IEAGHG Information Paper: 2017-IP18; ETI AUV Harbour Trials

I was fortunate to be invited to see the results of the harbour trials of the Energy Technologies Institute funded marine Monitoring Measurement and Verification (MMV) system, which has been developed for CO_2 storage site surveillance, which has a strong emphasis on the utilisation of AUVs (autonomous underwater vehicles) to reduce cost. These trials took place in Portland harbour over the last month.

The purpose of this project is to develop and demonstrate a cost-effective integrated MMV system for CO_2 and environmental assessments in the marine environment around CO_2 storage sites. The objectives are to be able to detect, locate, characterise and quantify sources of any leaks at depths and areas typical for offshore CO_2 storage sites, i.e. between 5m and 200m water depth and areal extents of 10-3000km^2. The project is led by Fugro in collaboration with Sonardyne, with input from the National Oceanography Centre (NOC), the British Geological Survey (BGS), Plymouth Marine Laboratory and the University of Southampton.

The NOC Autosub Long Range AUV has been adapted to mount a range of chemical sensors including pH, O_2, nitrates and phosphates together with physical sensors for speed, location and Sonardyne's Solstice high performance multi-aperture side-scan sonar. These sensors have been integrated these with several on-board data-processing-hubs developed by Sonardyne (which include target-recognition software to distinguish features of interest from background) and communications facilities. The AUV contains enough power storage to operate for a month. A typical deployment would start with systematic aerial surveys over the site, with data transmitted in batches to the onshore control centre via the Iridium satellite, and then the AUV being directed to focus in more detail on certain areas of interest. The AUV has been tested in Portland harbour with a controlled release of CO_2. The side-scan sonar easily detected the bubble plume from a low-level release rate from 100 metres distance.

Image above Courtesy of ETI

Also with this work, Sonardyne have developed two Landers. An 'active' lander which uses active sonar to scan up to 900 m range 360^0 around for bubble plumes indicative of a leak. The 'passive' lander has acoustic sensors to analyse the frequency of the bubble vibrations as a means of quantifying the leakage together with the same chemical sensors as on the AUV, and managed to detect pH changes associated with low leak rates.

The detection performance in these shallow harbour trials is very impressive. The next stage are sea trials in the greater depths of the North Sea, with the telemetry and control being based at NOC Southampton. The greater depths are expected to further improve detection performance, as there will be less natural environmental variation. The AUV will also be used for the STEMM-CCS project's controlled release on the seabed at the Goldeneye site in 2019.

These developments will enable more optimised and cost-effective environmental monitoring at CO_2 storage sites offshore.

And yes, if you were wondering, this AUV is a sister vessel to the now famous "Boaty McBoatface" AUV which is now on deployment in the Antarctic (see http://noc.ac.uk/education/educational-resources/boaty-mcboatface).

Many thanks to Rob Hines of Fugro, Graham Brown and Rob Crook of Sonardyne, and the rest of their team at Portland harbour for an interesting and informative visit. We look forward to hearing more on these world-leading developments at our Monitoring Network meeting and the Offshore CCS Workshop in June in the USA.

More project information is available on the ETI website http://www.eti.co.uk/programmes/carbon-capture-storage/measurment-modelling-and-verrfication-of-co2-storage-mmv .

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