

Development of Climate Change Projections in Southeast Asia

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Coupled atmosphere-ocean Global Climate Models (GCMs) are increasingly being used to simulate future climate change under various emission scenarios. Because of their computational expense, the grid resolution of those GCMs is typically around 200 km, which is too coarse to directly provide realistic climate simulations for most islands, or regions with steep orography or complex land-use. An approach that has become common is to use regional climate models, driven in some manner by a coupled GCM, to simulate the climate at smaller length scales. Some groups use limited-area models for this purpose, driven at the lateral boundaries by a host GCM, and this approach was originally used at CSIRO with the DARLAM model. For about the last 10 years, downscaling at CSIRO has been performed instead with a variable-resolution global atmospheric model, the Conformal-Cubic Atmospheric Model (CCAM). With computational and technical advances, it is now possible to run models, such as CCAM, downscaled from a variety of host models and scenarios.

A number of simulations will be shown over the Australian region, showing the monsoonal precipitation response. These include 140-year simulations at 60 km resolution, driven by the sea surface temperatures (SSTs) and sea-ice distributions of the CSIRO Mk 3.5 coupled GCM, as well as for five coupled GCMs from the IPCC Fourth Assessment (AR4): GFDL2.1, GFDL2.0, HadCM2, ECHAM5 and Miroc-Medres, all for the A2 emission scenario.

Quasi-uniform global CCAM simulations have also been performed at 200 km driven by the SSTs of the same coupled GCMs. These have been further downscaled to a resolution of 60 km over Southeast Asia, employing a digital filter technique to preserve the large-scale patterns of the 200



km simulations. The same technique can be used for downscaling to even finer resolution over individual islands. The various simulations are compared for their present-day climatology and for their climate change response.