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Contribution of hydroacoustic data to long-term seismicity studies along then northern MAR.

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The seismicity of the northern Atlantic Ocean, surrounded the MoMAR area has been recorded successively by the MARCHE array from 2005-2008 and the HYDROMOMAR array from 2010 to 2011 and from 2012 to 2014 (32˚ to 39˚N). These arrays are composed of autonomous underwater hydrophones moored within the SOFAR channel on the flanks of the Mid-Atlantic Ridge (MAR). The low attenuation properties of the SOFAR channel for earthquake T-wave propagation result in a detection threshold reduction from a magnitude completeness level (Mc) of ∼4 for MAR events recorded by the land-based seismic networks to Mc=2.3 using these hydrophone arrays. 14715 events were located and constitute a 6-year catalog of seismicity around the MoMAR area.

At large scales, seismicity rates show high values between the Pico and Oceanographer discontinuities mainly at segments presenting a symmetric mode of accretion where magmatic processes are dominant (Dziak et al., 2004; Giusti et al., 2018). On the contrary, from the Oceanographer to the Atlantis transform faults, the high seismicity rates are related to the asymmetric mode of accretion associated with detachment faults (Escartín et al., 2008). This seismicity rate difference traduces a difference in the mantle dynamics, probably due to the vicinity of the Azores hot spot. The spatial distribution of the numbers of events per 50 km length of MAR enables us to determine the south limit of the hotspot at 35˚ 40'N.

A cluster analysis were performed and we characterised the processes that generate these clusters in terms of swarms (magmatic episode) or in terms of sequences (tectonic episode). No tectonic sequence reflecting a detachment fault mechanism is identified in the northern part of the hydrophone array and swarms are mainly generated in symmetric or indeterminate areas.

For the moment, we are not able to conclude about a seismic cycle in this area as these hydrophone arrays recorded continuously during three years only. Teleseismic data with the ISC catalog offer a great period of observations (∼50 years) but it is still unsufficient to define a recurrence of the processes around the MoMAR area.

This study illustrates the potential of hydrophone data to monitor segment-scale ridge processes in the MoMAR area. The HYDROMOMAR project will end in 2020 and will permit us to build a 8 consecutive year catalog, that may allow us to better characterise the seismic cycle and confirm these preliminary observations.

- Dziak, R. P., Smith, D. K., Bohnenstiehl, D. R., Fox, C. G., Desbruyeres, D., Matsumoto, H. & Fornari, D. J. (2004). Evidence of a recent magma dike intrusion at the slow spreading Lucky Strike segment, Mid-Atlantic Ridge. J. Geophys. Res., 109.

- Escartín, J., Smith, D. K., Cann, J., Schouten, H., Langmuir, C. H., & Escrig, S. (2008). Central role of detachment faults in accretion of slow-spreading oceanic lithosphere. Nature, 455(7214), 790.

- Giusti, M., Perrot, J., Dziak, R. P., Sukhovich, A., and Maia, M. (2018). The august 2010 ear- thquake swarm at north famous-famous segments, mid-atlantic ridge : Geophysical evi- dence of dike intrusion. Geophys. J. Int.