

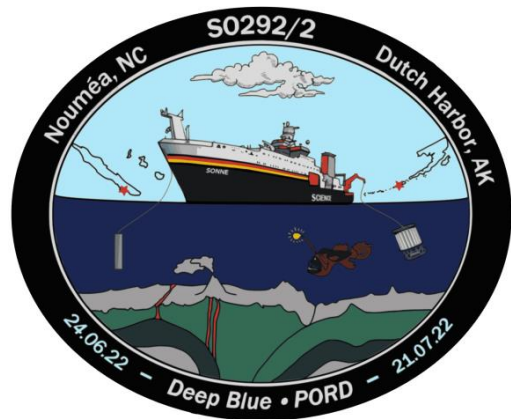
R/V SONNE

Expedition SO292/2

DeepBlue / PORD

24.06.2022 - 21.07.2022

Nouméa (NC) – Dutch Harbor (USA)



2. Weekly Report (27.06-03.07.2022)

For most part of the second week onboard R/V SONNE, we steamed towards the southernmost of our two study areas, in the Mariana Forearc, NE of Guam. The transit, which started on the 25.06, will end this Sunday (03.07.), with the entrance in the Northern Mariana Islands EEZ.



Figure 1: Scientists participating to a scientific meeting in the conference room.

The transit itself actually gave us the possibility to discuss the different geological features encounter on the Pacific Ocean seafloor during our way north, such as the tectonic settings of the Solomon Sea microplate, the formation of Pacific seamounts and guyots, and the emplacement of the Ontong Java Plateau. This LIP (Large Igneous Province) formed about 120 Myr ago and coincides with the Early Aptian oceanic anoxic event (Tejada et al., 2009), which was possibly caused by its massive basalts outpour on the seafloor.

During the whole week the scientists, which are mostly new to the ship, had the chance to get acquainted with the life on board and had to participate to the mandatory safety drill simulating an abandon ship situation. Science also kept the SO292/2 participants busy, laboratories were prepared for the first “core on deck”, science meetings were held daily in the conference room, and continuous multibeam and parasound profiles were taken during transit, in order to contribute to the DAM Underway Bathymetry project.



Figure 2: i) all the instruments to be deployed assembled on deck of the R/V Sonne, and ii) Mona Lütjens shooting an XSV probe to measure the water column sound velocity.

In addition, exciting data are currently being produced by the atmospheric scientists onboard: on the night of June 28th to 29th at around 9 p.m. ship time (UTC+11), an increased backscatter signal was initially detected in the data of the ceilometer at an altitude of about 1.5 km, which indicates a aerosol plume. As the aerosol plume reaches the top of the marine boundary layer, cloud formation increases. The time series measured by the ceilometer shows several similar backscatter signals between 1.0 and 2.5 km in the course of the morning. When the signal can no longer be detected by the ceilometer at around 12 noon ship time, the clouds also clear up again. L1/L2 type cumulus clouds were confirmed by onboard cloud observations up until about 12 noon. Afterwards cirrus clouds prevailed, low clouds were no longer observed.

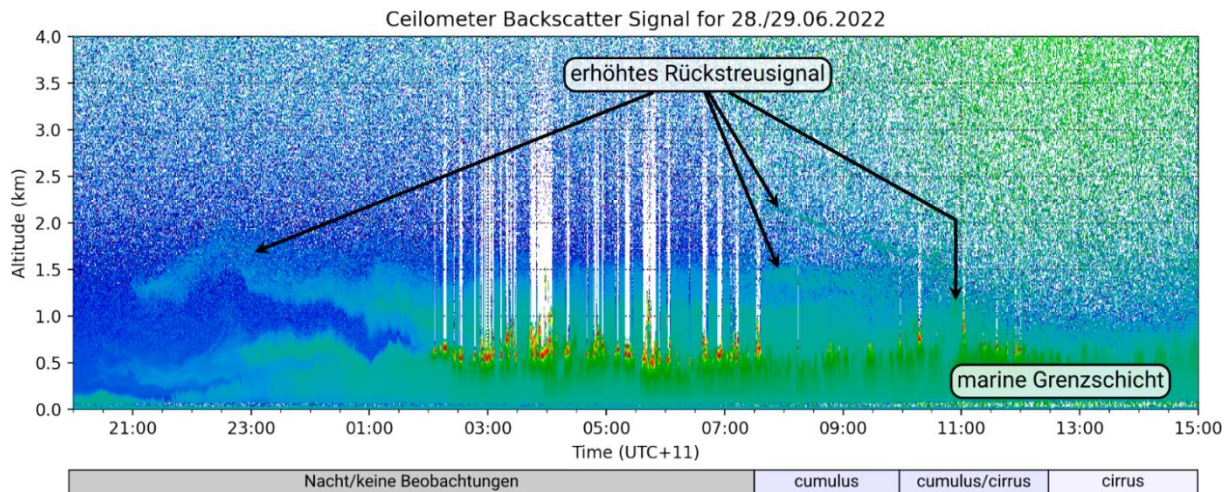


Figure 3: Ceilometer backscatter signal for the period in which an increased backscatter signal could be measured. The bar below the graph represents the cloud observations.

After sunrise, the increased aerosol signal could also be confirmed by the sun photometer: The aerosol optical thickness was increased by about 0.06. The measurements of the Tube MAX-DOAS instrument were then able to provide a crucial indication of the origin of this aerosol layer: While most trace gases show the course of the day to be expected, in the morning hours until around 11:30 a.m. the inclined column densities (DSCDs) of sulfur dioxide (SO_2) significantly increased. The fact that the signal is similarly strong for all elevation angles indicates an increased detection of the SO_2 plume, which is consistent with the increased backscatter signals from the ceilometer. The increase in the trace gas nitrogen dioxide (NO_2) typical of anthropogenic sources (e.g. ship exhaust plumes) could not be detected, which suggests a plume of natural origin. A volcanic plume matches all phenomena shown and a look at the list of active volcanoes in the area shows the moderately active Bagana Volcano (Papua New Guinea) as a suitable source. For more precise statements, however, further analyzes must be carried out.

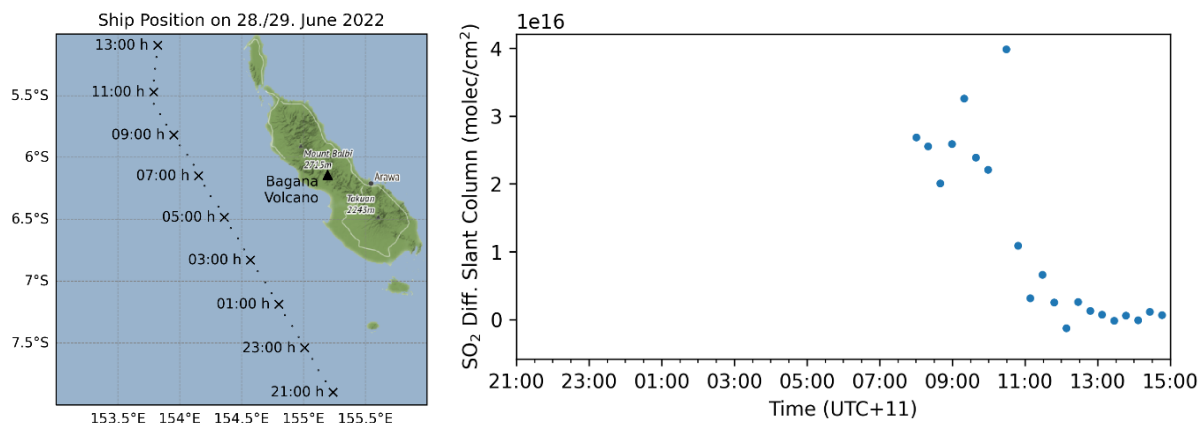


Figure 4: i) Ship position map between 21:00 (UTC+11) on 28/06/2022 and 13:00 (UTC+11) on 29/06/2022; ii) Time series of the measured differential slant column density (DSCD) of SO₂.

The scientific coring program is about to start, and all the SO292/2 participants are looking forward to give their contribution to the expedition. Everyone on board is feeling well and is enjoying the warm temperature and nice weather. More science will come in the next weeks, things are about to get even more interesting!

On behalf of the entire SO292/2 Team
Walter Menapace (Chief Scientist)

Walter Menapace

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