$$F = \underbrace{a\sqrt{\frac{660}{Sc}}\,u^2}_{pv} \cdot \underbrace{ff\,[atm\_CO_2 \cdot atm\text{-}prs - pCO2surf]}_{dCO2Star}$$

$a = 6.972E-9$ s/cm

$$sDIC = \frac{DIC}{S} \cdot S_0 \qquad sAlk = \frac{Alk}{S} \cdot S_0$$ (35)

$$\Delta F = \frac{\partial F}{\partial u}\Delta u + \frac{\partial F}{\partial pCO2}\frac{\partial pCO2}{\partial T}\Delta T + \frac{\partial F}{\partial pCO2}\frac{\partial pCO2}{\partial S}\Delta S + \frac{\partial F}{\partial pCO2}\frac{\partial pCO2}{\partial DIC}\frac{S}{S_0}\Delta sDIC + \frac{\partial F}{\partial pCO2}\frac{\partial pCO2}{\partial Alk}\frac{S}{S_0}\Delta sAlk + \frac{\partial F}{\partial pCO2}\frac{\partial pCO2}{\partial fw}\Delta fw$$

$$\frac{\partial F}{\partial u} = -2a\sqrt{\frac{660}{Sc}}\,u\,dCO2Star$$

$$\frac{\partial F}{\partial pCO2} = +ff \cdot a\sqrt{\frac{660}{Sc}} \cdot u^2$$ Due to inverting Fco2

$$\frac{\partial pCO2}{\partial T} = 0.0423\,pCO2$$

$$\frac{\partial pCO2}{\partial S} = \frac{pCO2}{S}$$

$$\frac{\partial pCO2}{\partial DIC} = \frac{pCO2\,\gamma_{DIC}}{DIC}$$

$$\frac{\partial pCO2}{\partial Alk} = \frac{pCO2\,\gamma_{Alk}}{Alk}$$

$$\frac{\partial pCO2}{\partial fw}\Delta fw = \frac{sDIC}{S_0}\frac{\partial pCO2}{\partial DIC}\Delta S + \frac{sAlk}{S_0}\frac{\partial pCO2}{\partial Alk}\Delta S$$

$$\gamma_{DIC} = \frac{3Alk \cdot DIC - 2DIC^2}{(2DIC - Alk)(Alk - DIC)}$$

$$\gamma_{Alk} = \frac{Alk^2}{(2DIC - Alk)(Alk - DIC)}$$

Variable List

- FG_CO2
- TAUX } Convert to U10
- TAUY
- fCO2star
- pCO2SURF
- SST
- SSS
- DIC
- AIK
- TAUX2
- TAUY2