‘Lab-on-Chip’ sensor for *in situ* determination of silicate in natural waters

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In situ sensors are attractive alternatives to discrete sampling of natural waters, offering the potential for sustained long term monitoring in remote locations, and eliminating the need for sample handling. Microfluidic technology miniaturises bench-top assay systems into portable devices, known as ‘lab on a chip’ (LOC) sensors. The Ocean Technology and Engineering Group at the National Oceanography Centre has been developing state-of-the-art microfluidic sensors, designed to autonomously perform *in situ* measurements down to full ocean depths.

In this presentation I will show laboratory development data and first field data for our new silicate sensor. The laboratory data includes the development of the assay to incorporate the highest sensitivity (0.05 μM/Absorbance Unit), precision (< 2%) and accuracy (4%) whilst ensuring the reagents are fit for purpose for a wide range of environmental conditions (0-37 Salinity Units, 2-40 ºC) for sustained deployments (6-12 months). We have successfully deployed this sensor in three field locations. The first field data are local deployments at test sites in the River Itchen, U.K. and in Southampton Water, U.K. each respesenting a fresh-and seawater environment respectively. Here we have found that that the sensor data and ground truthing grab samples have a 1:1 correlation ($R^2 > 0.9$). We have also recorded for the first time continuous silicate concentrations from December 2018 in the Southern Ocean (55ºS, 90ºW) mounting the Si sensor on the Ocean Observatories Inititative (OOI) Global Surface Mooring at 7m depth. This demonstrates the usefulness of these sensors in remote locations to measure unprecedented high resolution silicate concentrations not possible through manual sampling.