Clim Dyn
DOI 10.1007/s00382-015-2680-4

# An assessment of CSIRO Conformal Cubic Atmospheric Model simulations over Sri Lanka

**A. Thevakaran[1,2] · J. L. McGregor[2] · J. Katzfey[2] · P. Hoffmann[2] · R. Suppiah[2] · D. U. J. Sonnadara[3]**

Received: 21 August 2014 / Accepted: 20 May 2015


**Abstract** In this study, we present an assessment of the Conformal Cubic Atmospheric Model (CCAM) 50 km simulations forced by the sea surface temperature and sea ice concentration of six global climate models (GCMs) (ACCESS1-0, CCSM4, GFDL-CM3, NorESM, MPI-ESM and CNRM-CM5) from the Coupled Model Inter-comparison Project Phase 5 (CMIP5) over South Asia, centred on Sri Lanka. The model simulations were compared with the data provided by the Asian Precipitation Highly Resolved Observational Data Integration towards Evaluation of Water Resource (APHRODITE) project and ERA-Interim from the European Centre for Medium range Weather Forecast (ECMWF) over a broad region centred on Sri Lanka. This broad region includes South Asia and northern Indian Ocean. Statistical measures such as pattern correlations, mean biases and root mean square errors were calculated separately for the four seasons. Results based on statistical tests indicate that the current CCAM simulations capture the spatial patterns of 10 m wind speed, mean sea level pressure, temperature and rainfall over a broad region over South Asia fairly well. The annual cycles of temperature and rainfall were also compared against observations over the northern and southern regions of Sri Lanka by taking the field average of each model and the observed data. The characteristics of the observed annual variations of rainfall and temperature over the smaller domains are not very well captured by the CCAM simulations. There are differences in the magnitudes of the temperature and rainfall in the six member CCAM simulations. Comparatively, the two CCAM simulations CNRM-CM5 and GFDL-CM3 show slightly better agreement over the Sri Lankan region.

## 1 Introduction

Climate model results are used as projections for a variety of purposes. For example, climate change projections are used for planning of infrastructure, ecosystem and species distribution, agriculture and forestry, urban designs, etc. (Dale et al. 2001; Ryan et al. 2008). Since the projections from global climate models (GCMs) are derived from coarse horizontal resolutions and most of the climate impacts occur on regional and local scales, projections from dynamical and statistical downscaling are used in many studies (Schmidli et al. 2006; Hellstrom et al. 2001; Murphy 2000).

In this study, we have used the outputs from the Conformal Cubic Atmospheric Model (CCAM) which was developed at the Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia. CCAM is a global climate model which can simulate the regional atmosphere using a stretched conformal cubic grid, where the grid is focused on the area of interest (McGregor 2005a, b). A number of simulations were performed using CCAM to regenerate the regional climate systems especially over Australia and the surrounding countries. Corney et al. (2010) produced climate change projections with CCAM at 14 km resolution for the Special Report on Emission Scenario (SRES) A2 and B1 and demonstrated that the CCAM can reproduce many of the key climate systems that affect

✉ A. Thevakaran
atheva79@yahoo.com

[1] Department of Physics, University of Jaffna, Thirunelvely, Jaffna, Sri Lanka

[2] CSIRO Marine and Atmospheric Research, Aspendale, VIC, Australia

[3] Department of Physics, University of Colombo, Colombo 3, Sri Lanka

Published online: 28 May 2015