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Trends in floods in small Norwegian catchments – instantaneous vs. daily peaks

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Climate change is expected to cause increases in precipitation in Northern Europe with increasing flood magnitudes as a result. Although an increase in both the frequency and intensity precipitation events has been observed across most of Norway (Dyrrdal, 2012), no systematic spatial trends in flood magnitude have been identified (Wilson et al., 2010). Traditionally mean daily annual maximum values are often used for flood studies in the absence of sufficient periods of good quality instantaneous peak flow data, which for many stations only span the last 10-20 years. If the increase in precipitation is most pronounced for local short term extreme events, a larger increase in instantaneous flood peaks in small catchments as compared to daily average floods could be expected. In this paper data from 32 small Norwegian catchments (<60km2) for the period 1980-2011 were analysed to investigate spatial and temporal changes in daily and instantaneous annual maxima flood peaks, given these are two of the most crucial parameters for the reliability of design flood estimates. This research has been carried out as part of a project jointly funded by three government agencies in Norway who manage water resources, the roads and railways. This analysis contributes to one of the project objectives, to investigate climate change effects in small catchments in Norway and obtain improved flood estimates for climate change adaptation. The level of autocorrelation in all flood series, was assessed prior to analyses, but was found to be insignificant at all stations. The Mann-Kendall test was applied to investigate trends in: (a) the magnitude daily annual maxima peaks, (b) the magnitude of instantaneous annual maxima peaks, and (c) the ratio between daily and instantaneous annual maxima values. Results show the trend in flood magnitude is generally the same for daily and instantaneous flood peaks. Overall there are a greater number of positive trends (22%) in flood magnitude, particularly at stations southern Norway, with only a few stations (in the north, west and central areas) showing a weak negative trend (10-12.5%). In line with these results, the intensity of strong daily precipitation events also showed a general increase, except in parts of central and northern Norway (Dyrrdal, 2012). However, a different pattern is observed for the ratio, with many stations across Norway showing a decreasing trend (i.e. the difference between the daily and instantaneous annual maxima flood peaks has declined). Four stations (13%) show a strong negative trend, while 22% of stations show a weak negative trend.

References

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