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# Towards improving the reliability of future regional climate projections: A bias-correction method applied to precipitation over the west coast of Norway

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The early winter of 2011/2012 in the city of Bergen, located on the west coast of Norway, was dominated by warm, wet and extreme weather. This might be a glimpse of future average climate conditions under continued atmospheric warming and an enhanced hydrological cycle. The extreme weather events have resulted in drainage/sewage problems, landslides, flooding property damage and even death. As the Municipality plans for the future they must contend with a growing population in a geographically complex area in addition to any effects attributable to climate change. While the scientific community is increasingly confident in the projections of large scale changes over the mid - high latitudes this confidence does not extend to the local – regional scale where the magnitude and even direction of change may be highly uncertain. Meanwhile it is precisely these scales that Municipalities such as Bergen require information if they are to plan effectively.

Thus, there is a need for reliable, local climate projections, which can aid policy makers and planners in decision-making. Current state of the art regional climate models are capable of providing detailed simulations on the order of 1 or 10km. However, due to the increased computational demands of these simulations, large ensembles, such as those used for GCM experiments, are often not possible. Thus, greater detail, under these circumstances, does not necessarily correspond to greater reliability. One way to deal with this issue is to apply a statistical bias correction method where model results are fitted to observationally derived probability density functions (pdfs). In this way, a full distribution of potential changes may be generated which are constrained by known, observed data.This will result in a shifted model distribution with mean and spread that more closely follows observations. In short, the method temporarily removes the climate signals from the model run working on the different percentiles, fits the distribution to that of the observations and adds back the climate signal found in the model run.

This bias-correction methodology is applied to the output of a four-member ensemble of a high resolution AGCM (30 km over Norway) plus a control simulation. Point observations from the Bergen area for the control period are used to build “ground truth” pdfs. After the bias-correction method is applied the future climate simulations (2031-2060) are compared to a 30-year control period (1961-1990).

The results indicate that this method may lead to more reliable local scale projections for future precipitation change.