Temperature and Salinity Corrections of SBE41 Pumped CTD Profiles on Slocum Gliders for Real-Time and Delayed Mode Datasets

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Abstract (Poster)

A variety of methods for the correction of temperature and salinity profiles measured by autonomous vehicles have been proposed and/or previously published. The low sampling frequencies coupled with dynamically stratified and mixed water columns, internal waves and user-configured sampling strategies presents challenges for the application of quality control algorithms to achieve consistent, repeatable results of temperature and salinity measurements. The predictive ability of ocean forecast models is dependent on the accuracy of measurements of temperature and salinity. Ocean gliders provide researchers with a low-cost, flexible platform for sampling the global oceans on a consistent basis. Is imperative to develop a set of algorithms applicable across glider platforms, CTD packages and highly variable ocean environments be developed and published.

Power and data storage requirements and accuracy are factors determining CTD selection for ocean gliders. This balance has resulted in CTDs measuring at relatively low sampling frequencies (0.5-1Hz). Both pumped and non-pumped CTD packages are commonly used on ocean gliders.

Quality control algorithms for glider CTD profile involve the following steps: 1) Thermistor and pressure sensor alignment, 2) thermistor and conductivity cell alignment, 3) finite thermistor response correction, 4) conductivity cell thermal mass correction. Steps 1 – 3 are fairly straightforward while corrections for conductivity cell thermal mass effects have proven to be more difficult. Application of corrective algorithms for conductivity cell thermal mass effects are typically divided into 2 approaches, both aimed at accounting for heating and cooling of the conductivity cell: 1) Correction of the measured conductivity inside the cell and 2) estimation of the measured temperature inside the cell. Neither approach has proven to be repeatable in both mixed and stratified water columns.

In order to better understand the effects of heating and cooling on the CTD thermistor and conductivity cell, we reviewed the existing published methods and applied them on a series of glider deployments characterized by a range of water masses. During the review of these methods, we developed a new and more robust methodology to account for thermistor and conductivity cell thermal mass effects. This approach proved to be repeatable for temperature and salinity profiles in both highly stratified and well-mixed water masses.