



The Deep South Clouds & Aerosols project: Improving the modelling of clouds in the Southern Ocean region

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Southern-Hemisphere climate projections are subject to persistent climate model biases affecting the large majority of contemporary climate models, which degrade the reliability of these projections, particularly at the regional scale. Southern-Hemisphere specific problems include the fact that satellite-based observations comparisons with model output indicate that cloud occurrence above the Southern Ocean is substantially underestimated, with consequences for the radiation balance, sea surface temperatures, sea ice, and the position of storm tracks. The Southern-Ocean and Antarctic region is generally characterized by an acute paucity of surface-based and airborne observations, further complicating the situation.

In recognition of this and other Southern-Hemisphere specific problems with climate modelling, the New Zealand Government has launched the Deep South National Science Challenge, whose purpose is to develop a new Earth System Model which reduces these very large radiative forcing problems associated with erroneous clouds. The plan is to conduct a campaign of targeted observations in the Southern Ocean region, leveraging off international measurement campaigns in this area, and using these and existing measurements of cloud and aerosol properties to improve the representation of clouds in the nascent New Zealand Earth System Model. Observations and model development will target aerosol physics and chemistry, particularly sulphate, sea salt, and non-sulphate organic aerosol, its interactions with clouds, and cloud microphysics. The hypothesis is that the cloud schemes in most GCMs are trained on Northern-Hemisphere data characterized by substantial anthropogenic or terrestrial aerosol-related influences which are almost completely absent in the Deep South.