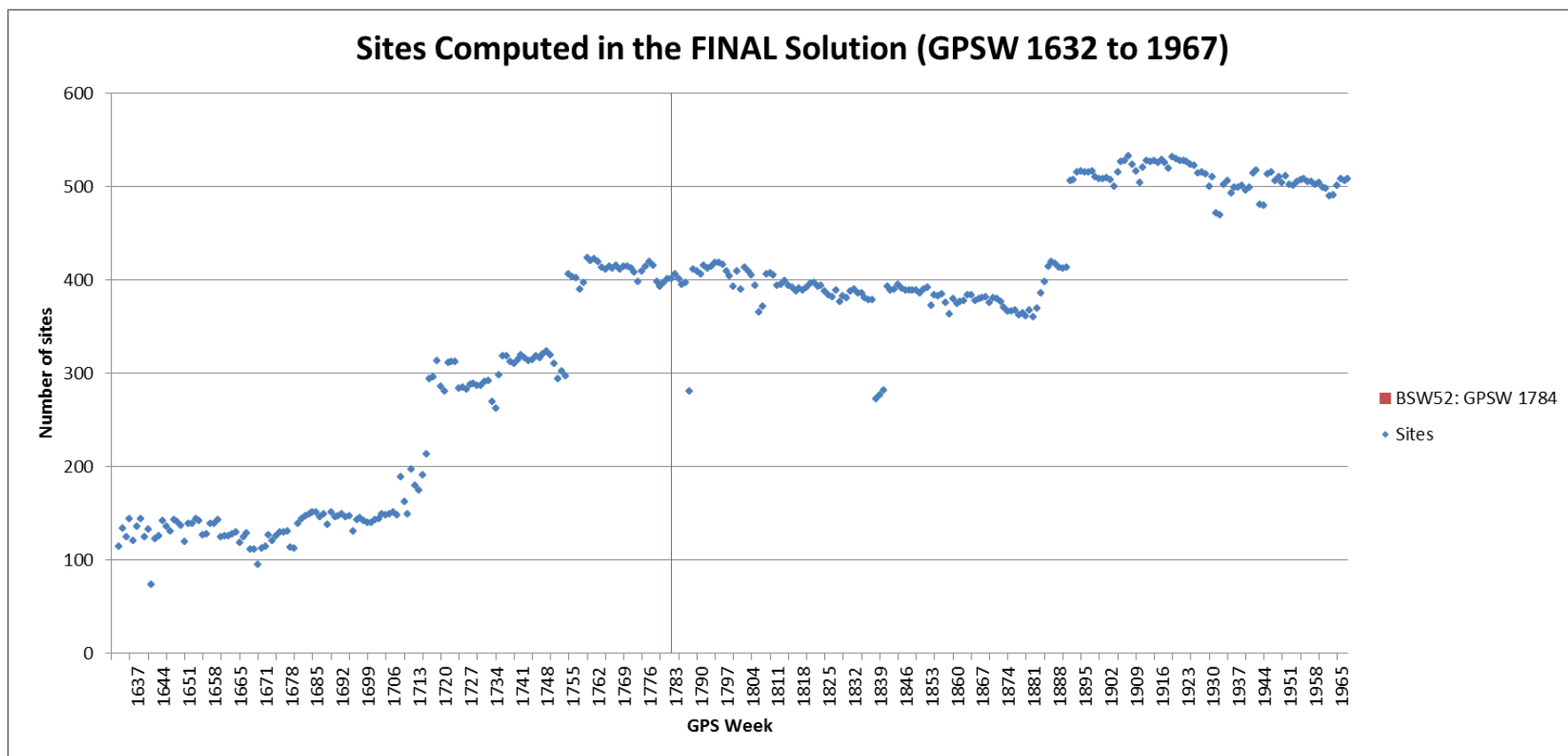
Two solutions are daily computed:

- RAPID solution, using rapid CODE products,
- FINAL solution (2 weeks later), using final CODE products

All the sites have a unique 4 char ID and DOMES number. An IGS-style logsheet tracking the history of each non EPN site is available on a web server and at the dedicated server at EPNCB.

# Introduction

In such a large networks, automated quality controls of the different processes and involved files are a must (last update: 2017-10-11).



# Quality Analysis

**A) RINEX Metadata/logsheets verification** is checked routinely using the IGS/EPN software

- a warning is issued and sent to the station manager **whenever a discrepancy between station logsheet and Rinex metadata is detected.**
- Rinex files are normally corrected in time for the solution with FINAL CODE orbits

## **B) Datum stability/sites' stability in the weekly solution**

1. Datum alignment (checked in the daily solutions): verifying the differences of the nominal (EPN published) and the adjusted coordinates of the EPN Class A sites considered, modulo 3 origin Translations. (similarly to EPN weekly combination)
2. All sites checking (weekly solution): high residuals (15 mm in all the three coordinates) are flagged and manual verification is requested to the LAC people.

# Quality Analysis

## B) Datum stability/sites' stability in the cumulative solution

A cumulative solution on all the normal equations since week 1632 (date at which the newest IGB08 standards were officially adopted) is run weekly, so that the coordinates and velocities are updated.

The update in the a priori velocities is done when the weight of the station's a priori velocity is modified in the cumulative adjustment. This happens when the available time span of the station is increased. The weights of the a priori velocities (sigmas) used are:

- Less than 1 year (**1.D-6** sigma)
- From less 1 year to 2 years: velocity is freely computed in the cumulative adjustment (**1.D-3**).
- Free velocity for more than 2 years (no sigma).

All the data are archived in a repository ([http://retegnssveneto.cisas.unipd.it/italian\\_network/](http://retegnssveneto.cisas.unipd.it/italian_network/)) and a permanent checking of the inconsistencies, residuals, offsets,... is performed in a daily/weekly basis. Web visualization of the time series, and the introduced solution numbers is made with reference to the used STA file.

## C) Discontinuity verification

Once a discontinuity is introduced in the **densification sites**, the following thresholds are imposed:

Horizontal: 3mm

Vertical: 6 mm

# Products available on the website

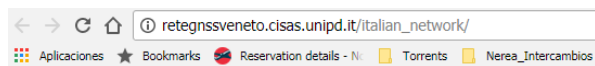
## Italian Dense GNSS Network products

Long term: [http://retegnssveneto.cisas.unipd.it/italian\\_network/](http://retegnssveneto.cisas.unipd.it/italian_network/)

STA directory of the cumulative solution contains the SOLN information with the official solution numbers for the time series of non EPN sites.

STA file (TYPE 001 and 003) is linked to the plot libraries.

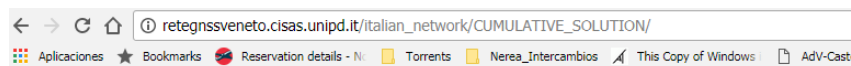
Weekly/cumulative SNX, logsheets, ..... complete outputs, coordinates, STA file.



### Index of /italian\_network

<a href="#">Name</a>	<a href="#">Last modified</a>	<a href="#">Size</a>	<a href="#">Description</a>
 <a href="#">Parent Directory</a>		-	
 <a href="#">CUMULATIVE_SOLUTION/</a>	05-Nov-2015 21:16	-	
 <a href="#">LOG/</a>	29-Aug-2017 11:33	-	
 <a href="#">NQ0/</a>	20-Sep-2017 15:28	-	
 <a href="#">SNX/</a>	20-Sep-2017 15:28	-	
 <a href="#">notice_on_some_antennas.readme.pdf</a>	18-Nov-2015 15:47	439K	
 <a href="#">readme.first.pdf</a>	16-Nov-2015 11:55	452K	

Apache/2.2.16 (Ubuntu) Server at retegnssveneto.cisas.unipd.it Port 80



### Index of /italian\_network/CUMULATIVE\_SOLUTION

<a href="#">Name</a>	<a href="#">Last modified</a>	<a href="#">Size</a>	<a href="#">Description</a>
 <a href="#">Parent Directory</a>		-	
 <a href="#">OUT/</a>	04-Nov-2015 22:49	-	
 <a href="#">SOL/</a>	04-Nov-2015 22:59	-	
 <a href="#">STA/</a>	06-Sep-2017 10:50	-	

Apache/2.2.16 (Ubuntu) Server at retegnssveneto.cisas.unipd.it Port 80

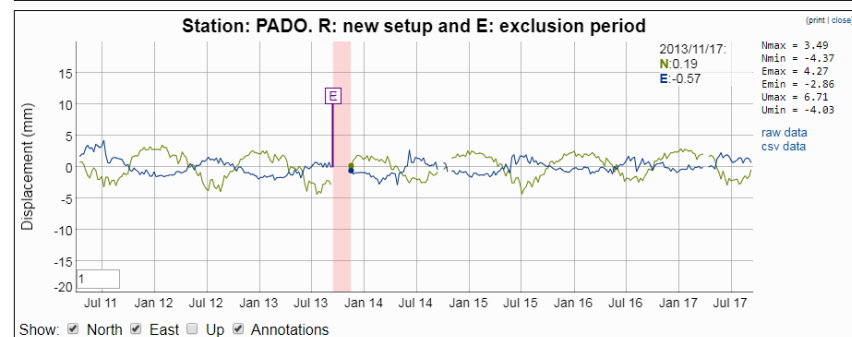
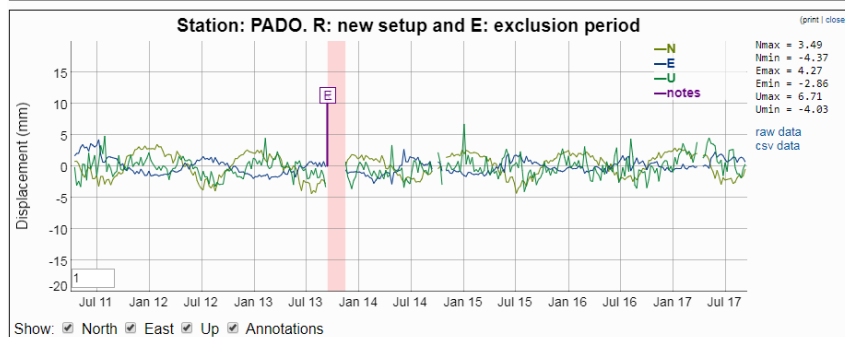
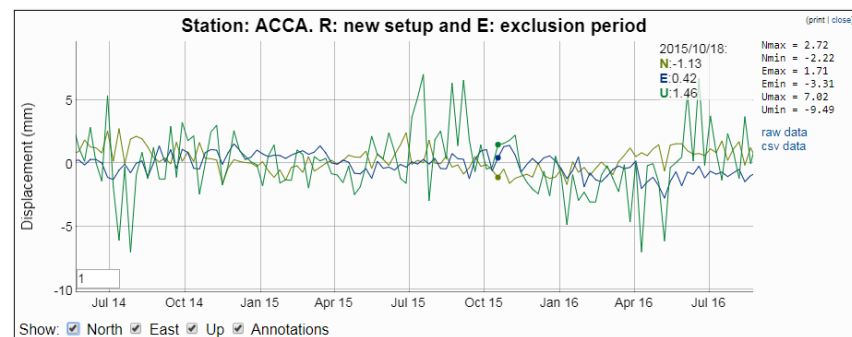
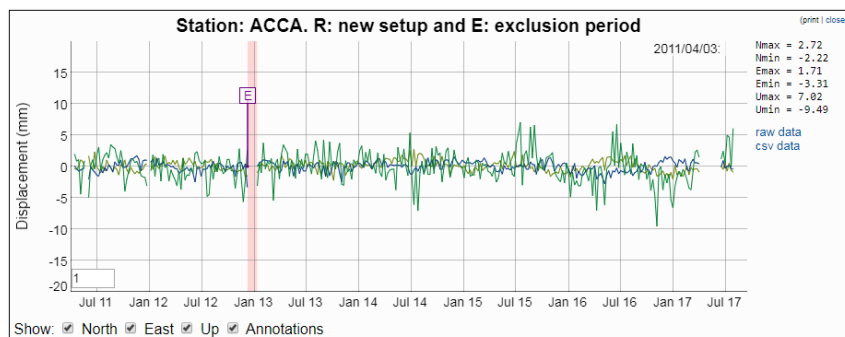
# Products available on the website

Italian Dense GNSS Network products

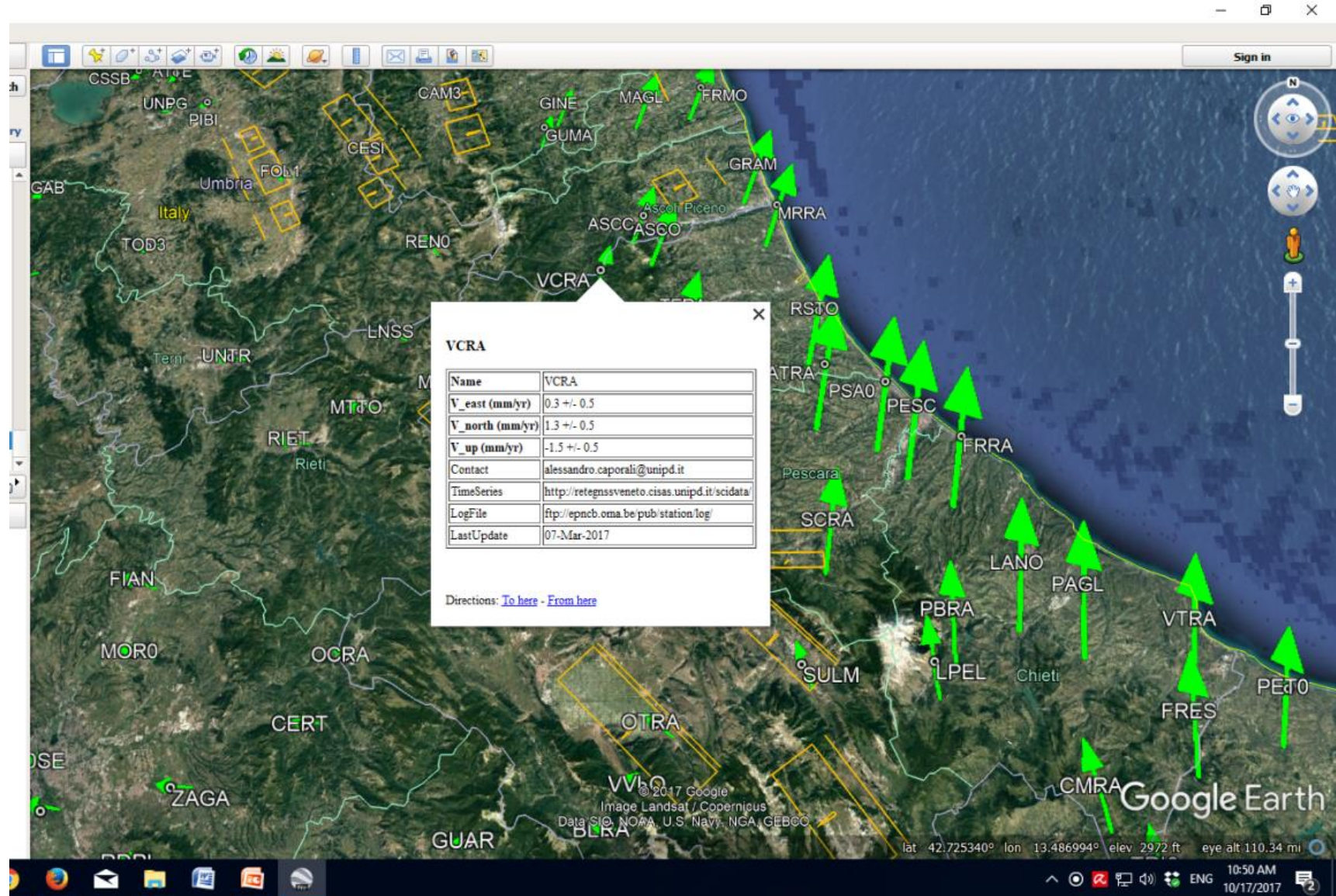
Time series: <http://retegnssveneto.cisas.unipd.it/scidata/>

Dynamic zoom capabilities (X and/or Y axes and NEU components selectable)

All the TYPE 001 and TYPE 003 records of the STA file is shown in the plots:

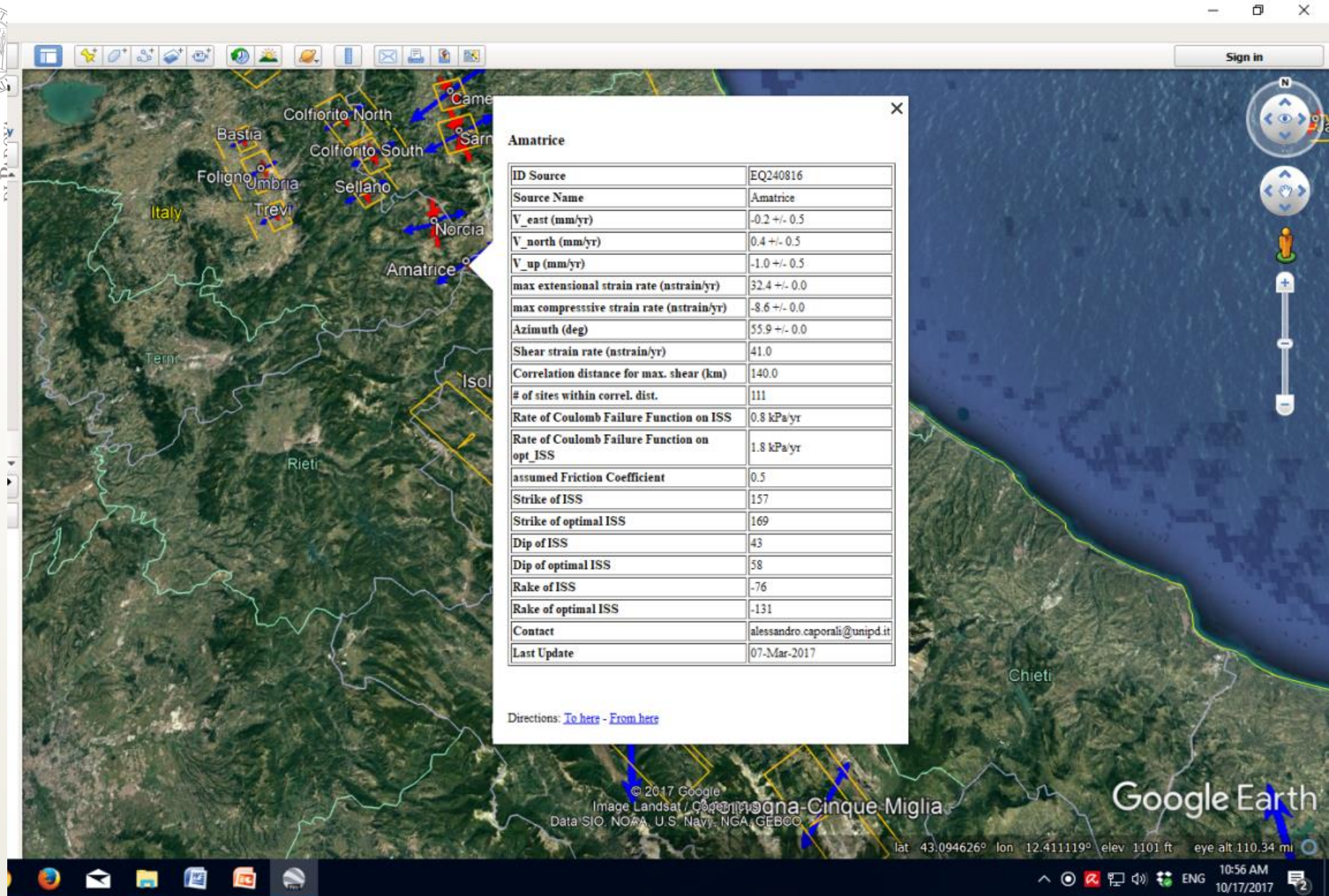






**Data Base organized in a Google Earth interface for easy access to final users (Civil Protection, Ministry of Interior ..**

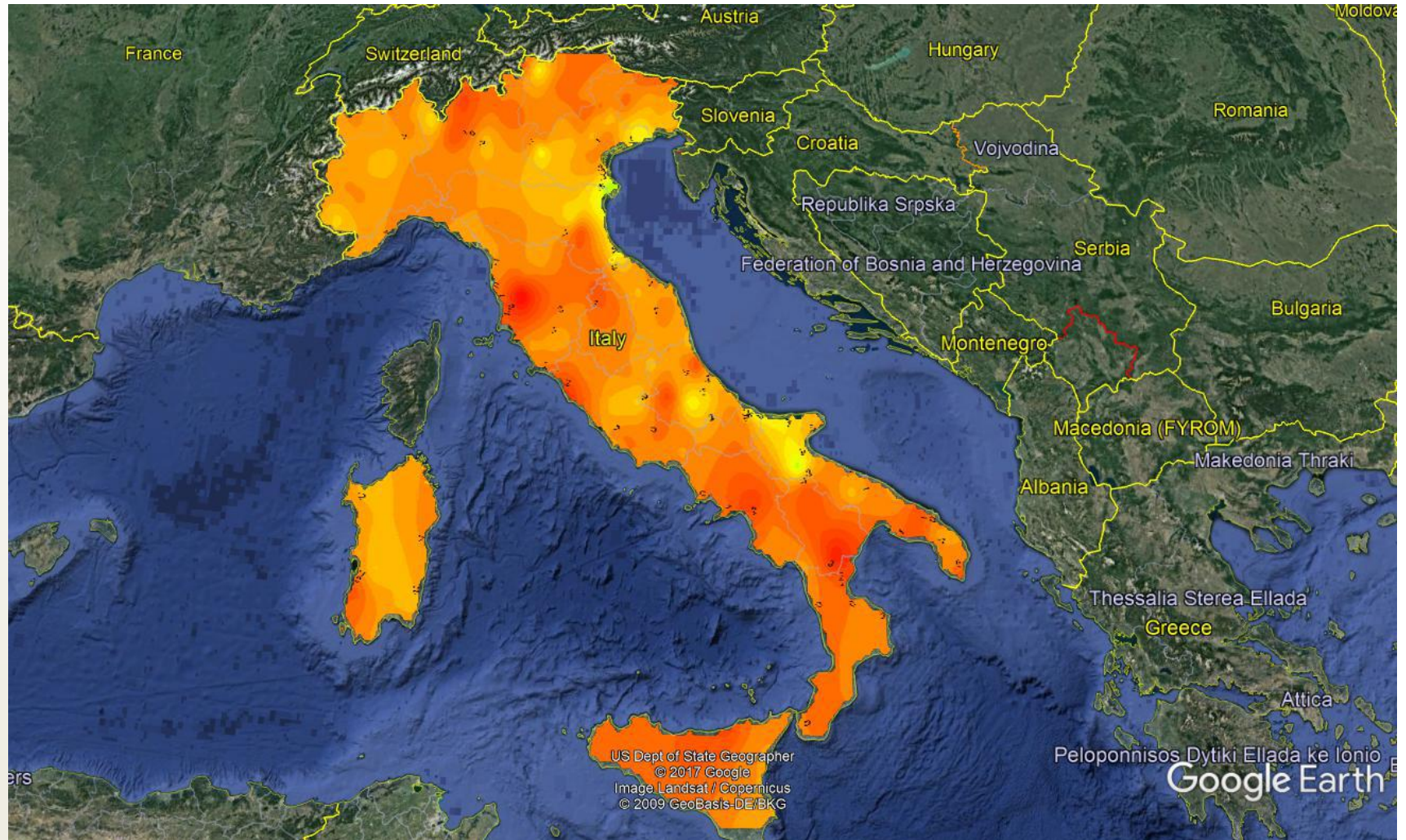




**Strain rates and Coulomb loading rates are computed at the Individual Seismogenic Sources catalogued by INGV (light brown rectangles)**



Not to forget the vertical!



Thank you for your attention