**Underway System**

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The Advanced Serial Data Logger software installed on the underway computer system records the TSG sensors, flow rate, NMEA data, and pCO2 (when installed) RS-232 serial data directly into text (.csv) files produced daily. There are 8 variables logged in the TSG csv log files; intake temperature, TSG Temperature, conductivity, fluorescence UV , pH, fluorescence, calphase from the optode, and calculated salinity. The frequency of measurements within each file type varies, with NMEA every second, TSG measurements every 5 seconds, and flow data

approximately every second.

A script was developed using R statistical software to collate the TSG and flow rate data with the corresponding positional data in the NMEA file. Measurements were interpolated in hourly bins and plotted to visualize spatial patterns and help validate the sensor outputs (see Figures xx and xx below). Optode calphase output from the underway is converted to O2 Concentration in ml/L, corrected for salinity using R.

As oxygen, chlorophyll and salinity samples taken from the underway that were measured on board, were plotted against the corresponding underway sensors throughout the mission using R scripts (see Figure xx) to validate the sensor outputs. Also the underway sensor data was plotted against the corresponding CTD sensors (see Figure xxx). The salinity bottle and CTD data matched well to the TSG data. The chlorophyl bottle data mostly did not match the TSG data the CTD data was a closer match. The bottle oxygen and CTD data was offset from the higher TSG data. CDOM and pH data showed an offset with TSG pH being higher and TSG CDOM being lower.