To be able to understand the atmospheric controls on glacier mass balance and extract a climate signal from glaciers in the Southern Alps, New Zealand, a robust understanding of the surface energy balance over snow and ice surfaces is needed. In the maritime climate of the Southern Alps the turbulent, sensible and latent, heat fluxes contribute significantly to melt energy available at the glacier surface. Point and distributed energy balance studies on the Brewster Glacier, show that this is especially the case during large, more infrequent, melt events, where turbulent heat fluxes dominate the melt energy. The energy balance models rely on AWS data from the glacier surface and use bulk aerodynamic methods to calculate the turbulent heat fluxes. However, large uncertainty still exists in the scaling coefficients used in these methods. In order to validate the energy fluxes and develop site-specific surface roughness lengths, eddy correlation data were collected over the glacier surface during two short periods. Surface energy balance is presented over both snow and ice surfaces with comparison of the turbulent heat fluxes calculated from bulk aerodynamic methods and eddy covariance data. The comparison will enable increased confidence in the methods used to calculate the energy and mass balance of the glacier over daily, seasonal and annual timescales. It will also improve our understanding of the role that different air mass types have on the physical processes controlling mass gain and loss. The findings will also be of interest to those studying glacier dynamics and snow hydrology elsewhere in the Southern Hemisphere.