Geophysical Research Abstracts
Vol. 18, EGU2016-1316, 2016
EGU General Assembly 2016

The role of antecedent moisture conditions on flood response

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A catchment's antecedent moisture conditions (AMC) represent the relative wetness of a catchment prior to a flood event. The catchment's moisture content prior to an extreme precipitation event can have a significant influence on overall flood response. This study derives an 'antecedent effect ratio' (AER) metric to describe the importance of a catchment's antecedent moisture content on overall runoff volume. The metric was applied to 211 catchments in Australia using hourly precipitation and streamflow data to identify the difference in flood response between dry and wet AMC. Regional calibration of the antecedent period length was used to estimate the effect ratio for all catchments. The AER was found to vary substantially, with the difference in flood response during wet and dry antecedent conditions up to three times that under median conditions for some sites. Higher AER values were found at latitudes closer to the equator and for catchments with highly seasonal precipitation regimes. Other climatic characteristics (e.g. mean annual precipitation, aridity index) and physical catchment characteristics (e.g. vegetation ratio, soil depth) had lesser influence. To improve the assessment of flood models it is important to have metrics, such as the AER, that can evaluate the contribution of antecedent moisture towards a flood response.