An Evaluation of Statistical Models for Downscaling Precipitation and Their Ability to Capture Long-Term Trends

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Large scale changes in the sea level pressure do not necessary reflect changes in the atmospheric moisture budget, and hence may not give a good representation of changes in precipitation as a result of a global warming. Statistical models using both sea level pressure and large-scale precipitation as predictor are evaluated for a number of locations in Fennoscandia. The statistical models in most cases were capable of capturing 60%–80% of the year-to-year seasonal variations in precipitation and a correlation analysis over independent data indicated predictive skills scores in the range 0.2–0.5. A comparison between statistical models based on large-scale precipitation, sea level pressure, and a mixture of these, indicated similar skills in terms of variance and predictive skill of inter-annual variations. Analyses of their ability to capture recent precipitation trends reveal potential problems regarding reconstructing long-term changes in the past. One explanation for why the statistical models do not give similar past trend values as the station observations may partly be that precipitation trends during the most recent 50 years are not well defined because the interval is not sufficiently long. This is supported by the fact that trend analysis for station observations based on two different data products, and different trend-analysis strategies do not correspond well with each other. An analysis of possible non-stationarities between large and local spatial scales does not indicate significant presence of non-stationarities.