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GPS crustal deformation studies in the Pyrenees

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The Pyrenees mountain belt, that separates the Iberian Peninsula from the rest of Europe, is part of the Alpine-Himalayan orogenic belt, formed as a result of a collision between the African and Eurasian plates. More recent, post-collisional evolution of the Pyrenees has differed in its eastern and western parts: while the former was characterized by the extensional tectonics due to the opening of the Valencia trough, the latter has not experienced any significant post-collisional events, and thus preserved the final stage of the orogenic growth. The recent history of the Pyrenees is dominated by slight compression as determined from instrumental earthquake focal mechanisms. An important cluster of seismic activity has been recorded along the western segment of the North Pyrenean Fault Zone suggesting the reactivation of some structures.

The main objective of our study is to determine whether the Pyrenees mountain range is still being active and whether it exhibits any signs of active deformation (e.g. north-south compression). In terms of more specific goals, we are interested to investigate the relationship between the GPS measured deformation and the seismicity, which is known to be concentrated in the western part of the mountain chain. Previous studies by Nocquet and Calais (2003) utilizing GPS measurements have shown no significant (more than 1 mm/yr) deformation across the Pyrenees. Our goal is to confirm (or reject) this finding using a denser network of CGPS stations.

With this in mind, we have compiled and analyzed data from the continuous GPS stations on both sides of the Pyrenees and adjacent regions. In our analysis we include more than 25 stations mainly from the Topo-Iberia, CATNET (ICC, Spain), ERGPS (IGN, Spain) and RGP (IGN, France) permanent GPS networks. The remaining stations belong to various regional and local networks. The GPS data were analyzed using GAMIT/GLOBK software from MIT employing a network mode, where all the stations (including IGS continuous GPS sites) are analyzed together and the ambiguities are resolved.

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