**The Sea Ice Model**

Our proposed model for sea ice is based on the surface energy budget of sea ice. There is a balance of surface fluxes, which include radiative fluxes, latent and sensible heat, and thermal conductivity of the surface. This can be represented by the following equation:

where

The sensible and latent heat terms ( and , respectively) are the classic bulk aerodynamic relationships for surface fluxes. The table at the end has a list of all of the coefficients and units. The thermal conductivity is taken to be a differential of the temperature of the surface to the temperature 5 millimeters into the ice block.

For radiation, we assume no clouds in the atmosphere. We define as the sum of shortwave and longwave. Incoming shortwave is defined using a piecewise function, following half of a period of a sine curve from 7am to 10pm, with a peak of 500 W/m^2. Any other time, incoming radiation is set to zero. Adding albedo gives the following equation for (where is ):

Net longwave radiation is defined as the balance between incoming and outgoing, where we assuming a constant influx of 200 W/m^2 of longwave radiation, and outgoing longwave is a function of surface temperature (represented by the Stefan-Boltzmann law).

The bulk air temperature model is used for only validation of the model. It is crudely modeled by a sinusoidal temperature profile based on the average high (275 K) and low (261 K) temperatures of Barrow, AK in the past century.

The bottom surface fluxes have a similar balance:

We can represent each of the terms of with