Geophysical Research Abstracts
Vol. 21, EGU2019-19202, 2019
EGU General Assembly 2019

Linking hydrological monitoring at the catchment scale to vegetation communities in upland blanket bog environments

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Understanding hydrological processes operating on peatlands and how they interact with the wider environment has been relatively neglected until recent years. The term ecohydrology was coined initially to demonstrate the close link between hydrology and ecology in peatlands. Research has been primarily focused on raised bog environments and blanket bog environments are relatively poorly understood. This research aims to address the gaps in knowledge related to blanket bog ecohydrology and its influence on the wider environment, in terms of ecosystem services to water through flow and water quality monitoring. With anthropogenic disturbances to peatlands, effects such as deterioration in water quality and flow regime have been prominent. Ecological impacts such as change in ecosystem structure and function and effects to receiving water bodies are also evident.

This two year study investigated the interactions between hydrology and ecology in three SAC blanket bogs within the island of Ireland that had both areas that were anthropogenically altered and unaltered areas. Ecological surveys along with hydrological and water quality monitoring were carried out over a 2 year period to help further understand the ecohydrological interactions in Irish Blanket bogs. Findings demonstrate that these ecosystems consist of a mosaic of different vegetation communities including blanket bog habitats dominated by different vegetation types. Notably there are distinct differences between the three sites, each with their own dominant vegetation communities and habitats in different mosaics. Blanket bog vegetation communities can be linked to hydrological processes and hydrogeological heterogeneity. Correlations between hydrological model outputs, vegetation (habitat) type and macro topography are evident. Microtopography reflects the interrelationship of hydrological supporting conditions for active blanket bog communities and the hydrological regime operating in the area. Vegetation maps indicate subsurface hydrological processes and thus can help make inferences for ecosystem services to water on Irish blanket bogs. Simulations of surface hydrological processes allow comparison with vegetation maps showing a relationship with mapped boundaries and areas experiencing focussed flow. In terms of water quality, it was notable that total organic carbon (TOC) within all sites increased markedly in August suggesting a flushing of organic carbon from the peat with first rains after prolonged periods of drought and lowered water tables. Organic matter contributes to colour of water and this is a topic of concern for water treatment agencies in terms of water treatment costs. The current conceptual model of blanket bog hydrology depicts water moving in and out of these ecosystems with minimal contact with the underlying bedrock, therefore having relatively low SEC, comparable to rainwater. However, data gathered in the study show base flow from stream waters routinely reaching over 300uS/cm from blanket peat covered areas, suggesting a contribution from more mineralised groundwater.

Ecohydrological investigations may be able to provide a means of using existing data to evaluate ecosystem services delivered in peatlands where there is lacking in relevant ecohydrological data and to help update the current conceptual model for blanket bog hydrology.