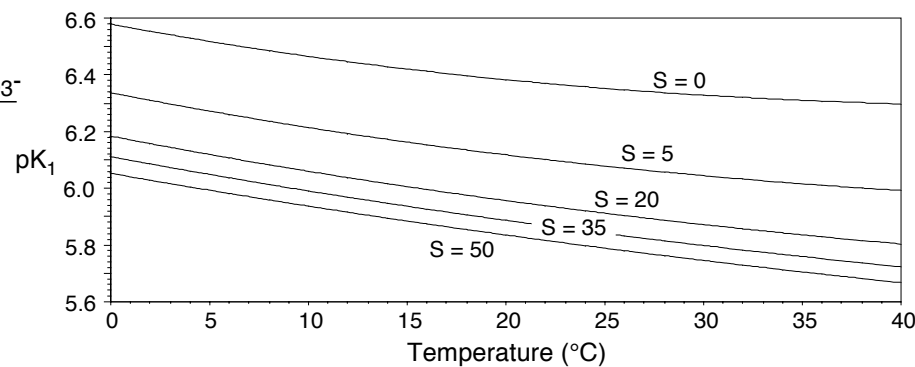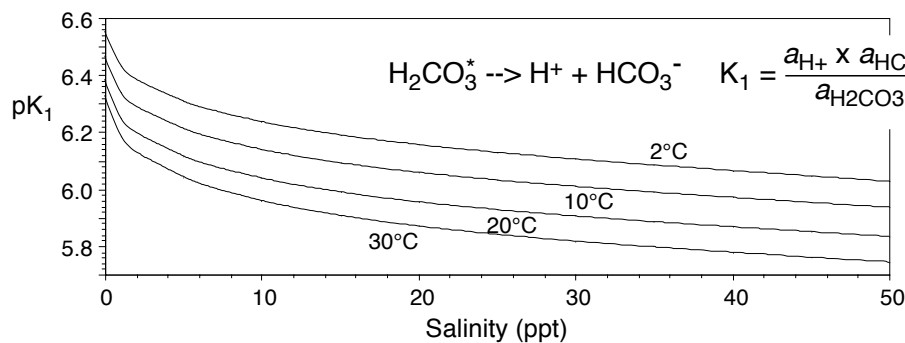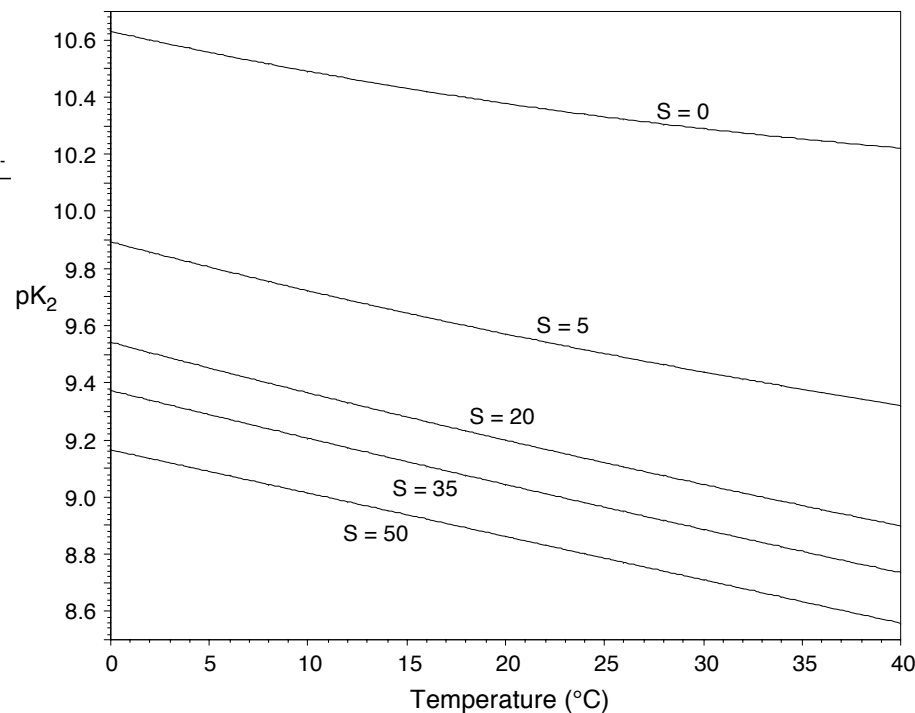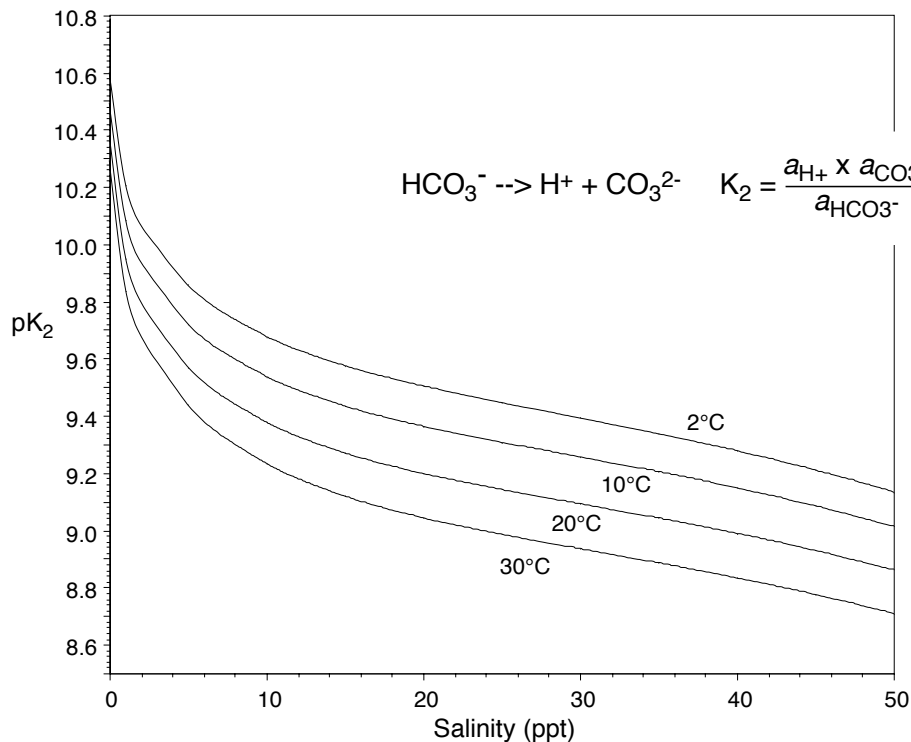# Variation in the dissociation constants of H_2CO_3 and HCO_3^- with temperature and salinity

As previous pages in this series have discussed, the behavior of dissolved inorganic carbon (CO_2, HCO_3^-, and CO_3^{2-}) hinges on dissociation of $H_2CO_3^*$ and HCO_3^-. The equilibrium "constants" for the dissociation of $H_2CO_3^*$ to HCO_3^- and H^+ (conventionally designated K_1) and of HCO_3^- to H^+ and CO_3^{2-} (K_2) vary with temperature and salinity. The plots below illustrate the extent of that variation. The values shown were calculated from equations reported by Millero, F.J., et al., 2006, Dissociation constants of carbonic acid in seawater as a function of salinity and temperature: *Marine Chemistry*, v. 100, p. 80-94.

$$HCO_3^- \longrightarrow H^+ + CO_3^{2-} \qquad K_2 = \frac{a_{H+} \times a_{CO3^{2-}}}{a_{HCO3^-}}$$

$$H_2CO_3^* \longrightarrow H^+ + HCO_3^- \qquad K_1 = \frac{a_{H+} \times a_{HCO3^-}}{a_{H2CO3^*}}$$

$H_2CO_3^*$ is the sum of true H_2CO_3 (C in three-fold coordination with one O^{2-} and two OH^-) and $CO_{2(aq)}$ (C in two-fold coordination and hydrated with one H_2O).