AOGS 2006

Climate Change and Extremes in Northern Canada: Statistical Downscaling Results Using Two Driving Coupled GCMS

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Statistical downscaling is one possible approach to relate the large scale climate variables with local or station scale observations to obtain near surface climate information at high resolution. This study investigate the most widely used regression-based statistical downscaling model (SDSM) with respect to its potential to reproduce the mean values as well as probabilities of extreme temperatures in the reconstruction of local observed climate, in some specific locations in northern Canada. Two series of climate predictors derived from two coupled global climate models (GCMs), namely the Canadian CGCM2 and the HadCM3 from UK, are also used to construct climate scenarios information for this region, in using A2 and B2 SRES emission scenarios. The results demonstrate that the statistical downscaling model is able to capture the major part of the climate change signal, with a plausible climatic regime for higher warming both in winter than in summer and in A2 than in B2 runs. Without using the low level air temperature of the GCMs (which is strongly biased) as a predictor, the study suggests that the combination of relevant atmospheric predictors is able to take into account most key factors of the climate change signal. While the GCMs have some generic weaknesses to simulate the main features of temperature regime in that particular region of Canada, the comparison of downscaled results with the GCMs temperature suggests a more consensual and physically-plausible signal in all downscaled series by comparison with CGCM2 and HadCM3 raw data anomalies. The confidence in local climate change information has not only related to the use of some specific methods (GCMs or all downscaling methods both dynamical and statistical ones) and their assessments, but also to the scrupulous analysis of climate regime and its temporal and spatial distribution, relevant at the scale of interest required for impacts studies.