Geophysical Research Abstracts, Vol. 8, 05825, 2006
SRef-ID: 1607-7962/gra/EGU06-A-05825

Seismicity of passive margins

F. Deschamps (1), O. Dauteuil (1), D. Rouby (1), A. Mocquet (2), O. Bourgeois (2)

(1) Géosciences Rennes, France, (2) Laboratoire de Planétologie et de Géodynamique de Nantes, France, (francois.deschamps@univ-rennes1.fr - fax: 00 33 223 236 100)

The high level seismic zone are largely studied because they represent an important natural hazard and often fit with plate boundaries. However, it exist significant intraplate seismicity in some areas notably the passive margins that correspond to the transition between continental and ocean lithospheres. Various processes have been proposed to explain long terms deformation affecting the structures. Four main processes can be distinguished: an isostatic response due a loading/unloading (ice, sediment accumulation or removal), regional thermal adjustments, regional compression, or ridge-push. These processes may interact generating time and space variation of the deformation. Some of them are either ubiquitous as the ridge-push or more local, and may explain the pattern variability or the margins.

We focus our analysis about the earthquake distribution to constrain the pertinent geodynamic parameters of the recent deformation of the passive margins. The data come from IRIS seismic data Centre. This work bears on the margins of Norway, North-East America, South America, Western Africa, India and Australia. The magnitude and the amount of the earthquakes are small explaining why it is poorly studied. To alleviate this problem, the seismic energy was estimated in boxes of 1degree-side. Synthetic sections have been processed perpendicular to the margins included the earthquakes projected along this line, the shape of the post-break-up sediment deposits, and the present-day topography. The sections and the distribution map highlights that the earthquake are mainly localised on a coastal band of some hundreds kilometres. Few earthquakes are present on the oceanic part, except in the case of South America. The coastal band fits very often to an elevated belt (up to 1800 m). This is observed on margins of Norway, North America and of Western Africa. However, it is more diffuse on South America and India. The earthquake density is very variable depending on the margin: the most active is the Norway, while the most quiet is the South America. Few

earthquakes affect the marginal basins. A two other peaks of earthquakes having a significant cumulative energy appears more or less far away the first one: one close to the ocean-continent boundary, and the second inside the continent, at a various distance.

This work points out that at passive margin: 1) the continent is more deformed and so weaker than the ocean part, (2) that the coastal reliefs are seismically active and thus appear dynamically maintained, (3) the wide range of earthquake distribution imposes that the regional geodynamic context associated to mechanical state of the lithosphere largely control the deformation pattern of the passive margin.