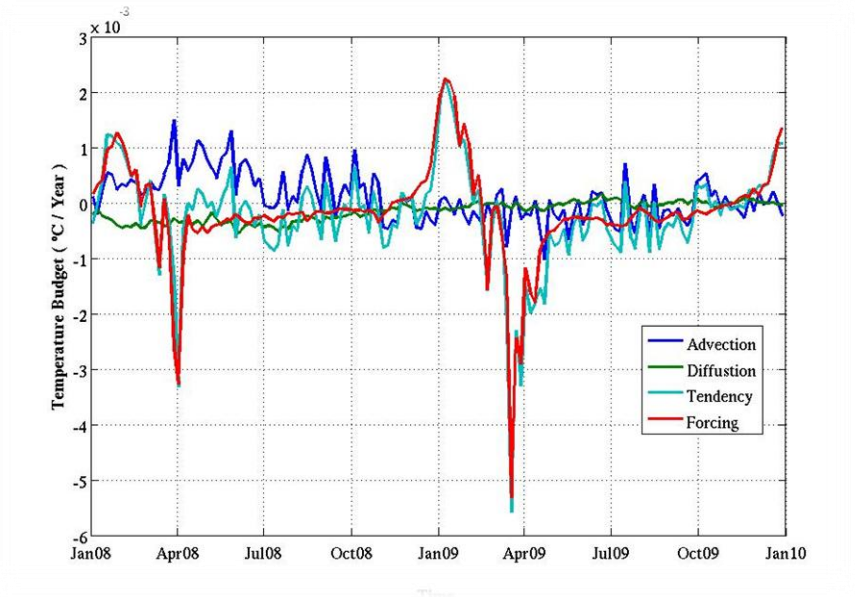
$$\underbrace{\frac{\partial T}{\partial t}}_{tendency} = \underbrace{-\nabla \cdot (\mathbf{u}T)}_{advection} + \underbrace{\kappa \nabla^2 T}_{diffusion} + \underbrace{Q_{net}}_{forcing}$$



Radar interferometry and regional climate modeling have identified an area of rapid glacial melt to be the west coast of Antarctica, where the Pine Island Glacier is receding at an accelerated rate. Data from an ocean model constrained to observations, the Southern Ocean State Estimate (SOSE), are analyzed over 2008 to 2009 in the Pine Island Bay (PIB) region. An along shelf coordinate system is constructed with a chosen target depth of 2600 meters. On average, an along shelf westward flow of 1.4 Sv is augmented by 0.7 Sv of across shelf flow to be balanced by a 2.1 Sv outflow at the eastern border of our study domain. The SOSE temperature budget is analyzed along the shelf, revealing that advection, parameterized small scale mixing, and local air-sea temperature flux all contribute significantly to the total change in temperature with time. However, in times of minimal sea ice coverage, the change in temperature appears to be dominated by the air-sea flux. Overall, advection serves to warm waters along the shelf while small scale mixing and air sea flux tend to cool them. Despite warming of the Southern Ocean as a whole, waters along the PIB shelf cool by 0.04°C from the beginning of 2008 to the end of 2009.