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Monitoring of Tropical Cyclones using Seismic and Infrasonic stations surrounding the South-Western Indian Ocean.

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In the South-West Indian Ocean, tropical cyclones occur every year from December to April. As they move over the ocean, cyclones generate strong swells that may represent large sources of microseismic noise (secondary peak, in the frequency band of 0.1-0.35 Hz) and infrasound noise (microbaroms at around 0.2 Hz). A dominant source of noise in the oceans is indeed generated by standing waves, issued from the interaction of two swells of similar periods propagating in opposite directions. Such standing wave generate pressure variations through the water column down to the ocean floor, and create seismic waves that propagate as surface waves (Rayleigh waves) in the oceanic crust and that may be recorded by seismic stations, even at large distance (Longuet-Higgins, 1950). In the meantime, these stationary waves generate microbaroms' sources that travel in the atmosphere and that are well recorded by infrasound stations (Benioff & Butenberg, 1939; Posmentier, 1967). We combined these two independent observables of stationary waves for tracking Bingiza tropical storm (February 2011). We used seismic stations from the Volcano Observatory of the Piton de la Fournaise (OVPF) on La Réunion Island and IMS infrasound data from CTBTO. The azimuths of the secondary microseismic source regions in the ocean basin are determined by polarization analyses (Schimmel et al., 2012) in the time-frequency domain. The microbarom sources are analyzed with WinPMCC4.3 software (CEA/DASE2010) based on Progressive Multi-Channel Correlation Method (Cansi, 1995). As result, during the passage of Bingiza cyclone, we observed a clear signature in both seismic and infrasound noise sources that show good agreement with the cyclone track.