Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06948, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06948
EGU General Assembly 2008

Identification of seismic sequences along the northern part of the Mid-Atlantic Ridge (12ºN - 54ºN) using regional hydrophone arrays

N. Simão (1), J. Haxel (2), J. Goslin (1), R. Dziak (2), M. Cannat (3) and D. Bohnenstiehl (4)

(1) IUEM /CNRS Domaines Océaniques, UBO, France, (2) CIMRS, NOAA/Oregon State University, USA, (3) IPGP/CNRS Géosciences Marines, France, (4) MEAS, North Carolina State University, USA. (nuno.simao@univ-brest.fr)

In this study, eight distinct mainshock-aftershock sequences of earthquakes were identified along the northern Middle Atlantic Ridge (12ºN - 54ºN) using Autonomous Hydrophone arrays. We fit the Modified Omori Law to each of the sequences obtaining a range of p-values between 0.8 and 2.7 that we joined with previous MAR sequences analyzed by other authors. Seven of the sequences had p-values bigger than 1.2 while six had p-values smaller than 1.2, illustrating how crustal strength along the Middle Atlantic Ridge can be both highly fragile, where the strain rate release is slow, and in other areas more ductile, with rapid strain rate release. Comparing the spatial distributions of the sequences along the segments and the p-value we suggest that there is slow and fast strain rate release both at segment centre and at segment ends. Also there is no correlation between the p-values of the sequences and the Mantle Bouguer Anomaly. This implies that strain rate release along the Middle Atlantic ridge is independent of the position of the fault within the ridge segmentation and also independent of the broad wavelength measure of density in the crust. The analysis of the Modified Omori Law goodness of fit for these sequences shows that all of the sequences are well described near their onset, yet shortly thereafter a few of them depart from the Modified Omori Law distribution suggesting complex failure dynamics within the local crust. The way in which strain is released and crustal failure occurs suggests that the failure limit and tectonic stresses along slow spreading ridges strongly depend on local conditions affected by crustal heterogeneity, faulting geometry, tectonic activity during ongoing magmatic regime and hydrothermal circulation. The Gutenberg-Richter frequency-magnitude relationship analysis shows that the sequences with low angle ($\sim\leq 30$) fault mechanisms, generally associated with detachment faults, have b-values equal 0.08 and that the bigger angle slightly oblique fault mechanisms diverge to other values. Despite the small number of sequences, this result suggests a dependency of the b-value computed using T-phase acoustic Source Level with the source mechanism. These new insights into the Middle Atlantic Ridge faulting highlight the complexity of the processes occurring at slow spreading ridges and the usefulness of Autonomous Hydrophone arrays.