

RU 02.01 – Update of the Italian Seismic Catalog (2003-2007) Catalogo della Sismicità Italiana CSI v2.0

Castello B., Di Stefano R., Chiarabba C.

Istituto Nazionale di Geofisica e Vulcanologia, Centro Nazionale Terremoti, Via di Vigna Murata 605

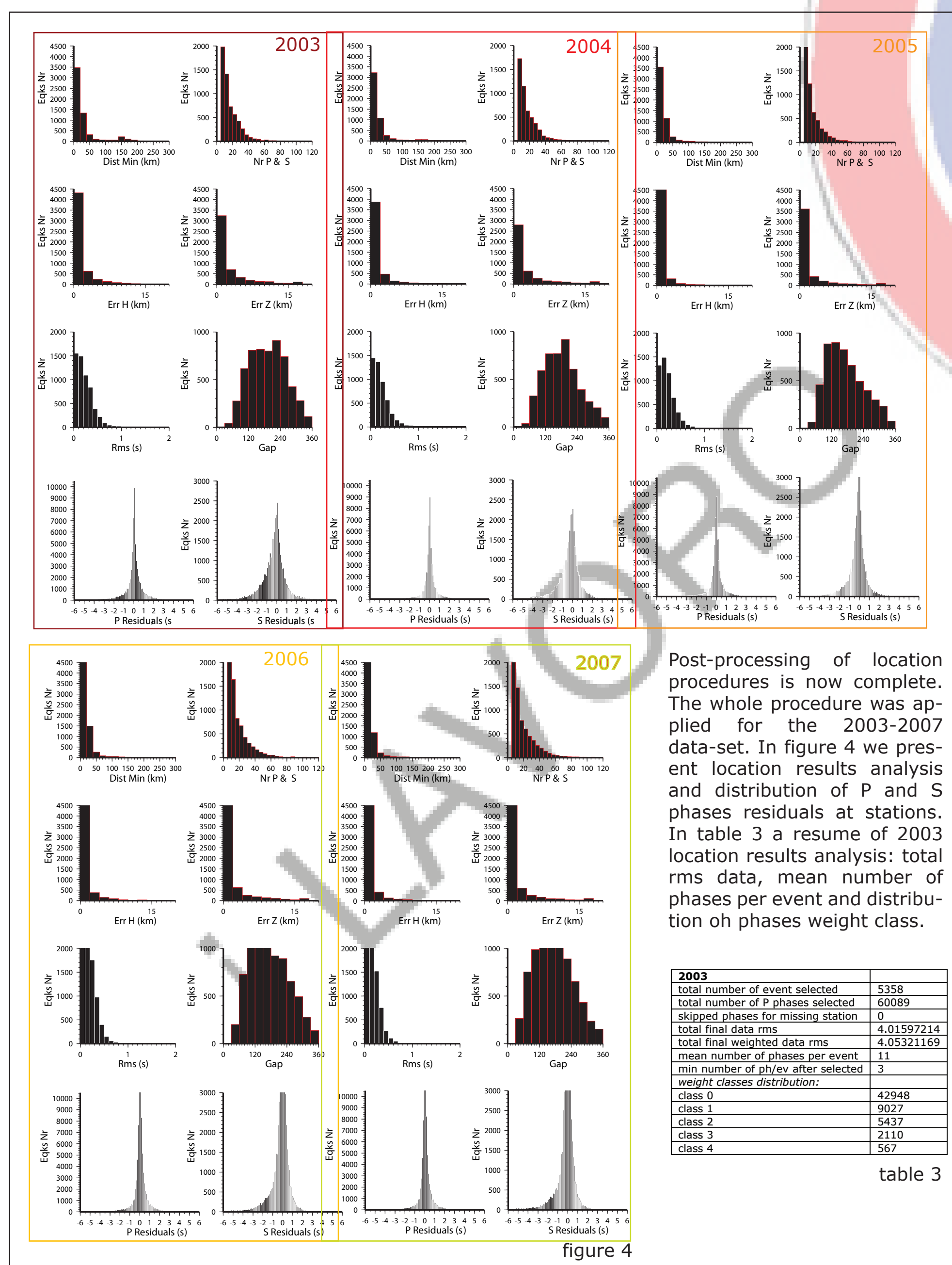
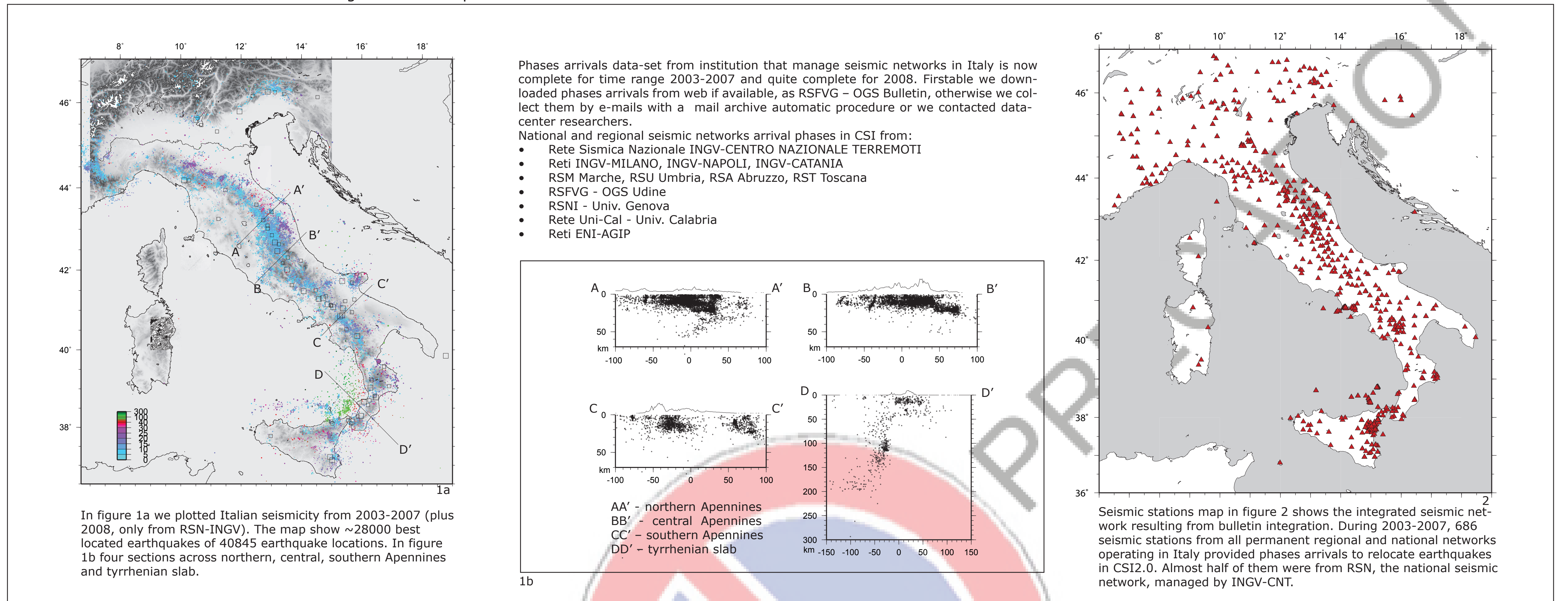
Earthquake catalogues are the basic tools that furnish parametric data for seismic hazard evaluation, studies on evolution of seismic sequences and earthquake occurrence. The INGV seismic network covers a large part of the Italian region and it is complemented by several regional permanent network handled by other institutions. CSI results from the combination of INGV seismic bulletin with bulletins produced by other institutions. To update CSI from previous release to version 2.0 we collected seismic bulletins sent to INGV from, at present, 12 institutions managing permanent seismic networks during 2003-2007. Procedures to convert different file formats to PHS format as input files of Hypoellipse program have been setup that also perform preliminary checks on possible errors.

To correctly merge different seismic bulletins it is mandatory to have a strict control on phase associations. To do this, additional procedures to identify earthquakes external to the interest area and wrong associations of different earthquakes based on geographic control network associations and stations' residuals after event location have been produced.

About 35,000 earthquakes, a mean value of ~6600 earthquakes per year, with more than 600,000 P-phase arrivals and more than 250,000 S-phase arrivals have been collected and located with Hypoellipse. To enhance final locations quality we applied a multiple location approach and then selected the best among several calculated hypocentres for each event. Location criteria are based on the use of two different weighting schemes for stations' distance combined with several reference regional 1D velocity models.

Native MI Magnitudes from 2003 to 2007 are retrieved and then associated to the corresponding event from INGV bulletin. When native MI is not available, MI based on regression law by Castello et al. 2007, is attributed.

The update of CSI catalog, also due to the strong improvement of the INGV seismic network between 2005 and present, offers a more complete image of the Italian seismicity and a new important reference for further studies on the evolution of this region and earthquake occurrence.

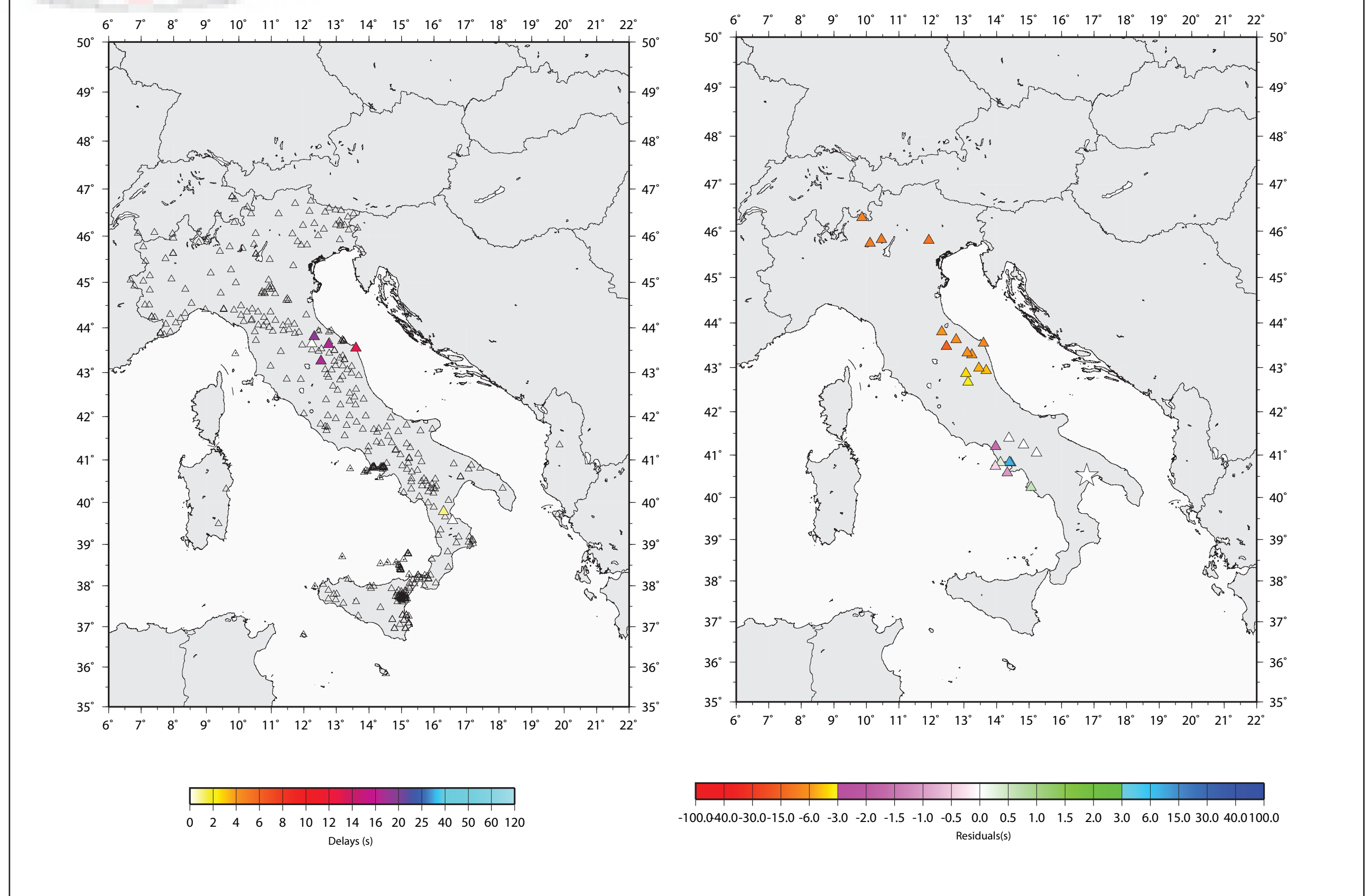


The methodology to locate earthquakes in CSI is composed by different steps and was completely implemented and tested:

- 1) procedure to convert different file formats to PHS as input file of Hypoellipse program - TOBOL
- 2) procedure to get seismic station code used in phs files: retrieving of new stations coordinates to update stations file - STATIONS
- 3) procedure to associate phase arrivals from seismic stations - MIXA
- 4) procedure to optimize location by using Hypoellipse program - PHS2CSI
- 5) procedures of post-processing to control the last two steps - GEOMAP and RESIMAP

In particular we spent most of time on step1 in order to convert phase files format of seismic network data-centers into a Hypoinverse format named PHS format. This is because sometimes phases file format of the same data-center changed from previous version of CSI. Moreover we implemented in step5 two procedures of post-processing data results of step3, to control phases association we made, both first and after locations.

Both procedures were based on a geographic control of stations compared the first with P-phases arrivals and the second on P-phases residual. In figure 5a delays plot from GEOMAP procedure shows that phase arrivals at local networks as Rete Sismica Marche and Rete Università della Calabria belong to two different local earthquakes occurred at the same time. In figure 5b residuals plot from RESIMAP procedure shows that phase arrivals at local networks as INGV-MI, Rete Sismica Marche and INGV-NA belong to a regional earthquakes located in Albania as noticed from INGV Bulletin. For this reason RSN-INGV were previous automatically eliminated in TOBOL procedure.



We present first results about numbers of earthquake locations, seismic stations and associated phases for years 2003-2007. We are still retrieving 2008 phases data-set from other institutions. The total number of located earthquakes (2003-2007) with almost 5 phases arrivals is 40565

	2003	2004	2005	2006	2007
Number of associated earthquakes	8461	7312	6945	9518	12,050
Number of located earthquakes	5358	4537	4876	7139	9178
Numero of P and S phases	60.089P-34.537S	47.786P-29.564S	49.607P-31.402S	76.414P-52.043S	92.381-62.515
Number of seismic stations	355	422	404	458	474

Bibliography.

- Castello B., Selvaggi G., Chiarabba C., Amato A., 2006. CSI Catalogo della sismicità italiana 1981-2002, versione 1.1. INGV-CNT, Roma <http://csi.rm.ingv.it/>
- Castello B., Olivieri M., Selvaggi G., (2007) "Local and duration magnitude determination for the Italian earthquake catalogue (1981-2002)". Bulletin of the Seismological Society of America, Vol. 97, No. 1B, pp. 128-139, February 2007
- Chiarabba C., Jovane L., and Di Stefano R. (2005) "A new view of Italian seismicity using 20 years of instrumental recordings", Tectonophysics, Vol 395/3-4 pp 251-268