Motivation

The NZESM is a powerful tool for simulating the complex interactions between components of the climate system. However, its complexity makes it difficult to assess individual components of the system. The NZESM single column model (SCM) allows easier validation of processes. The DSC project “Developing capacity in process assessment and improvement in NZESM through the use of the single column version of the model” used the SCM for radiation experiments in the Deep South [7]. Radiation components from SCM are compared with measurements from the AWARE campaign [3]. Furthermore, SCM results were compared with the full NZESM above the Southern Ocean. The capacity which has been developed can now be used to investigate a gap in our understanding about how Antarctica cools itself and explore the outgoing longwave radiation budget to improve simulations of New Zealand’s changing climate.

Improving NZESM simulations of New Zealand’s changing climate

Antarctica’s heat budget defines how it will respond to climate change. Antarctica’s surface cools itself by emitting infrared radiation (≈50% at wavelengths beyond 15 μm). Models of this radiative cooling are challenged by a paucity of measurements of surface emissivity at wavelengths beyond 15 μm, compromising climate change projections over Southern middle and high latitudes. The far-infrared surface emissivity is commonly assumed to equal 1 (emissivity of a blackbody radiator) in climate models, however, it has been shown that perturbations to this parameter cause significant changes in the OLR where the atmosphere is extremely dry, see Fig.1 (from Feldman et al., 2014) and [1, 2].

Using the single column NZESM for radiation experiments in Antarctica

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References