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Assessing the transferability of Regional Climate Models

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An analysis of surface variables simulated by five Regional Climate Models (RCMs) was performed over seven different regions of the globe, with the objective of assessing their "transferability". That is, the ability of the RCMs to simulate the variability of continental scale climates, over different regions of the world, without any parameter changes as the models were run on the various domains. The RCMs used analysed lateral and surface boundary conditions and were run for a 5-year period spanning 2000-2004. To fully assess the ability of the five RCMs to represent observed variability we have used observations collected within the Coordinated Enhanced Observation Period (CEOP), over a 3-year period at high temporal frequency. We evaluate the performance of the 5 RCMs in simulating the observed variability of surface temperature and humidity, precipitation and wind speed. Where useful, an analysis of the simulated surface energy budget (surface radiation and turbulent fluxes) is made using CEOP flux observations. This aids in understanding the cause of deviations in surface temperatures and humidity from those observed. To gauge the transferability of the five RCMs we have evaluated their performance separately for winter and summer seasons, using CEOP observations taken from: (i) 1 mid-latitude coastal site (Cabauw, Europe), (ii) 2 mid-latitude continental sites (Lindenberg, Europe and Bondville, North America), (iii) 2 Arctic sites (Sodankyla, Northern Finland and Barrow, Alaska), (iv) 2 tropical land regions (Santarem, Brazil and northeast Thailand), (v) 1 southern-hemisphere land station (Tumbarumba, Australia) and 1 equatorial island (Aimeliik, western Pacific). We present time-series, frequency distributions, bias estimates and mean diurnal cycle results for these stations, highlighting geographic

areas and/or seasons when all the RCMs perform well or where there are systematic deviations. Where possible we use extra CEOP observations to determine the cause of a given model error and make recommendations for improvements for the individual modelling group concerned.