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A new GPS velocity field from Central Peru to northern Ecuador

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Fast subduction of the oceanic Nazca plate beneath the South American continent induces large earthquakes with a characteristic repeat time of 100-150 years in Chile and southern Peru (Comte and Pardo, 1991; Dorbath, et al., 1990; Nishenko, 1991). Previous studies of the interseismic deformation along the Andes subduction using GPS and/or InSAR have shown a current significant level of locking of the interplate interface all along the margin. However, the overall picture is still missing information from the latitude 10°S (north of Lima) to 2°S (north of Guayaquil, Ecuador). In that area, no large earthquake has been recorded for the last three centuries (Dorbath et al., 1990, Kelleher, 1972), suggesting on one hand that this portion may be freely aseismically slipping. On the other hand, the factors usually assumed to control the level of locking (convergence rate, age of the ocean floor, presence of sediments along the trench, Ruff and Tichelaar, 1996) are not very different from the adjacent segments where large earthquakes have occurred in the past. The question posed is: has the plate interface accumulated large stress during the last centuries possibly triggering a giant earthquake in the next years or is it aseismically sleeping? We present new GPS results for northern Peru resulting from a combination of survey-mode GPS and continuous GPS to answer this question. Our solution spans the 2007-2010 period, and includes CGPS sites from the LISN project (http://jro.igp.gob.pe/lisn/) dedicated to the monitoring of the ionosphere, from the ADN project and IGS global stations. We first assess the quality of our time series and discuss the uncertainty of velocity estimates after 2-3 years of data. We first note that obtained repeatabilities strongly depend on the type of monumentation and equipment, reaching 7 mm for the horizontal components and 15 mm for the vertical for sites from the LISN network. Nonetheless, for velocity estimates, the agreement with sites showing best repeatabilities are usually within 1-3 mm/yr. At this level of precision, low coupling is found from central Peru at about lat 8°S to the border with Ecuador. Very high coupling is found further south around Lima. We will present preliminary models of coupling based on these results.