The NARCliM Project: Model Evaluation and Climate Projections for Temperature and Precipitation for South-East Australia

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The objective of NARCliM (NSW / ACT Regional Climate Modelling) Project is to provide regional climate projections for Australia, with a special focus on New South Wales and Australian Capital Territory. The project brings together a diverse set of state and local government departments, and researchers from UNSW Climate Change Research Centre.

Dynamical downscaling of output from General Circulation Models (GCMs) is used to provide 50-km resolution projections for the CORDEX-AustralAsia region, and 10-km projections for South-East Australia. The project improves on previous work in the amount of policy-relevant model output, and in the procedure of climate model selection. The process of selecting driving GCMs has several components. We first assess model performance through a literature review. Second, we rank models by their independence. Finally, we select independent models that adequately sample temperature and precipitation projections in the full model set. The chosen GCMs include MIROC3.2, ECHAM5, CCCMA3.1, and CSIRO-MK3.0. Another set of measures is put in place to select three out of 36 Regional Climate Models (RCMs). These measures include an assessment of model independence, and an evaluation of model skill at reproducing several precipitation events. The three RCMs to perform downscaling are WRF models with different parameterizations of planetary boundary layer, surface layer, cloud microphysics, and radiative exchange. NARCliM model runs span four periods: 1950-2009 (reanalysis), 1990-2009 (present), 2020-2039 (near future), and 2060-2079 (far future). 12 GCM-RCM pairs are used for each period except for the reanalysis, where the three RCMs are used. While each run generates projections for a diverse set of atmospheric and land surface variables, we limit this analysis to temperature and precipitation.

Evaluating the skill of NARCliM models at reproducing current climate is an important step for interpretation of NARCliM projections. For the present and the reanalysis periods, we compute seasonal and annual climatologies of daily mean, minimum, and maximum temperatures, as well as precipitation for each RCM. We perform the same analysis for daily mean temperature and precipitation for driving GCMs. We assess model biases by systematically comparing the results for the present to observations from Australian Water Availability Project (AWAP).

We present preliminary climate projections for the near- and far-future for seasonal and annual climatologies, and changes from present. We compare the RCM and the GCM projections, and speculate on the reasons for the differences between the two.

NARCliM, South-East Australia, Climate Projections, Dynamical Downscaling, Climate Modeling