5.104 Sensitivity of climate to modelled aerosol particles and their transport patterns in southern Africa.

Presenting Author:
Rebecca Garland, Natural Resources and the Environment Unit, Council for Scientific and Industrial Research, Pretoria, South Africa and Climatology Research Group, North West University, Potchefstroom, South Africa , RGarland@csir.co.za

Co-Authors:
Mary-Jane Bopape, Centre for High Performance Computing, Council for Scientific and Industrial Research, Pretoria, South Africa
Marcus Thatcher, Marine and Atmospheric Research, Commonwealth Scientific and Industrial Research Organisation, Melbourne, Australia
Thabo Makgoale, South African Weather Service, Pretoria, South Africa
Roelof Burger, Climatology Research Group, North West University, Potchefstroom, South Africa
Susanne Bauer, Center for Climate Systems Research, Columbia University, New York,NY, USA and NASA Goddard Institute for Space Studies, New York, NY, USA
Stuart Piketh, Climatology Research Group, North West University, Potchefstroom, South Africa
Francois Engelbrecht, Natural Resources and the Environment Unit, Council for Scientific and Industrial Research, Pretoria, South Africa and School of Geography, Archaeology and Environmental Studies, University of the Witwatersrand, South Africa

Abstract:

Africa contains the largest sources of biomass-burning aerosols and dust, globally. An accurate representation of these aerosols in climate models is needed to understand the regional and global radiative forcing and climate impacts of aerosols, at present and under future climate change. Previous work has validated the current representation of aerosol particles in the Conformal Cubic Atmospheric Model (CCAM) using the CMIP5 historical emissions inventory to monitored AERONET data over Africa, and for southern African found that CCAM simulates the monthly cycle of AOD well. Here, we focus on investigating the sensitivity of the southern African climate to the presence of aerosol particles and their transport patterns, with a particular focus on understanding the simulated aerosol climatology and aerosol transport patterns off the southwestern coast of Africa. This area can be impacted by different sources of aerosols (e.g. marine, biomass burning, dust, anthropogenic), and is of importance climatologically due to the presence of the stratocumulus clouds that form off the Namibian and Angolan coasts. In this study we analyze historical regional simulations from CCAM consistent with the experimental design of CORDEX. CCAM has a prognostic aerosol scheme for organic carbon, black carbon, sulfate, dust, and diagnostic sea salt. Regional simulations were

run with and without aerosols (using the CMIP5 emissions inventory (RCP8.5)). Aerosol and synoptic climatologies were generated using self-organizing maps to understand the aerosol patterns and their transport pathways, and the associated synoptic conditions. Preliminary results of the transport of aerosols suggest a newly identified aerosol pathway for biomass burning aerosols that exit the continent over Angola and are then recirculate back over the Atlantic Ocean towards Namibia. The impact of the simulated aerosol characteristics on clouds and climate were also investigated. This work is towards the development of the first African-led submission to CMIP6.