A REGIONAL SCALE KINEMATIC MOISTURE TRANSPORT MODEL ANALYSIS OF THE SOUTHERN AFRICA

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The Southern African region is widely acknowledged to be an area that is highly vulnerable to climate variability, particularly rainfall variability. Many recent climate change studies have suggested increased climate variability for the region in the future. Increasing population pressures caused by population growth as well as urbanisation will only magnify the vulnerability of the area to extremes in climate with drought being of major concern. Understanding the regional climate and in particular the processes driving the regional moisture cycle is critical to any attempts to predict the response of the regional climate to future climate change forcing.

Past research of moisture transport mechanisms in the area have largely been focussed on the large scale using relatively course scale tools such General Circulation Models (GCM), gridded moisture flux analysis and some simple trajectory modelling. Recent developments in Regional Climate Modelling (RCMs) have shown that regional scale moisture transport processes are much more complicated than can be captured with the course scale tools mentioned. Of particular interest are local sources of moisture including the role of the land surface in serving as a source of moisture. Linked to this is the concept of moisture recycling which describes the process whereby the local land surface provides moisture for local precipitation. Past studies have shown that for some areas this can play an important role in the regional precipitation.

In order to investigate these complexities this study has used a modern RCM to simulate the regional climate of Southern Africa on climatological time scales. The output of the RCM has then been used to drive a regional kinematic moisture transport model that traces parcels of moist air backwards in time from the point of precipitation to areas of evaporation. In addition, grid based moisture recycling and source sink analyses have been done to support and guide the results of the trajectory model.

The results presented show the climatological regional scale moisture pathways as well as intra-annual and inter-annual variability in the moisture pathways. This variability is presented in conjunction with the results of the moisture recycling and source sink analysis to give a comprehensive and quantitative analysis of regional scale moisture transport. .