International Journal of Earth Sciences Knowledge and Applications
www.ijeska.com

Short Communication

e-ISSN: 2687-5993

Recent Seismic Activity at Bransfield Strait, Antarctica

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INFORMATION

Article history
Received 29 January 2021
Revised 17 February 2021
Accepted 18 February 2021
Available 15 March 2021

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1. Introduction

Unusual and important seismic activity was recorded between the end of August 2020 and the end of January 2021, at Bransfield Strait, Antarctica (Fig. 1).

First of all, about 60 earthquakes of moderate to strong magnitudes, on average around Mw=5.0 Richter scale, and a hundred aftershocks of moderate intensity were registered in the vicinity of Carlini Base (ex Jubany), located at King Geoge Island (South Shetlan Islands, Antarctica).

The swarm of epicenters was located around an underwater volcanic shield, which culminates in a crater, also underwater, called "Orca Seamount", which is located at the bottom of Bransfield Strait, at about 1,500 m deep and 26 km SSW from Carlini Station (Arg.) (Fig. 2).

The relatively moderate magnitude of the seismic events and the shallow depth (at a maximum of 10 km below seabed) of their hypocenters, all located around the submarine volcano, indicate that tectonic activity is closely related to magmatic processes.

Bransfiel Strait separates South Shetland Islands from the Antarctic Peninsula and represents the opening of an extensive marine basin, named Bransfield Basin. The recorded seismic activity suggests that the basin opening process is still active and continues generating active basalt-type volcanism, for example at Deception, Penguin and Bridgeman islands (Fig. 1), with the consequent rise of magma that produces hydrothermal activity, such as that recorded at the vicinity of submarine volcanoes Orca and Wordie (Fig. 2).

Seismic activity and temperature anomalies together with the presence of thermophilic microorganisms detected in the

seawater around the Orca Seamount (Rodrigo et al., 2018), indicate that volcanic activity it is still active (Fig. 2). Its crater is about 3 km wide and 500 m high over the seabed of Bransfield Strait (Fig. 3). The significant seismic activity recorded in the vicinity of Carlini Station, for example recorded from the JUBA Seismographic Observatory (JUBA Seismographic Observatory of the Argentinean-Italian Antarctic Seismographic Network ASAIN) on November 10, 2020 (Fig. 4), complements other seismic events observed along the South Shetland Islands and it becomes so relevant because such important seismic activity is rarely recorded within the Antarctic Plate. The huge weight of the ice, several billion tons, would largely prevent major tectonic movements from occurring within the Antarctic Plate, except at its limits and on the Scotia and South Sandwich plates (Fig. 1) where most of the seismic events are recorded in global seismographic observatories.

The seismic events described above took place mainly between August 28 and January 2, 2021 and after an interval of relative calm of about twenty days, they occurred again between January 23 and 29, 2021, this time focused on the Wordie Seamount, also located at bottom of Bransfield Strait, but at about 170 Km to the E of King George Island and 55 Km southward from Elephant Island (Figs. 1 and 2). This new series of seismic events began on January 23, 2021 with an earthquake of Mw = 6.9, which aroused alarm of tsunami due to its high magnitude, followed by a series of aftershocks of Mw between 5.5 and 4.7, always on Richter scale.

Both tectonic-volcanic events are related to magmatic activity in the interior of Bransfield Basin.

2. Epigraphs of the Figures

Fig. 1: Schematic map showing the location of King George Island within the group of South Shetland Islands, at Brnsfield Strait, in the context of the extreme northwest of the Antarctic Peninsula and in relation to the southern extreme of South America. The boundaries of the Antarctic, Scotia and South Sandwich plates are also shown. 1: Deception Island, 2: Penguin Island, 3: Bridgeman Island, 4: Wordie Seamount.

Fig. 2: Schematic map which shows the underwater morphology of Bransfield Strait with the location of the Orca and Wordie seamounts (Modified from Google Earth Pro, image date 12/13/2015). Epicenters 1 and 2: August 28th, 2020 to January 02nd, 2021. Epicenters 3: January 23rd to 27th, 2021. Data taken from the (ASAIN NETWORK, 2021) (URL1, 2021).

Fig. 3: Three-dimensional diagram of Orca Seamount. Modified from Hannes Grobe/AWI. Own work, CC BY 3.0. Bathymetric mapping of Orca Seamount, mapped with swath sonar system of RV Polarstern during cruise (ANT-XI/3, 1994).

Fig. 4: Seismogram recorded on 2020/11/10 at the JUBA Seismographic Station (Carlini Satation, Arg.) in relation to the Orca Seamount.

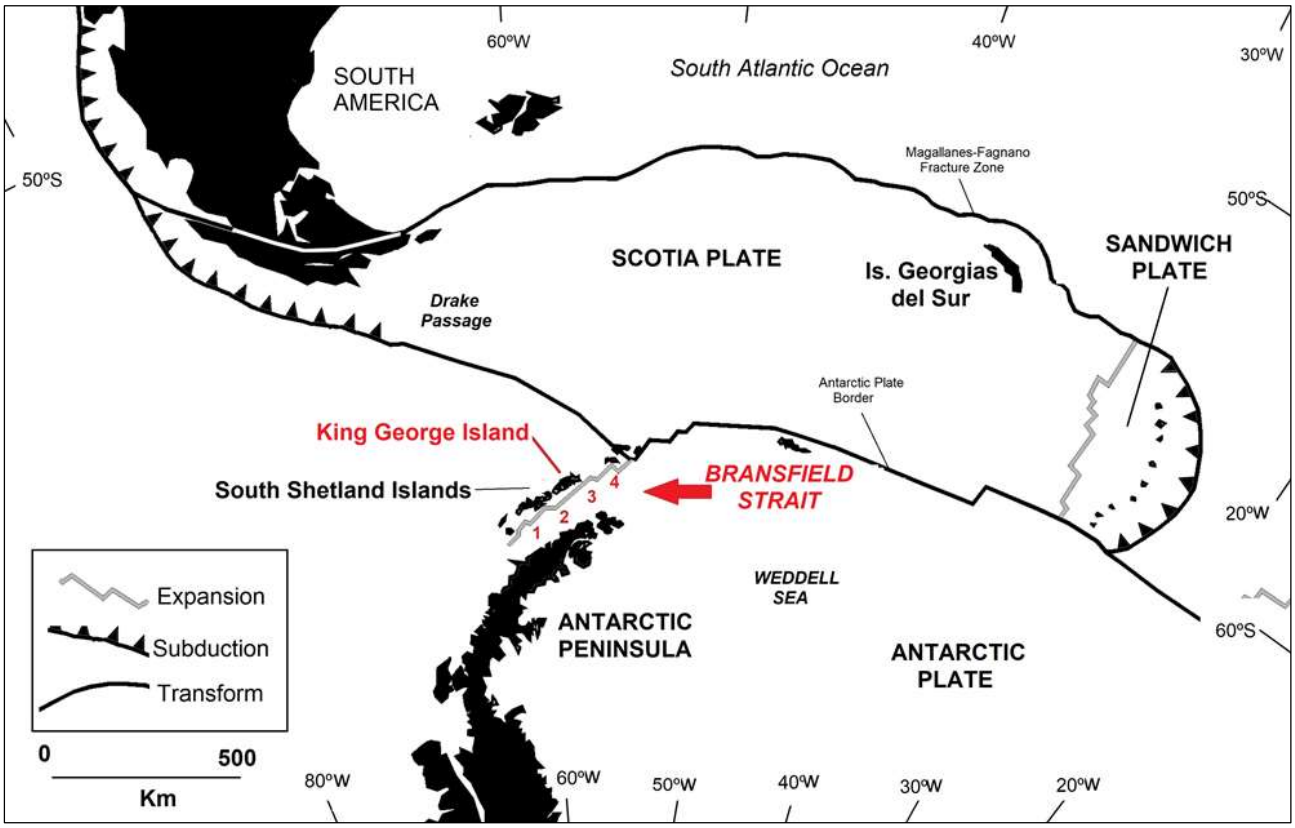

Fig. 1. Schematic map of King George Island within the group of South Shetland Islands

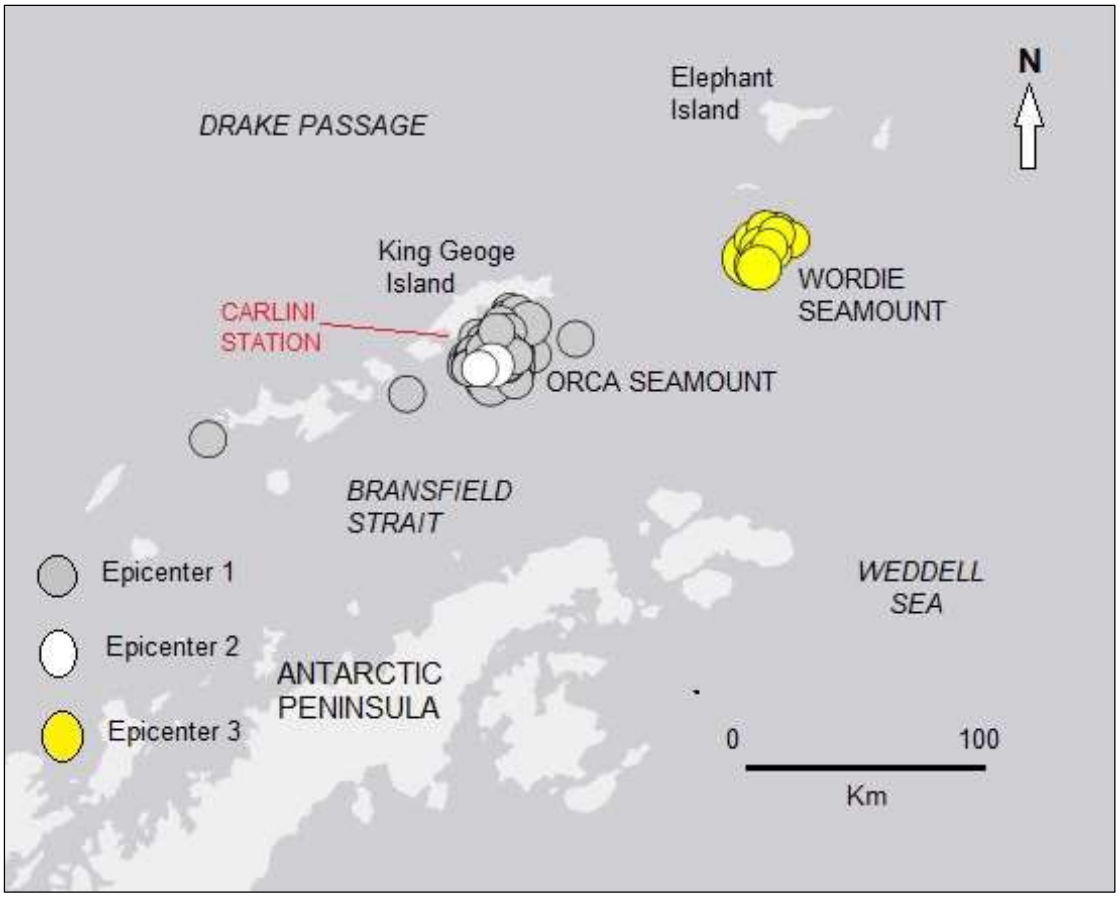

Fig. 2. Schematic map of underwater morphology of Bransfield Strait with the location of the Orca and Wordie seamounts

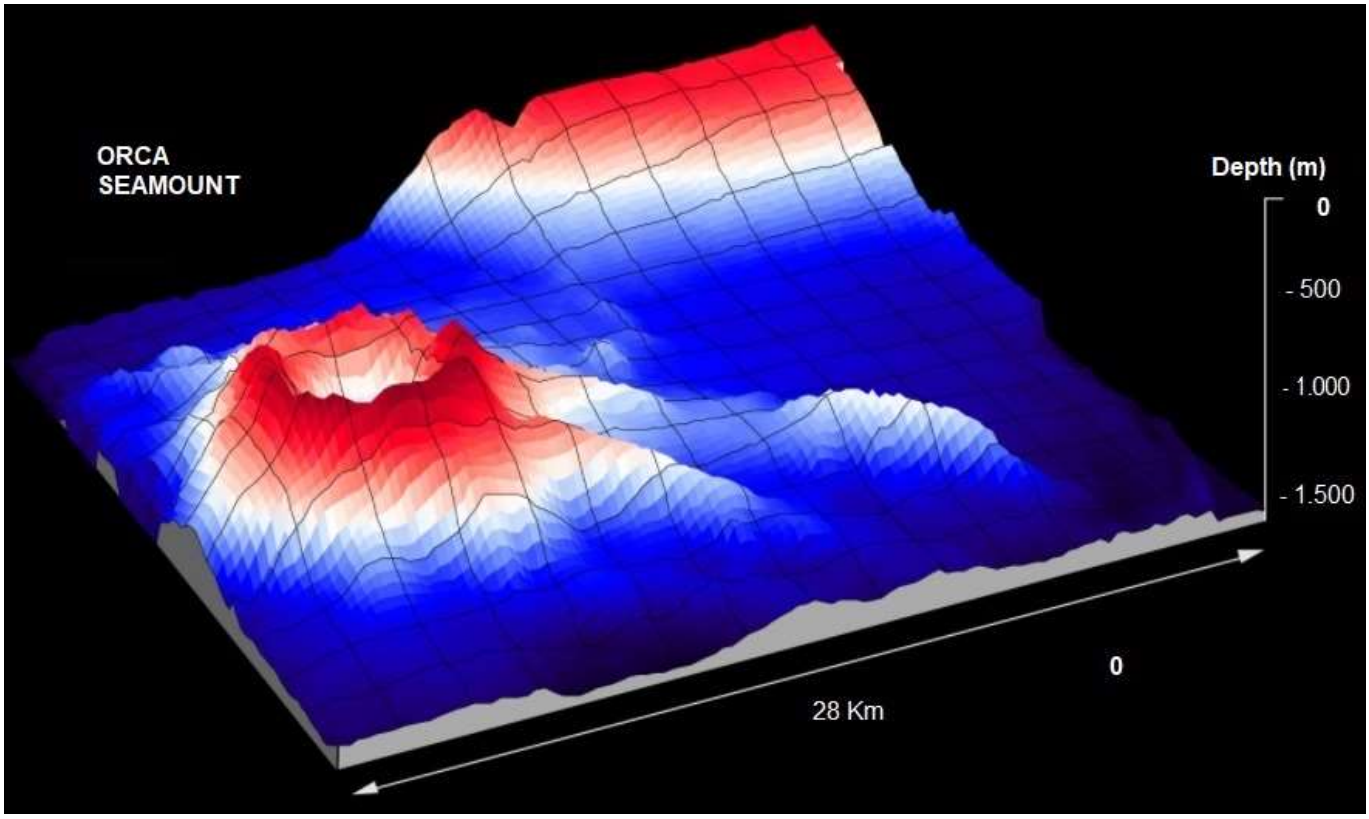

Fig. 3. Three-dimensional diagram of Orca Seamount

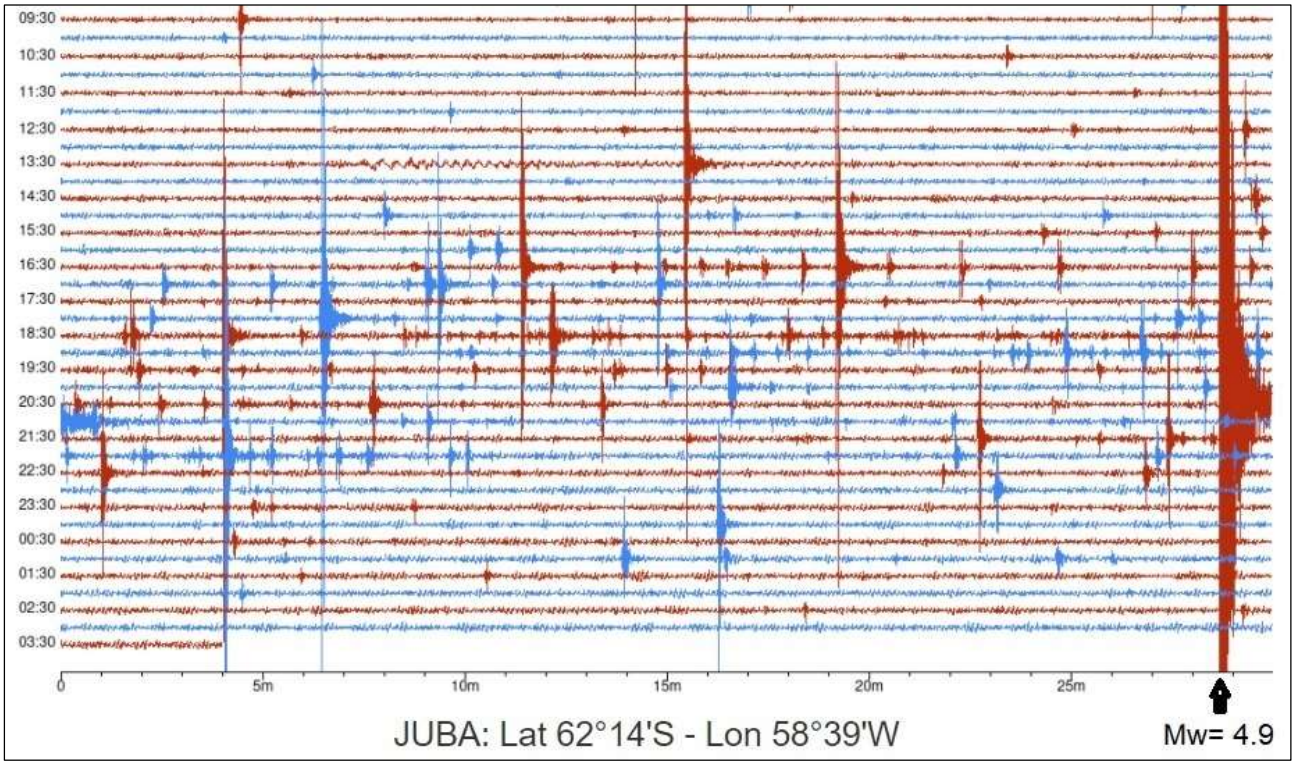

Fig. 4. Seismogram image (Carlini Satation, Arg.)

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ASAIN NETWORK, 2021. Available at: http://www.crs.inogs.it/asain/ and USGS: https://earthquake.usgs.gov/earthquakes/map/.

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