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Three End Members Generating Stream Chemistry in Kawakami Headwater catchment, Central Japan

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Attempt to characterize stream chemistry from various source areas of runoff has received much attention of hydrologists and environmentalists to come up with a conceptual strategy for the environmental management. Yet, the hydrologic flowpaths and chemical pathways generating the stream chemistry are still debatable. End Member Mixing Analysis (EMMA) has been used to identify the potential source areas involved in the formation of stream water chemistry in Kawakami forested headwater catchment, Central Japan. The analysis has shown that three end members have been involved in the mixture of stream chemistry including (a) near surface riparian water, (b) hillslope soil water and (c) deep riparian groundwater. Contribution of each end member was quantified for the 143.5 mm of storm on August 21-22, 2001, which showed that the near surface riparian, hillslope soil water and deep riparian groundwater were the major sources of storm runoff comprising as much as 45%, 35% and 20% of the total runoff respectively. A mixing diagram of Ca^{2+} and SiO_2 showed that the stream chemistry was well bounded within the end-members contributing to storm runoff (Figure 1). Stream water chemistry was much similar to that of the near surface riparian water at baseflow condition and at the post storm, while similar to that of hillslope soil water at the peak storm. Although the concentrations of Na^+, K^+, Mg^{2+}, Ca^{2+}, Cl^-, NO_3^-, and SO_4^{2-} of the deep riparian groundwater were the highest among the end members, but those contribution to the stream chemistry were less. This suggests that the stream chemistry of the catchment studied was obviously generated by the shallow flow.

Keywords: End members; End-Member Mixing Analysis (EMMA); Stream chemistry; Runoff; Headwater catchment

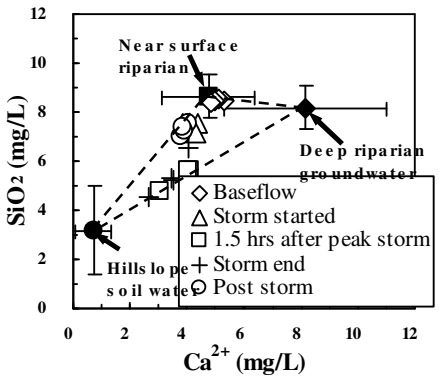

Figure 1: Mixing diagram of Ca2+ and SiO2 concentrations during storm runoff on August 21-22, 2001