Estimation of nitrate loading into the river water, surrounded by mountain forest and alluvial fans

Takashi Nakamura[1]; Futaba Kazama[2]

[1] Ecosocial System Eng., Yamanashi Univ; [2] Ecosocial System Eng., Univ.Yamanashi

http://www.coe.yamanashi.ac.jp/˜coe/

Oxygen, hydrogen and nitrate-nitrogen isotopes were used as tracers in hydrograph separations and to identify the nitrate sources during the base-flow and storm-flow in the Fuefuki watershed, Japan.

Instantaneously discharged water in the Fuefuki river showed wide fraction of nitrate-nitrogen isotopes during the storm event. Hydrograph separation by oxygen and hydrogen isotopes demonstrated that the discharge water during the base-flow predominantly consisted of groundwater (80-90%), while, mountain stream water shared only about 10-20%. Unlike the base-flow, during the storm-flow event, the discharge water consisted 45% groundwater and similar percentage (45%) from mountain stream water, whereas less than 10% derived from the rain water.

The water derived by rainfall was calculated by the multiplying the discharge (m^3/s) and nitrate concentration (mg/l) in rainwater. The nitrate-loading from the water derived by rainfall was less than 1% during the storm-flow. End Member Mixing Analysis using nitrate-nitrogen isotopes demonstrated that the nitrate-loading during the base-flow were 15 %(10g/s) and 85 %(50g/s) from forest and agricultural areas respectively. During the storm-flow the forest and agricultural areas had the nitrate loading rate 48 %(220g/s) and 51 %(240g/s) respectively.

The study found the origin of water component during the base flow and the storm flow events and it has further demonstrated the sources of nitrate and their contribution during these events.