Fig. 1 – Tomography study area in Lisbon (Portugal), with the distribution of the GNSS (GNSS) stations over a digital terrain model (white areas are water), superimposed to the horizontal 3D grid resolution (left). Vertical cross section of the tomographic grid showing the vertical resolution of the model in meters (right).
Fig. 2 – Comparison between radiosondes launches on day 18 July 2013 (0h, 8h, 16h, and 0h), and tomographic vertical profile solution (densified network) extracted from the center of the grid (FCUL, IGP0, IGEO). Radiosonde at 0h is used as startup solution for the tomography and for the following X0 solution from the previous 2h is used to generate the solution. Values are in kg.m⁻³. Good agreement is obtained between the two techniques.
Fig. 3 – West-East vertical cross section tomography profiles (left) and south-north vertical cross section tomography profiles (right), both at 12h day 18 July. (x=1,y=1 corresponds to upper left grid corner).

Fig. 4 - Tomographic vertical profile solution (densified network) extracted from the center of the grid (FCUL, IGP0, IGE0) showed in a temporal evolution during several days of the campaign (hour/day of year), with a 2h sampling solution. It is noticed high water vapor dynamic variability during this period on the lower tropospheric levels.
Fig. 5 – GPS tomographic network in the region of Lisbon overlaid to an InSAR ΔPWV obtained from ENVISAR data (master date reference October 4, 2009 and the slave date image November 8, 2009). Figure also shows location and name of GPS, radiosonde and meteorological stations are reported. The tomographic model footprint and the grid points with SWD_Slave – SWD_Master observations are also visible (Benevides et al., 2015).