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Evaluation of parametric post-seismic models and application in reference frame determination

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During the past decade, many earthquakes have caused crustal deformations and mo-ved geodetic stations from few millimeters to several meters, inducing slow transient motions, called post-seismic deformations. These relaxation effects may last for several decade, and cannot be accurately modeled by piece-wise linear functions currently operated in the International Terrestrial Reference Frame (ITRF). Therefore it becomes essential to properly handle these seismic deformations which affect the stations of the ITRF if we want to improve its accuracy and its stability.
We investigate various parametric post-seismic models, using logarithmic or exponenti-al functions to predict the behavior of geodetic stations affected by an earthquake. Their parameters are fitted by an iterative least squares method using GPS position ti-me series after the earthquakes. Although these models reflect a relaxation mechanism in its most simplistic form, we evaluate their ability to estimate post-seismic deformations over earthquakes that show different seismic mechanics and different intensities. The agreement between data and these models is predictably better than using piece-wise linear functions. We outline next the limits of these models, particularly their sensitivity to the observation time-span after an earthquake and to local effects. Finally, we discuss strategies to incorporate these parametric models in reference frame determination when they are accurate enough.