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High-resolution imaging of the Ivrea Geophysical Body: A joint seismic and gravity approach

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The Ivrea geophysical body (IGB) is a piece of Adriatic plate lower lithosphere, located at upper crustal depths along the inner arc of the Western Alps. Its northeastern portion exposes middle to lower-crustal rocks at the surface in the so-called Ivrea-Verbano Zone. The geophysical anomalies associated with the Ivrea geophysical body are primarily high density and high seismic velocity.

We here aim at refining the structure of the Ivrea geophysical body starting from the most recent local earthquake tomography result (Diehl et al., 2009), defined over a 25 x 25 x 15 km grid. To achieve a higher resolution imaging, we deployed ten broadband seismic stations (of the MOBNET pool of the IG CAS Prague) at 5 km spacing along a linear West-East profile crossing the Insubric Line, the Ivrea-Verbano Zone at the level of the Sesia Valley, and two lakes. Teleseismic earthquakes are used to image sharp and broad discontinuities by means of P-to-S receiver function (RF) analysis following the frequency-dependent approach of James et al. (2003). Our preliminary results allow, for the first time, to delineate the Ivrea geophysical body structure at high resolution with RFs.

We also carry out a series of gravity surveys in the same area with 2-D coverage (1 point / 4-9 km2) to provide additional constraints on the structure and physical properties, mainly density, of the Ivrea geophysical body. Together with existing measurements, these surveys will provide new relative gravity data, which will be used to constrain a 3-D density model of the Ivrea geophysical body in the Ivrea-Verbano Zone. Being the elevation of measurements of crucial importance, different GNSS data-processing techniques have been explored to find the optimal approach as a compromise between accuracy and acquisition time for the forthcoming gravity campaigns.

The results from seismology and gravity will be jointly used to provide a higher resolution image of the IGB by 1) highlighting its contour in terms of velocity contrasts and 2) characterizing the density distribution of the area. This approach allows us to get a more reliable estimate for the depth and characteristics of the geophysical Moho in the Ivrea-Verbano Zone.