Statistical downscaling of daily precipitation in two catchments in eastern China

F. Wetterhall (1), D. Chen (2), S. Halldin (1), C.-Y. Xu (1)

(1) Air and Water Science, Department of Earth Sciences, Uppsala University, Sweden, (2) Earth Sciences Centre, Gothenburg University, Sweden (fredrik.wetterhall@hyd.uu.se / Fax: +4618551124 / Phone: +46184712259)

Global climate studies indicate significant consequences for water resources globally and regionally, but many of its critical impacts will occur at sub-regional and local scales. Downscaling methods are, thus, needed to assess effects of large-scale atmospheric circulation on local parameters such as precipitation and runoff. In this study four methods of statistical downscaling of precipitation are evaluated on two regions in eastern China. Focus in the evaluation is on statistical properties of precipitation depending on season, since the study area has large seasonal differences. The study utilizes the evaluation indices outlined by the STARDEX project. The predictors in this study were daily data from the NCEP/NCAR-reanalysis project with 2.5˚ x 2.5˚ resolution for the time period 1961-2000. The predictors used were MSLP, GPH at 850 and 700 hPa and relative humidity at 1000, 850 and 700 hPa levels. The downscaling methods used were two analogue methods, one using principal components analysis (PCA) and the other Teweles-Wobus scores (TWS), a multi-regression technique with a weather generator producing precipitation (SDSM) and a fuzzy-rule-based weather-pattern-classification method (MOFRBC). The two analogue methods were mainly used as benchmark methods. In the study the temporal and areal properties of the predictors were carefully evaluated to derive the optimum setting for each method. Both MOFRBC and SDSM were able to downscale daily precipitation in par with the analogue methods, but different depending on season. The wet summer season was best captured by the MORBC method, whereas both SDSM and MOFRBC performed well in winter. The main conclusion was that the methods can be applied on precipitation stations in china.