



Seismic swarm at Bransfield Basin, South Shetland Islands (Antarctica)

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Abstract

A seismic swarm began on August 26, 2020 in the Bransfield Basin (South Shetland Islands-Antarctica). The King George Island is part of the South Shetland microplate situated in a complex tectonic context (to the North, East, West and South the South Shetland - Phoenix subduction zone, the Shackleton and Hero fracture zones, and the Bransfield back-arc basin are located). The Observatorio Geofísico del Uruguay has installed since March 2020 a seismological station (raspberry-shake 3D, AM.R4DE2) at the Artigas Antarctic Scientific Base (BCAA: -62.1802, -58.8853). The station was operating from March 8 to 13 and began recording again on August 8, 2020. The only months that have been able to be reviewed in their entirety have been August 2020 and January 2021. Additionally, due to the existence of some gaps (time without data), not all earthquakes were recorded in the seismograms, this could be the product of instrumental errors or data transmission system lapses through the internet. The seismic records were parameterized by their waveform and S-P arrival times. The seismic source distance was calculated according to the arrival times of the P and S phases using the Bransfield basin velocity model proposed by Robertson et al. (2003) recalculated in Loureiro Olivet et al. (2021 under review) who obtained a value of 6.11 km/s for V_p and 6.55 for the Omori coefficient. The epicentral distance and depth were calculated considering the angle of incidence of the P wave obtained from particle motion analysis and the hypocentral distance. The angle of incidence was calculated using the formula of Wiechert (1907). For the localization we use single station observations which require the calculation of the backazimuth for which the amplitudes of the first P wave were considered. From this seismic swarm, 5652 events have been parameterized to date, of which 815 present $M_L \geq 4$. From the 5652 events reviewed manually, 757 correspond to August, 3119 to September, 222 to October, 569 to November, 290 to December, 206 to January, 152 to February, 27 to March, 268 to April and 42 to May. From the 815 earthquakes of $M_L \geq 4$, 49 correspond to August, 217 to September, 78 to October, 218 to November, 47 to December, 65 to January, 33 to February, 8 to March, 85 to April and 15 to May. The average depth obtained is approximately 11 km while the epicentral distance is ca. 25 km. According to the epicentral location, most of the seismic events occur in the upper plate being related to the movement of active normal faults of ENE attitude that limit the Bransfield basin. In addition, epicenters near surface faults with NNW directions have been recorded within King George Island and near the NNW Artigas fault, which limits two blocks of different cortical thickness within the South Shetland microplate. Also, some events have been located near the caldera of the Orca volcano in the Bransfield basin.

References

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