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BROMINE IN RAINFALL, CLOUD, STREAM AND GROUNDWATER IN THE PLYNLIMON AREA OF MID-WALES

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Dissolved labile bromine (DLBr) and bromide concentrations in rainfall, cloud water, stream water and groundwater are described for the upper River Severn catchments of mid-Wales. Stream water and rainfall concentrations of DLBr and bromide are of similar concentration, with the streams moderately higher. The DLBr range in average concentration across the area between 18.3 and 27.8 ìgl-1 and this compares with a rainfall average of 15.6 ìgl-1 for DLBr. The corresponding values for average bromide concentration are 13.8 to 18.6 ìgl-1 for the streams and 13.2 ìgl-1 for rainfall. For cloud water, throughfall and stemflow, DLBr concentrations are an order of magnitude higher than in rainfall and the concentrations are strongly correlated with chloride. Bromide in rainfall and cloud water shows similar levels as DLBr and strong correlations with chloride (no bromide measurements were taken in throughfall and stemflow). These features indicate that marine aerosol inputs are high and that the DLBr is associated primarily with bromide. For cloud water, there is correlation between DLBr and dissolved organic carbon (DOC) as well as with chloride and, hence, there may well be an organobromine component. Within the streams DLBr increases with time when DOC increases. DLBr concentrations in the stream are correlated with chloride, albeit weakly. In the streams, bromide is weakly correlated with chloride but not with DOC. Within the groundwater, only DLBr has been measured and its concentration is similar to that for the streams. Dissolved labile bromine is poorly correlated with DOC concentrations in the groundwater zone where DOC is largely converted to CO2. Atmospheric input-stream output flux estimates indicate a net uptake of bromide by the catchment of around 30% but this uptake is

matched by a corresponding release of DOC-associated bromine.

Key words: bromide, cloud water, chloride, dissolved labile bromine, dissolved organic carbon, Hafren, Hore, mist, organobromine, Plynlimon, rainfall, stemflow, Tanllwyth, throughfall, river.