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Loading phenomena impact on velocity field computation in the Pyrenees from GPS campaigns

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The Pyrenees mountain range area presents a continuous and moderate seismic activity. To quantify the present-day tectonic deformation in this area, different GPS campaigns were performed between 1992 and 2008. Considering the expected rate of deformation of about 1 mm/yr, we analyze the impact of the different parameters used for the data processing on velocity field computed from these sparse GPS campaigns. In particular in this study, we focus on the impact of the different loading effects. Indeed, atmospheric, oceanic, and hydrological loading phenomena due to mass redistributions can induce crustal deformations up to several centimetres of amplitude with different time periods (annual, semi-annual, diurnal, sub-diurnal…). Moreover, the studied area located between the Atlantic Ocean and the Mediterranean Sea, with high relief may be particularly sensitive to such effects.
We demonstrated that the loading effects are far from being negligible on the velocity estimates and therefore on the characterization of the deformation since the accumulated loading effect (except tidal ocean load) is at the same level than the expected displacements.