Flow path-based assessment of DOC-discharge relationships in a headwater catchment

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The effects of water flow paths on the variation of scatter plots between dissolved organic carbon (DOC) concentration and stream discharge (C-Q plots; units, mg L-1 for concentration and m3 s-1 for discharge) at the outlet of a headwater catchment (106 ha) in central Japan were investigated based on hydrometric and hydrochemical observations for a hillslope (0.65 ha). The stream water during storm flow periods represented a broad range on the C-Q plot. However, the classification of stream water based on dominant flow path confined stream water to a fairly narrow field on the C-Q plot. On the C-Q plots, when the dominant flow path was saturation excess overland flow generated from near a spring area, the stream waters were bounded by lines of 1:100 and 1:300; on the other hand, when the dominant flow path was saturated subsurface flow derived from an upslope area, they were bounded by lines of 1:10 and 1:30. For identification of dominant flow paths, it was only necessary to monitor the hillslope discharge after the relationships between hillslope discharge and dominant flow paths were found through a 6-month intensive hillslope hydrological observation. These results suggest that hydrological observation on a hillslope scale can be a useful tool to assess DOC concentration-discharge relationships on a headwater catchment scale.