# Spectrophotometric Determinations of Carbonate Dissociation Constants in Seawater

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Carbonate system parameters (pH, total alkalinity (TA), total dissolved inorganic carbon (DIC), carbon dioxide fugacity ($fCO_2$)) are related through calculations involving the $CO_2$ dissociation constants, $K_1$ and $K_2$. These constants, which relate $H^+$ concentrations to the relative concentrations of $CO_2$, $HCO_3^-$ and $CO_3^{2-}$, have uncertainties on the order of 2% and 5% respectively and thereby limit our understanding of the marine $CO_2$ system. The goal of my investigation is improvement of the accuracy of $K_1$ and $K_2$ parameterizations over a wide range of salinity and temperature.

My determinations of $K_1$ and $K_2$ are being performed using spectrophotometric pH measurements obtained with purified meta-cresol purple indicator. The procedure used in this work involves adjustments of solution pH to values near an expected equilibrium pH, and then adding pure $NaHCO_3$ to determine the pH at which $NaHCO_3$ additions produce no pH change. The pH at which $NaHCO_3$ additions cause no pH change is equal to $\frac{1}{2}(pK_1+pK_2)$. Calculated $K_2$ values and literature $K_1$ values will subsequently be used to determine whether the correspondence between calculated and measured TA, DIC and pH values obtained on the GOMECC-3 expedition (2017) is improved relative to calculations that use previous $K_1$ and $K_2$ parameterizations.