1. weekly report SO 259-3

The transit voyage of the R.V. Sonne from to Emden (Ger) to Buenos Aires (Arg) offers the opportunity to sample atmospheric data over oceans for evaluations of assumption in and products from satellite retrievals or global modeling. Five scientists (of the German Max-Planck Institutes for Meteorology and for Air Chemistry and of the Dutch KNMI institute) explore atmospheric properties of clouds, aerosol and trace-gases with 3 sun-photometers, with 2 MAX-DOAS instruments and 1 cloud camera (with a visible and a thermal sensor). Two other scientists (of the HCU University) explore standard bathymetric monitoring of the ocean floor (orography), and another two scientists (of the University of Oldenburg) test installed oceanic water sensors -for only the initial three days of the cruise.

All atmospheric instruments are installed and appear to working properly (as expected). The MPI-Met cloud camera and the NASA supplied sun-photometer are pictured in Figure 1. The calibrated thermal imager of the cloud camera hereby monitors cloud properties (e.g. low altitude cloud base and cloud structures). The sun-photometer captures at times when the sun is not covered by clouds column properties of aerosol and water vapor. The crisp blue sky conditions during the departure in Emden permitted initial samples which yielded dry (0.5 cm/atm) and aerosol sparse (0.05 for the mid-visible AOD) properties - as expected from arctic air-masses (advected by northerly winds) during winter.

Figure 1. *The MPI-Met cloud camera (left) with two sensors: a frog-eye visible imager (bright dome in back) and a calibrated thermal imager (dark rim sensor in front). Also presented is the sun-photometer with an associated GPS (right, for continuously updating the changing latitude). The sun-photometer extracts from direct solar attenuation data at selected solar frequencies information about atmospheric properties for aerosol and water vapor*

The other two atmospheric instruments are two MAX-DOAS instruments operated by staff of KNMI and MPI-Chem. Results of first samples during the departure in Emden are not yet in, but both instruments, pictured in Figure 2, operate as expected.

Figure 2. *the MAX-DOAS instruments of the KNMI (left) and of the MPI-Chem (right). Both instruments sample the sky-radiance at different elevation angles at solar frequencies with and without absorption by trace-gases to extract column loads and near-surface profiles of gases (e.g. NO2, SO2) and aerosol.*

Similarly at first glance, the bathymetric data recording and the ocean flow sensors appear to work properly and to provide the expected results. During SO259-3 data of different echo sounder systems will be acquired, processed, visualized, and analyzed. The main focus lies on the multi-beam echo sounders (Kongsberg EM122 and EM710) which determine the water depth. They send acoustic signals arranged in a fan vertically down into the water. Then water depth is computed from the reflected signal delay. The fan opening angle can be set up to 140° which results in a mapped stripe of the sea-bed with a width of up to 5.5 times the water depth. Processed data will be implemented into a global database to improve global charts of the oceans under the Seabed 2030 initiative. In addition, a sediment profiler (Teledyne Atlas Parasound DS P-70) will acquire echograms from the upper sediment. This system can penetrate the sea-bed up to 200m in depth (depending on the sediment type). The water column data of the scientific echo sounder (Kongsberg Simrad EK60) will be recorded to examine the detectability of schools of fish and vertical migration of zooplankton within the water column.

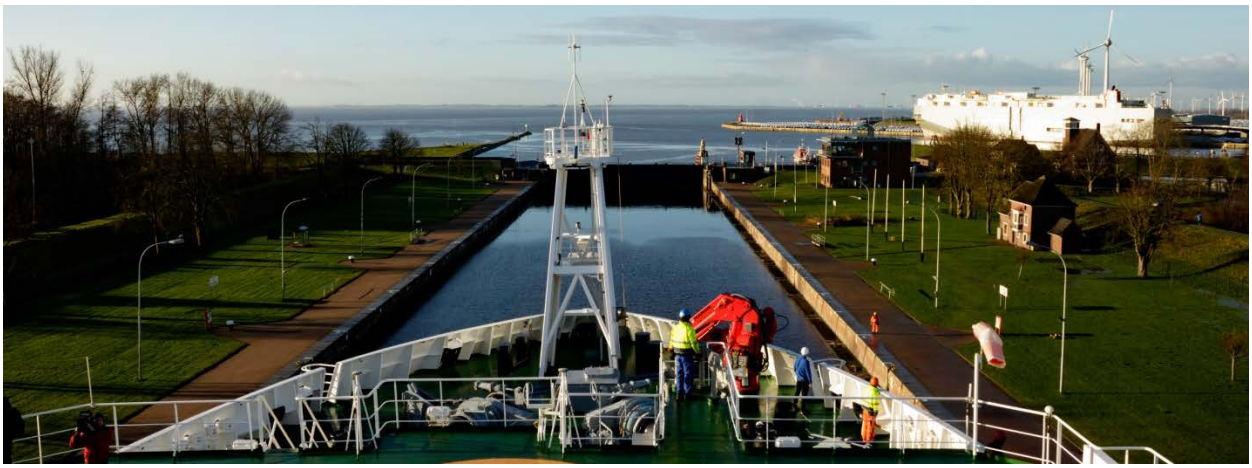

Figure 3 *RV SONNE before entering the Emden locks during the morning of December 17, 2017.*

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