Extreme Precipitation in Norway and the Connection to Atmospheric Rivers

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In recent years, the awareness of landfalling atmospheric rivers (ARs) and their association with extreme precipitation in Norway has increased dramatically. Stohl et al. (2008) and Sodemann and Stohl (2013) provide compelling evidence for the important connection between northerly moisture transport and high impact Norwegian weather.

In this study, we present a 35-year climatology of cool season extreme precipitation using ERA-Interim data. Precipitation 'events' are identified when the 24-hour area-average precipitation exceeds the 99 percentile. The areas in question (North, South and West) are based on both the observed climatology of precipitation and operational forecast experience. Subsequently, an objective technique to discern the presence or absence of ARs is employed (based on Rutz et al. 2014): preliminary results illustrate that the majority of the events are associated with landfalling ARs.

To better understand the large-scale setup that preconditions the environment for extreme precipitation, an empirical orthogonal function and fuzzy cluster analysis is conducted on the observed events in each region (Harr et al. 2008). Convincing evidence exists that there are unique setups that are conducive to the all important northerly moisture flux that culminates in extreme precipitation.

We believe these results provide insight into predictability on the medium range. A companion paper providing an in depth analysis of a damaging event that occurred in October 2014 will further highlight the predictability aspect of this work.

Knowing the main features behind extreme precipitation in Norway is vital, as precipitation is an important input to precipitation-runoff models. Within the field of hydrology (and engineering), the theoretical estimation of extreme precipitation, probable maximum precipitation (PMP) is used as a design value for infrastructure, e.g dams and flood protection structures. The ultimate goal of this research is to provide a much improved, dynamical estimate of PMP for Norwegian high impact events.

References:

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