



## **Runoff exceeding rainfall: The problems of precipitation underestimation in the Eden Catchment, Cumbria, UK.**

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Calculating runoff depth in a catchment is a useful tool in investigating catchment response to storms. It is a simple technique to apply to a catchment as it requires only the discharge of the channel at the outlet of the catchment and the catchment area. The value of runoff can then be compared with rainfall that fell in that catchment. Usually, runoff would be less than rainfall owing to other catchment losses. The Upper Eden catchment, Cumbria (part of the CHASM network) has a dense upland hydrological network which currently has 31 tipping bucket raingauges and 11 stage gauging stations strategically placed over the 616km<sup>2</sup> catchment in a nested catchment system. Over the past three years there have been 5 substantial rainfall events producing major flooding. Data from these events show an erroneous pattern of runoff exceeding rainfall for an upland sub-catchment during storm periods. The possible causes for this are an inaccurate stream rating curve for calculating high flows and an underestimation of rainfall from the raingauges. Undercatch of rainfall from strong winds could be a likely factor and runoff is more likely to exceed rainfall when the wind speeds in the catchment are high. In some storms gusts have been close to 160km/hr. To investigate the problems of undercatch in the catchment further, pit (ground level) raingauges will be dug next to high elevation gauges. The imminent introduction of a mobile X-band radar (20km range) monitoring in the catchment would provide much better space-time precipitation estimates.