

Microseismicity around Orca submarine volcano, Bransfield Strait, Antarctica, during 2019-2020 from OBS data

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Abstract

Orca seamount is located in the Bransfield Strait, between the South Shetland Islands and the Antarctic Peninsula. The volcano developed on an extensional rift produced by a combination of slab rollback at the South Shetland trench and transtensional motions between the Scotia and Antarctic plates. From January 2019 to February 2020, the BRAVOSEIS project deployed a dense amphibious seismic network in the Bransfield region, comprising both land and ocean bottom seismometers (OBS), as well as moored hydrophones. We perform an analysis of the seismicity recorded in the area of Orca volcano using a subnetwork composed of 15 OBS around Orca seamount and its SW rift, covering a region of about 20 km x 10 km, with inter-station distances of ~4 km. OBS data are organized, visualized and analyzed using the SEISAN software package. Earthquake detection was achieved through an STA/LTA algorithm. We use a visual procedure including spectral analysis and filtering to discriminate local earthquakes from other types of signals. For earthquake location, we use P and S phase arrivals and a layered model derived from previous geophysical studies in the region. In this way, we identify and locate around 3000 earthquakes with magnitudes in the range from -1 to 3. There is a continuous background level of microearthquake activity, although a large part of the earthquakes occurred during a swarm in June-July 2019. Source depths are mostly concentrated in the first 10 km (within the crust). The epicentral distribution covers the whole area around the volcano, but it is clearly densest in the NE flank, where an intense seismic series started in September 2020.

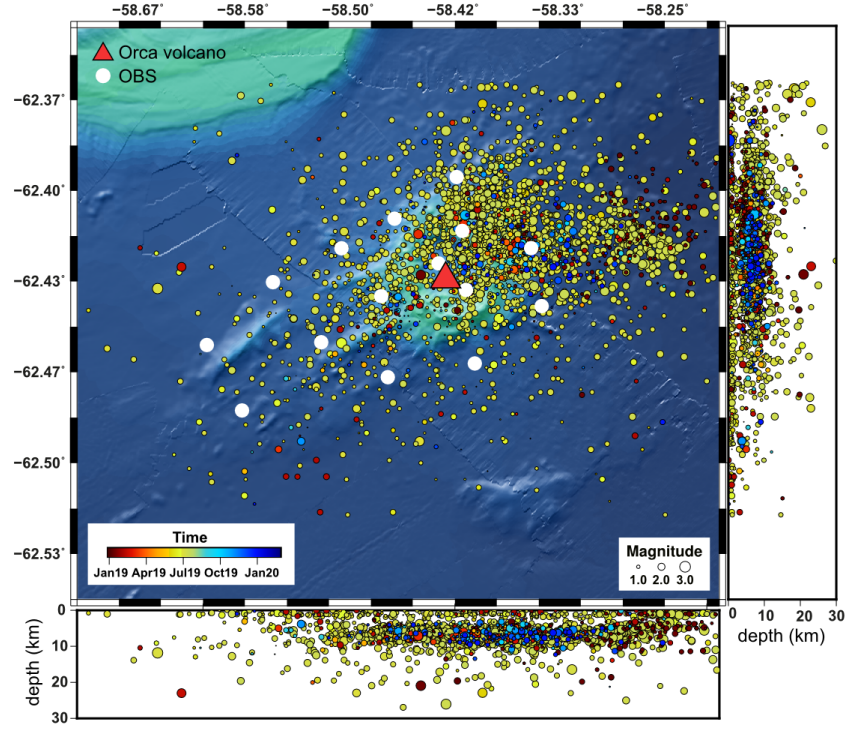
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