



Update on the field plan 2018-2019 for Project BRAVOSEIS

Project title: Seismological study of the submarine volcanoes of the Bransfield Strait, Antarctica: geodynamic environment, structure and dynamics
Acronym: BRAVOSEIS
Reference: CTM2016-77315-R
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Institution: University of Granada

The BRAVOSEIS project 2017-2020 is based on field activities in Antarctica during three surveys. In the original proposal they were:

- Leg 1 (2017-2018 survey): deployment of 18 land stations, 2 seismic arrays, and 6 hydrophones
- Leg 2a (2018-2019 survey): deployment of 12 broadband OBS and 9 short-period OBS
- Leg 2b (2018-2019 survey): geophysics & seismic reflection profiles
- Leg 3 (2018-2019 survey): maintenance of land stations
- Leg 4 (2018-2019 survey): recovery of 9 short-period OBS
- Leg 5 (2019-2020 survey): recovery of 12 land stations, 2 seismic arrays, 6 hydrophones, and 12 broadband OBS

Proposed sources of instruments were University of Granada (land stations, arrays), GFZ (land stations), NOAA (hydrophones), AWI (broadband OBS), and UTM (short-period OBS). Geophysics and active seismic instruments are provided by UTM.

The first field survey (**Leg 1**, 2017-2018) has been already completed. We have had a time window of 14 days on-site, February 22 to March 7, 2018 (except for a few days that were dedicated to transport of research groups and service of the bases). However there are a few things that we must have into account:

- Due to an accident on March 2, 2018, our 2017-2018 field survey ended earlier than expected. We installed only 5 new land stations, and updated our 3 permanent stations already operating in the Bransfield Strait. The seismic arrays and 7 additional land stations that were to be deployed in the South Shetland Islands were not installed.
- The 6 hydrophones from NOAA were not yet available in October-November 2017, so we could not take them for deployment during the 2017-2018 survey as initially proposed. But they will be finally available for the 2018-2019 survey.
- An NSF project led by William Wilcock (University of Washington), that is parallel to our project, will contribute 15 short-period OBS from WHOI. These will substitute the 9 OBS from UTM, with the further advantage that they are long-term instruments. They will be recovered in the 2019-2020 survey, together with the broadband OBS and remaining instruments.

Therefore we need to update the field plan for the 2018-2019 survey. Taking into account the activities that we plan to do, we propose to rearrange the activities, and require three legs as in the original proposal, dedicated to:

Leg 2: Maintenance of the 8 seismic stations currently operating in the Bransfield Strait area, and deployment of the remaining 7 seismic stations and seismic array. Estimated number of participants: 4. Estimated time on-site: 8 days

ship movements = 2.5 days (600 nm at 10 kn)
deploy/service 15 stations = 2.5 days (4 hours per station)
deploy seismic array = 1 day
contingency = 2 days

Leg 3: Deployment of 12 broadband OBS, 15 short-period OBS, and 6 hydrophones. Estimated number of participants: 20. Estimated time on-site: 8 days

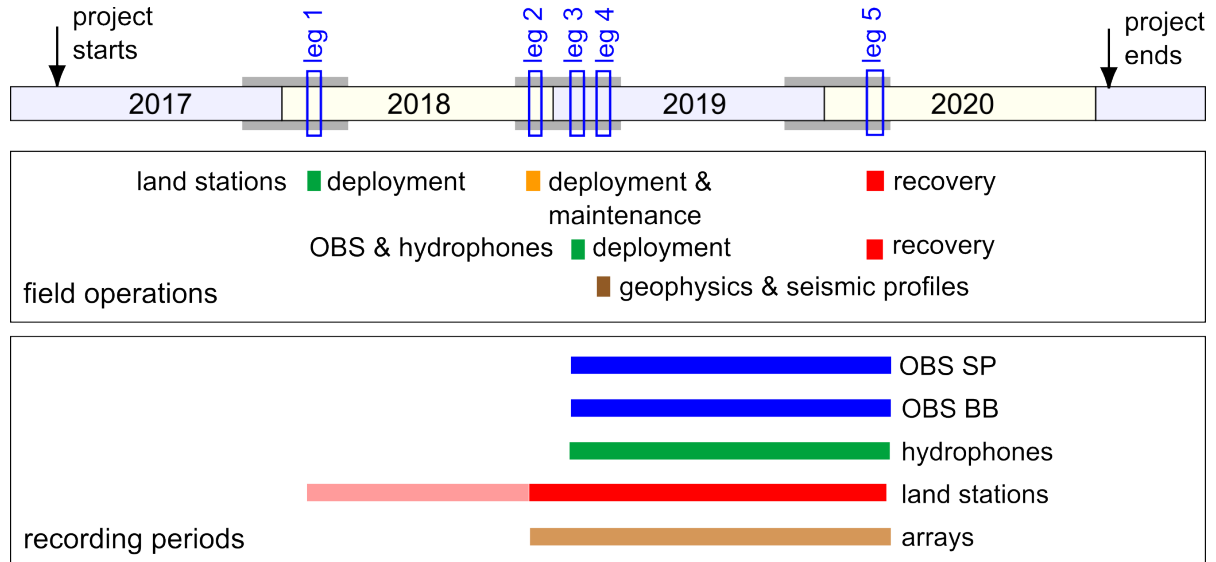
ship movements = 1.5 day (350 nm at 10 kn)
deploy 27 OBS = 3.5 days (3 hours per OBS)
deploy 6 hydrophones = 1 day (4 hours per hydrophone)
contingency = 2 days

Leg 4: Geophysics and seismic reflection profiles. Estimated number of participants: 14. Estimated time on-site: 19 days

deploy/recovery test = 2 days
across-axis lines = 9 days (50 profiles of 25 km, with 10 km turns, at 4.5 kn)
along-axis lines = 2.5 days (500 km at 4.5 kn)
tomography lines = 2.5 days (500 km at 4.5 kn)
contingency = 3 days

Additionally, **Leg 5** will take place in 2019-2020, to recover all instruments deployed: 15 land stations, 12 broadband OBS, 15 short-period OBS, 6 hydrophones.

An updated schedule of the field operations and recording periods of the instruments is displayed below.



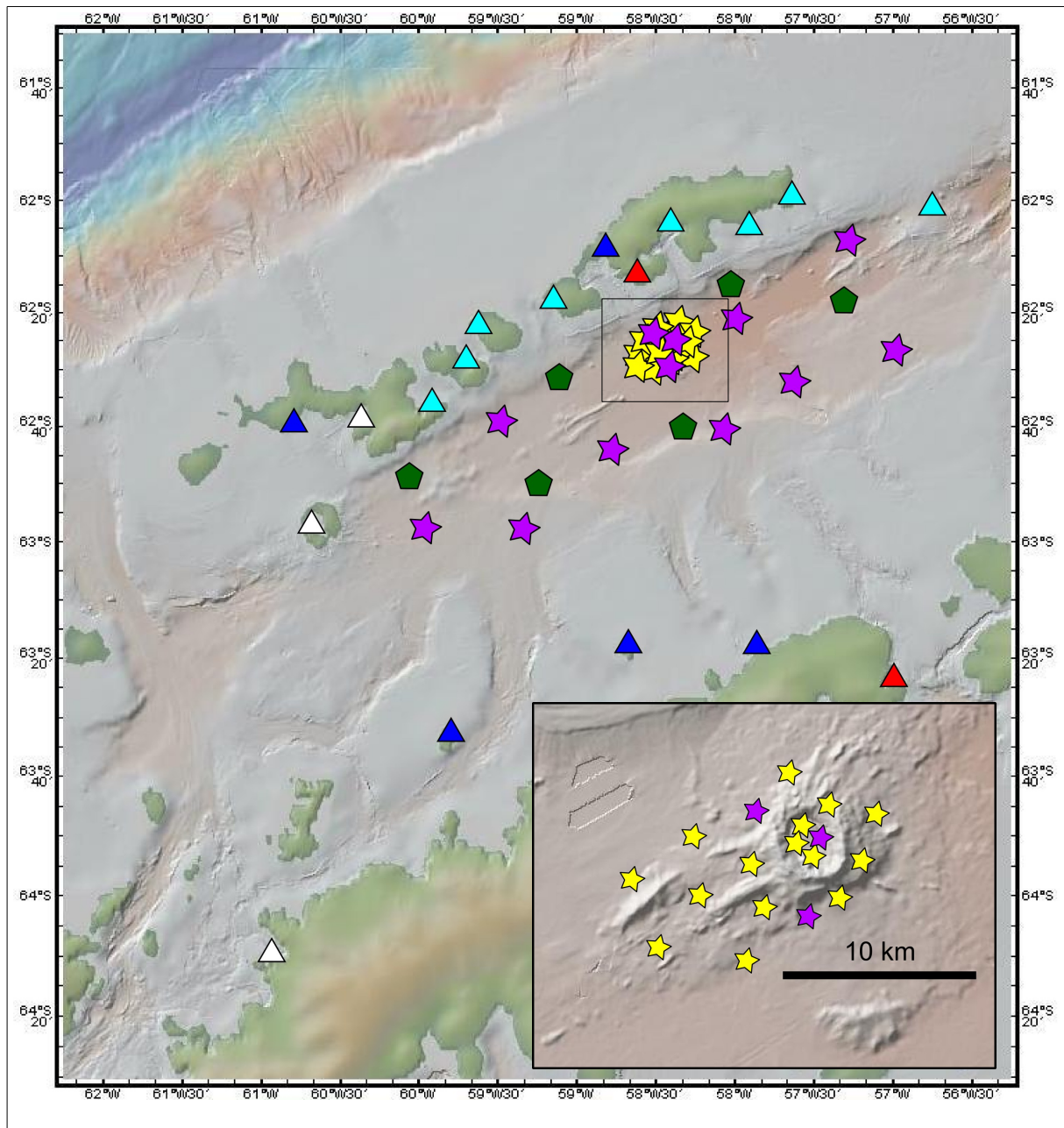
Leg 2 can be carried out early in the 2018-2019 survey (e.g. December 2018), if necessary.

Leg 3 should be scheduled after February 1, 2019. The US instruments are being currently used in another experiment, and this will ensure that they arrive to Punta Arenas in time for loading on the ship. The US logistics send all their equipment to Punta Arenas, so it is required that they should be loaded on board Hespérides from there. Therefore, Leg 3 should start from Punta Arenas. Once Leg 3 has finished, the empty container should stay on board until unloaded again in Punta Arenas. The same applies to Leg 5, that should end in Punta Arenas as well. It is also important that personnel can enter and/or leave the ship via King George Island, to shorten as much as possible the time that technicians are idle on board.

Leg 4 should be done last, after Legs 2 and 3, when all instruments are on site, so that they all record the airgun shots. In this Leg 4, we will use the marine geophysics instruments provided by UTM on board Hesperides: sediment profiler TOPAS 18 , multibeam Echo Sounder EM122 , Lockheed-Martin BGM-3 gravimeter , Marine Magnetics Sea Spy magnetometer , high-power airguns Sercel G.GUN II, BOLT 1900LL, and multichannel streamer Geometrics GeoEel. We request the support of UTM technicians, who are necessary to manage these instruments. The lines for seismic profiles in Leg 4 are basically the same as in the original project proposal, although some modifications could be put forward. Special care regarding the possible effect of airgun shots on marine mammals is encouraged, to comply with protocols in application in the US.

Legs 2 and 3 could be combined in a single leg. On the contrary, Legs 3 and 4 cannot be combined, given the large amount of gear required for each one of them. There should be a port between Leg 3 and Leg 4, to load/unload equipment.

The land stations locations for Leg 2 are the same as proposed for Leg 1 in the 2017-2018 survey. The OBS and hydrophone locations are still under discussion but there will be a regional deployment in the Bransfield Strait and at least one dense deployment around Orca volcano. A possible set up is shown below. Triangles are land stations (white permanent, red ASAIN, blue installed 2017-2018, cyan for pending deployments in 2018-2019); stars are OBS (magenta broadband, yellow short-period); and pentagons are hydrophones.



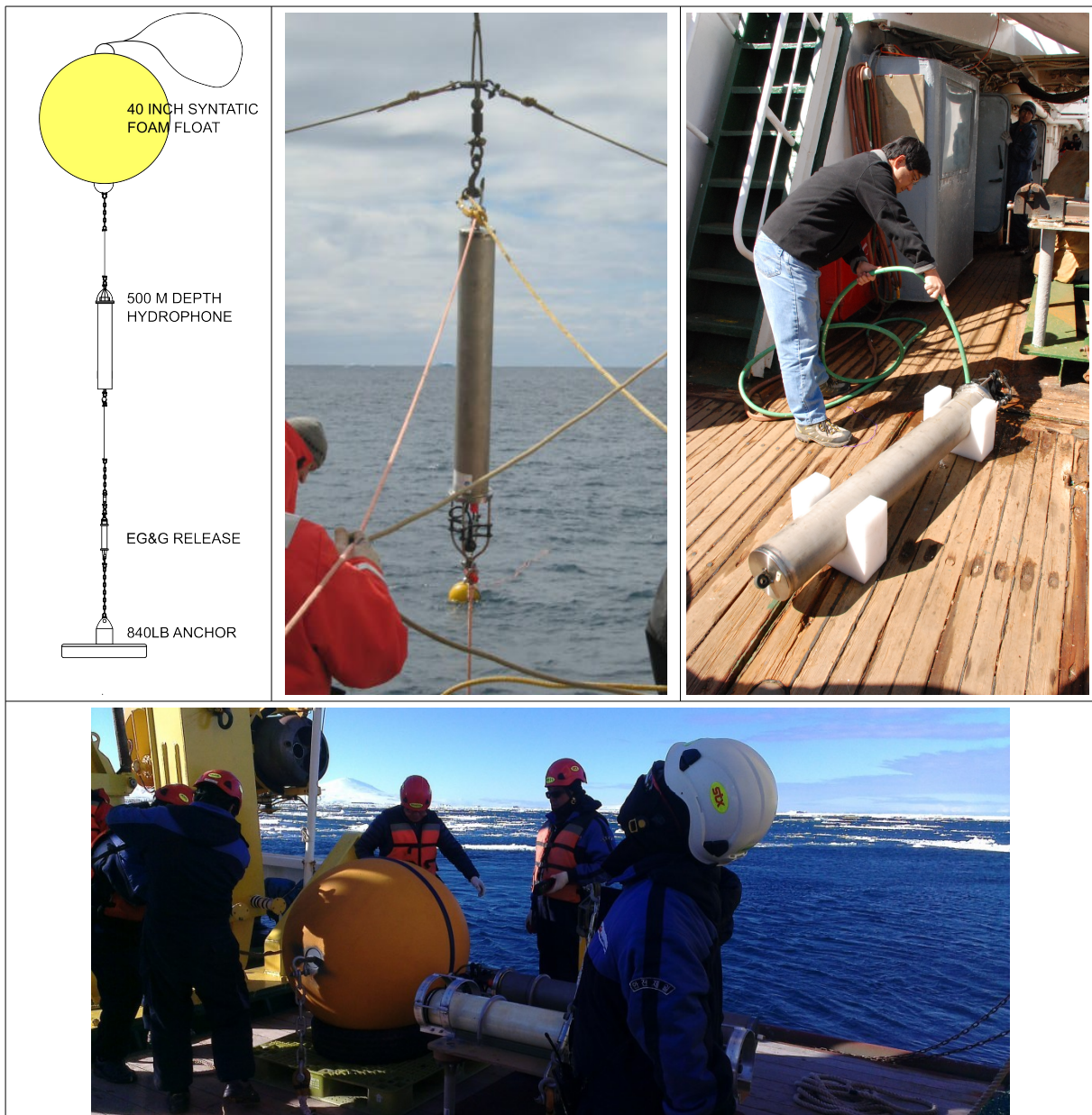
Additional details about the instruments and requirements from each participant institution are below.

NOAA

6 hydrophone moorings

contact: Robert Dziak (robert.p.dziak@noaa.gov)

There will be 6 acoustic moorings with the following components: 6 anchors = 5500 lb
6 floats (3750 lb), 6 spools (1200 - 3000 lb depending on depth), 6 releases (690 lb), 6 hydrophones (900 lb), 1 deck set (40 lb), 1 reel stand (30 lb), 6 sets hardware (325 lb).
Each mooring requires ~3 x 3 m of deck space.

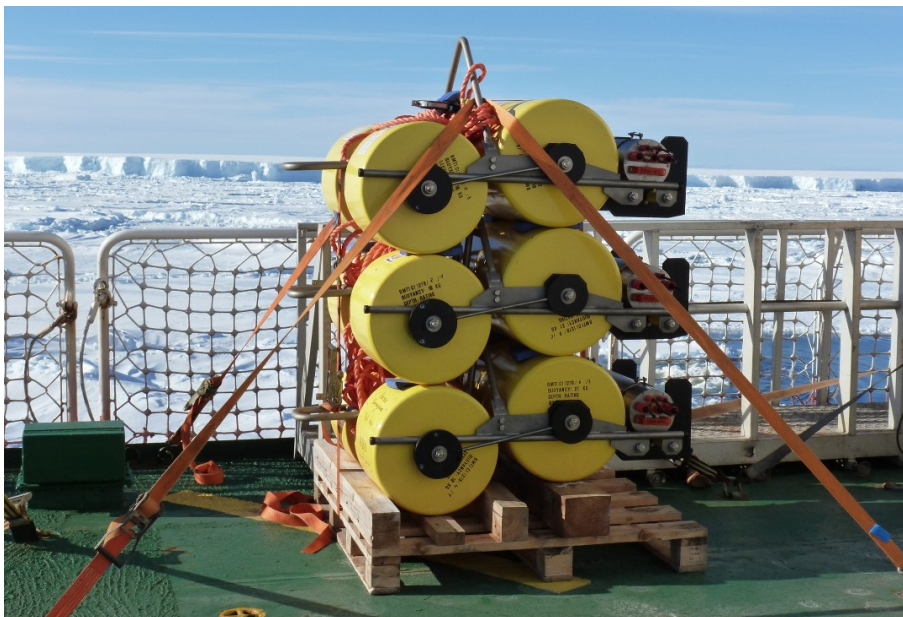


AWI

12 broadband OBS Lobster

contact: Mechita Schmidt-Aursch (mechita.schmidt-aursch@awi.de)

AWI will send the instruments and the auxiliary equipment in one standard 20' container (approx. 8 tons) to Cartagena in September/October 2018. They prefer to have the OBS shipped to South America in this container. In the container, the 12 OBS are packed in stacks of three (see pictures). All electronic parts (releaser, seismometer, etc.) are stored in approx. 20 Zarges boxes. They need some dry and sheltered place, e.g. in a lab, to prepare the pressure tubes. One fully assembled OBS has a size of approx. 150x130x75 cm, the weight with anchor is approx. 380 kg. The station spacing is rather small, so all OBS should be prepared at once. There is also a basket for the releaser test (put releaser in the basket, lower to deployment depth, release there, heave back to deck). The auxiliary equipment and empty boxes should be sent back in the container after the cruise.



WHOI

15 short-period OBS D2

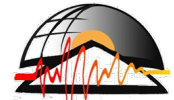
contact: Dan Kot <dkot@whoi.edu>

The OBSs will be in a Lab Van (a 20-ft container used as a lab) weighing about 12000 lbs. The van needs power (~30A). It is currently wired for 440 or 480 VAC (can be changed). The container will house the 15 OBS with their anchors. We will need access to the van's door (on the long side of the container). We will also need some interior space for storage of support gear that we will access from time to time. The individual instruments weigh ~259 lb (with anchor), ~208 lb (no anchor). The container needs to be in a position where the OBS can be moved safely to the location from which they are deployed. The OBSs come out of the van ready for deployment. We use a cart/hand truck to move the instruments. We attach a quick release (brailer release), and deploy at the water surface with a crane/A-frame/etc. To survey in the instruments once they are on the seafloor we utilize the ship's NMEA strings and connect our Edgetch 8011M (acoustic deck box) to the ship's hull transducer (12 kHz).





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