In this work we present the results obtained by an integrated approach using both the local and teleseismic data acquired during a passive seismic experiment located in Venetian Alps (NE-Italy). In this study we focus on 1) the definition of the three-dimensional Vp and Vp/Vs crustal structures using the local earthquake tomography (L.E.T.); 2) the characterization of the geometrical setting of the Adriatic-Europe plates margin at lower crust and upper mantle depths through the application of the Receiver Function technique. The tomographic images show an upper crust characterized by an abrupt Vp and Vp/Vs variations, both vertical and lateral, due to the complexity of the geological structures. In particular, close to the structures toward to the Po Plain, a high Vp value characterizes the shallower 15 km depth. Seismicity is located in correspondence of the high Vp values both close to the southern thrust structures verging toward to the Po Plain. A subset of 350 teleseismic earthquakes has been selected to perform the Receiver Function’s analysis. We obtained a detailed image of the subsurface structures, since the RF method is very suitable for the determination of positive and negative velocity jumps under the seismic stations. The study area has been shaped by the geodynamic evolution of the doubly vergent subduction/collisional system of the Alps, which is still poorly investigated. Receiver function’s analysis show two different mohos belonging to the Adriatic and European plates, their relative geometry and position giving new details about the structures involved in the area.