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^{10}Be and ^{26}Al dating of marine terraces to quantify the uplift of Peruvian and Chilean costal areas

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Along most of the Southern Peru and Northern Chilean coasts, discontinuous uplifts are recorded by marine terraces and marine abrasion surfaces; they have thus preserved a record of eustatic sea level changes and the uplift history of the coastal area in the Andean forearc. One approach to study the tectonic history of the Andean forearc is to identify its effects in marine sedimentation or erosion patterns along the coastal area. To investigate these processes, the Neogene marine formations are studied in various coastal sections either in southern Peru or in Chile, in order to sample possibly different response of the continental plate to the subduction process. Differential GPS and cosmogenic datations (^{10}Be and ^{26}Al) are pursued to propose thorough ages on these sites and subtract the effects of eustatic sea-level changes from local curves, identifying tectonic uplifts. We chose this method in order to obtain absolute ages for each sampled terrace and because it is under application and calibration in the southern Peru on alluvial terraces (Hall et al., 2006, submitted). ^{10}Be and ^{26}Al samples analyses in laboratory (with the collaboration of the UCSC and the Lawrence Livermore National Laboratory, USA) are still under way but already gave determinant ages. Indeed, there are four observable terraces along the Chilean coast (+7 m, +40 m, +184 m et +370 m), all of which we have sampled. We obtained an average age for two of them: 231 Ka +/- 14,9 for the +40 m terrace and 330 Ka +/- 1,34 for the +184 m one. So the +40 m terrace corresponds to the 7^{th} isotopic stage and the +184 m terrace corresponds to

the 9^{th} isotopic stage, which is younger than predicted by previous authors (Ota et al, 1995). We can thus expect that the 5^{th} isotopic stage corresponds to the +7 m terrace and the 11^{th} isotopic stage to the +370 m terrace. This hypothesis will be confirmed by the very next analyses. The terrace of the 5^{th} isotopic stage is lower and less developed than waited. The uplift rate is not constant: we calculated an uplift rate of 0.63mm/y between 330Ka et 231Ka and of 0.15mm/y since 231 Ka. So the uplift rate for the Chilean forearc is decreasing since 330 Ka at least. Marine surfaces formation results from the interaction of eustatism and regional tectonic effects in the coastal zone. Eustatism alone cannot explain the present-day surface elevation. The fact that we observe marine surfaces north and south of the Arica bend shows that the subduction plane geometry is not directly responsible for the coastal uplift. The phenomenon that could explain the tectonic affecting the Peruvian and Chilean coasts may be either the underplating below the continental plate (Lallemand et al., 1994; Adam and Reuther, 2000), resulting in the formation of normal faults and in uplift or coseismic vertical motions, as observed in coralline algae records in the Antofagasta area (around 23˚40'S, Ortlieb et al., 1996c), and the uplift of emerged marine platforms and of the coastal cliff along the Chilean coast (Marquardt et al., 2004; Quezada et al., 2005).