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Projected changes in extreme climate indices at 1.5 , 2 and 3 degrees of global warming in Queensland

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Global coarse resolution climate models are unable to resolve well the weather systems, local scale topographic features and land surface characteristics such as coastline, islands, urban areas, vegetation and soils. Many important weather systems such as tropical cyclones, east coast lows need much higher resolution than the current IPCC class global climate models can provide. Dynamical downscaling using global variable resolution CSIRO Cubic Conformal Atmospheric Model (CCAM) provides state of art climate modelling approach able to better capture relevant regional climate features.

In this talk we will describe examples of dynamical downscaling focusing on high-resolution (∼10km) climate change projections over Queensland region under RCP8.5 and RCP4.5 scenarios. We selected 11 CMIP5 global models representing a range of simulated changes over Australian region and used their sea surface temperature (SSTs) and sea ice to drive CCAM model at 50 km global resolution. SSTs from CMIP5 models were bias corrected for mean and variance to reduce systematic bias introduced by CMIP5 global coupled climate models. CMIP5 time varying radiative forcing such as concentration of greenhouse gases, solar, ozone change and aerosols emissions were used in addition to SSTs and sea ice to complete 11 simulations for period 1950 to 2099 at 50 km global uniform resolution. Subsequently global streach version of CCAM was used at 10 km spatial resolution over Queensland region. Eleven simulations were completed for period 1980 to 2099 using 6-hourly 3-D data from 50 km simulations and using 1-D spectral nudging approach.

Daily data from high resolution simulations was bias corrected using parametric and non-parametric bias correction approach. Raw model and bias corrected daily maximum and minimum temperatures and daily precipitation from eleven CCAM simulations over Queensland region was used to derive the climate extremes indices(CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI)). Talk will present results of analysis focusing on projected changes in selected extreme indices over Queensland region at 1.5, 2 and 3 degrees of global warming. We will also discuss the impact of bias correction approach on the projected changes in extremes.