

## POS534 cruise to Goldeneye, North Sea (1.05.-29.05.2019)

### 2nd weekly report

#### On site at Goldeneye

It took us three days to reach the Goldeneye meeting point (Fig. 1). However, it was not only the rough weather during transit, we also monitored several abandoned oil and gas wells in the Norwegian and British EEZ when cruising with slow speed of 3 knots. This is one of our scientific targets on the POS534 cruise, to investigate the significance of methane seepage from the several thousand abandoned wells located in the North Sea. Three out of 8 investigated wells were “leaky”, just a snapshot.

We arrived at Goldeneye in the evening of 9<sup>th</sup> and the first operation of priority next morning was to deploy our “SHIELD” lander (Fig. 2), which is equipped with an upward looking current profiler (ADCP), CTD, and pH and CO<sub>2</sub> sensors. The latter are manufactured by TU Graz, a partner in our STEMM-CCS consortium. The whole device will stay at the seafloor and will collect valuable data nearby the CO<sub>2</sub>-release site for about 2.5 weeks until recovery.



Fig. 1: Meeting point of RV Poseidon with RRS James Cook at the Goldeneye offshore platform (courtesy of P. Linke).

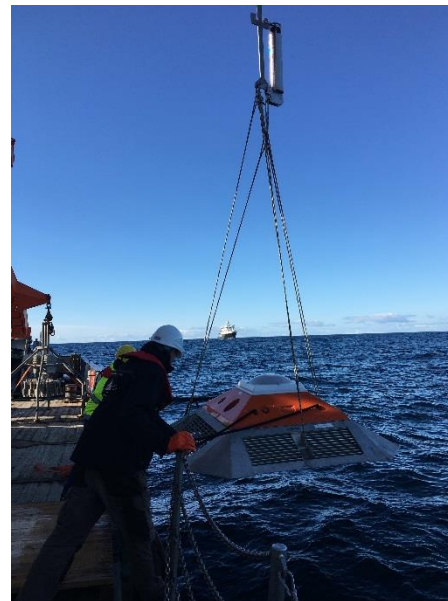


Fig. 2: First deployment with high priority: “SHIELD” lander (courtesy of P. Linke).

The next four days were quite busy with good weather in forecast and calm sea state. We mainly conducted far-field measurements with our workhorse, the “Video-CTD” (Fig. 3). Its water sampler rosette is usually equipped with 10 liter sample bottles and a CTD device. Our refitted device is equipped with numerous additional sensors, i.e CO<sub>2</sub>-, CH<sub>4</sub>-gas sensors, pH, and O<sub>2</sub>. Moreover, a HD-camera, LED lamps, and a water pump, which connects the 120 m deep bottom water with the research vessels laboratory by a 1-inch water hose, makes it a multi-purpose oceanographic device. The onboard laboratory is also fully equipped for gas detection, with a portable membrane inlet mass spectrometer for dissolved gas detection (GEOMAR), gas in water sensors (HydroC), an atmospheric gas measurement device (PICARRO), and an automatic alkalinity titration unit (HydroFIA).

A night-shift on the 13<sup>th</sup> to 14<sup>th</sup> gave us the first chance to monitor the CO<sub>2</sub>-release site itself. Our partners on RRS James Cook managed to drill a pipe into the sediment and connect it to a CO<sub>2</sub>/tracer-tank sitting at the seafloor. For the next two weeks, there will be a controlled release of CO<sub>2</sub> from the seafloor into bottom water, however, with small gas fluxes first. During our towed Video-CTD track we monitored gases dissolved in seawater and other parameters in the water column above the release, during a full tidal cycle. RV Poseidon did a great job in holding us exactly above the small bubble streams, although it is not equipped with Dynamic Positioning (DP). We did also observe our “Benthic chamber” (Fig. 4), and equipment of STEMM-CCS partners placed at the seafloor by ROV ISIS, operated from RSS James Cook.

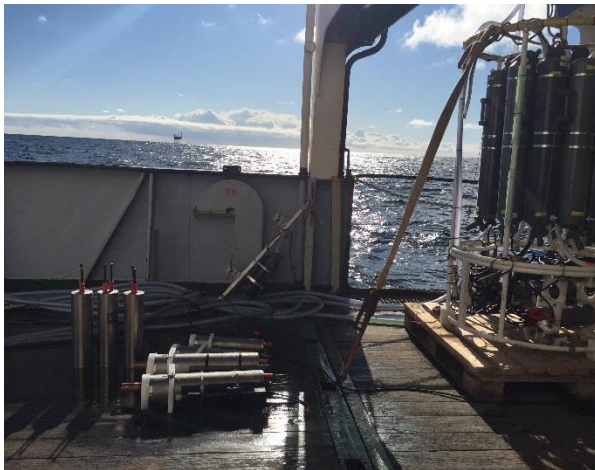


Fig. 3: Four HydroC-gas sensors (KM Contros) and additional power packs are waiting to be mounted to the Video-CTD frame on the right side (courtesy of M. Schmidt).

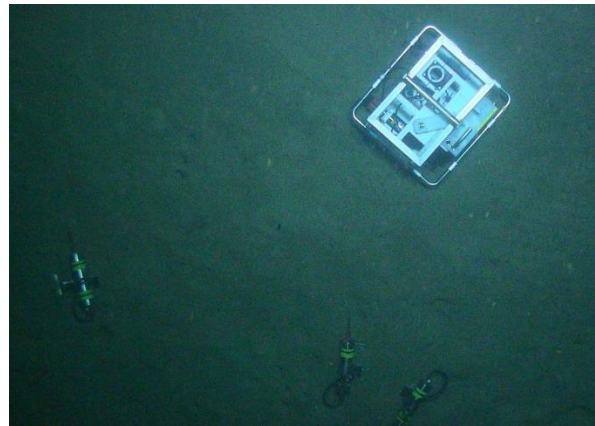


Fig. 4: Spotting our benthic chamber (upper right corner), which had been deployed by ROV before by using the HD camera of the Video-CTD (courtesy of P. Linke).

Night-shift again from 14<sup>th</sup> to 15<sup>th</sup>, busy with hydroacoustic monitoring of the water column above abandoned wells. The moon-pool installation mentioned before, a combination of ADCP and echosounder worked perfectly and gave us excellent images of gas bubble “flares” emanating from the seafloor i.e. at abandoned wells (Fig. 5).

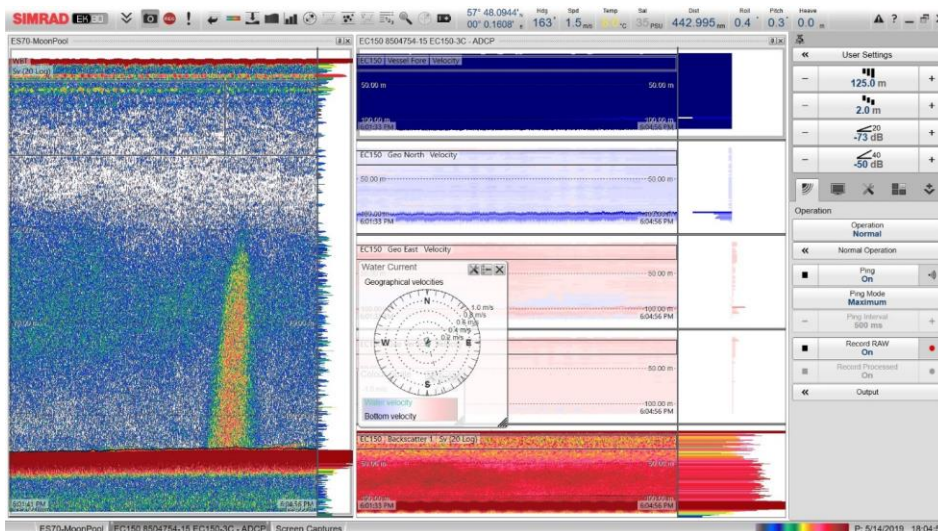


Fig. 5: Strong gas bubble flare emanating at an abandoned well, detected by a new SIMRAD ADCP/echosounder device (courtesy of M.Schmidt).

All of us are in a good mood. Weather is fine, and some exciting days are still expected.

On behalf of all scientific crew members,

Dr. Mark Schmidt (PI)

p.s. One can follow two blogs about the “Goldeneye”-campaign at

<http://www.oceanblogs.org/pos534/>

<https://stemmccs.blog/>