Seasonal to inter-annual climate variability as simulated by the Variable-Resolution Earth System Model

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Abstract

The need to understand the contribution of various climate forcings and their intricate interactions is of key importance in climate predictability studies. This objective may better be accomplished, at seasonal to inter-annual climate timescales (though computationally expensive) with the use of Earth System Models (ESM) that interactively couple the ocean-atmosphere-land-cryosphere. However, recent studies showed that even these models are unable to realistically reproduce key observed climate features outside the tropics and particularly so over the Southern Hemisphere (SH) Such features include the phases of the southern annular mode and trends in the poleward displacement of the eddy driven jet stream and lower stratospheric cooling (which all exist in reanalyses data). Many of these problems can presumably attributed to the weak representation of climate processes as these relate to the Southern Oceans and Antarctica, and an associated lack of plausible teleconnection physics in the models. With this in mind, the Council for Industrial Research (CSIR) in South Africa in collaboration with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia has been developing a Variable-resolution Earth System Model (VRESM). This ongoing study is, therefore, primarily aimed at investigating the systematic errors in the model within the context of representing seasonal to inter-annual variability in the Southern Hemisphere, from a process-based perspective.