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Analysis of the low-level seismicity along the Southern Indian Ocean spreading ridges recorded by the OHASISBIO array of hydrophones in 2012

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Arrays of autonomous hydrophones (AUHs) proved to be a very valuable tool for monitoring the seismic activity of mid-ocean ridges. AUHs take advantage of the ocean acoustic properties to detect many low-magnitude underwater earthquakes undetected by land-based stations. This allows for a significant improvement in the magnitude completeness level of seismic catalogs in remote oceanic areas. This study presents some results from the deployment of the OHASISBIO array comprising 7 AUHs deployed in the southern Indian Ocean. The source of acoustic events, i.e. site where - conversion from seismic to acoustic waves occur and proxy to epicenters for shallow earthquakes – can be precisely located within few km, inside the AUH array. The distribution of the uncertainties in the locations and time-origins shows that the OHASISBIO array reliably covers a wide region encompassing the Indian Ocean triple junction and large extent of the three mid-oceanic Indian spreading ridges, from 52°E to 80°E and from 25°S to 40°S. During its one year long deployment in 2012 and in this area the AUH array recorded 1670 events, while, for the same period, land-based networks only detected 470 events. A comparison of the background seismicity along the South-east (SEIR) and South-west (SWIR) Indian ridges suggests that the microseismicity, even over a year period, could be representative of the steady-state of stress along the SEIR and SWIR; this conclusion is based on very high Spearman's correlations between our one-year long AUH catalog and teleseismic catalogs over nearly 40 years. Seismicity along the ultra-slow spreading SWIR is regularly distributed in space and time, along spreading segments and transform faults, whereas the intermediate spreading SEIR diplays clusters of events in the vicinity of some transform faults or near specific geological structures such as the St-Paul and Amsterdam hotspot. A majority of these clusters seem to be related to magmatic processes, such as dyke intrusion or propagation. The analysis of mainshock-aftershock sequences reveals that flew clusters fit a modified Omori law, non-withstanding of their location (on transform faults or not), reflecting complex rupture mechanisms along both spreading ridges.