Hydro-geomorphological factors which control reduction processes in a forested watershed.

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Many studies have reported that denitrification may occur in riparian zone(e.g., Hill et al (2000) where topographic gradient is small. The relationship between topography and reduction processes such as denitrification attracts researcher's attention these days (Gold et al., 2000; Hill et al., 2000). Past studies (Ogawa et al., 2006; Shibata et al., 2010) have reported that the nitrate concentration of stream water is small in catchments of small topographic gradients. The cause of it is probably due to denitrification. But concrete and systematic knowledge is limited where the reduction processes such as denitrification occur in forested catchment.
The purpose of this study is to know hydro-geomorphologial conditions in which denitrification, manganese, iron and sulfate reduction processes occur.
The study site is a small forest catchment located in Hachioji Tokyo. We measured the topographic gradient and the concentration of nitrate, dissolved manganese, dissolved iron and sulfate in water extract from soil and ground water.
The nitrate concentrations of upper sampling points in steep slope are higher than 0.05mmol/kg from surface soils to deep soils (Fig.1). On the other hand, the nitrate concentrations have become lower than 0.05mmol/kg or nitrate was not detected at the saturated zone of middle and lower sampling points in gentle slope (Fig.1). So denitrification occurred in underground of gentle slope area.
The dissolved manganese concentrations have become higher than 1.0μg/kg at the saturated zone of middle and lower sampling points in gentle slope (Fig.1). Therefore, manganese reduction occurred in underground of gentle slope area.
The dissolved iron concentrations have become higher than 4.0mg/kg at the saturated zone of middle and lower sampling points in gentle slope (Fig.1). Therefore, iron reduction occurred in underground of gentle slope area.
The sulfate concentrations have become lower than 0.05mmol/kg at the saturated zone of middle and lower sampling points in gentle slope (Fig.1). The sulfate concentrations of other area were much higher than 0.05mmol/kg (Fig.1). Therefore sulfate reduction occurred in underground of gentle slope area.
The ground water concentration of nitrate gradually deceased along the ground water flow (Fig.2). And the ground water concentration of sulfate from the well E was very low (Fig.3). These changes of nitrate and sulfate concentration from well A to well E mean that these substances may have been reduced when the ground water flowed through this reduction zone (Fig.1) located at the bottom of this forested watershed.
This study demonstrated where nitrate, manganese, iron and sulfate reduction processes occur in forested watershed. The reduction zone was located at the underground in gentle slope. It is likely that gentle slope which makes shallow soils saturated by ground water is the hydro-geomorphologial factor and it causes the reduction processes. This result suggests that such reduction zone has a great influence on ground water and stream water chemistry.

Keywords: a forested watershed, hydro-geomorphological, reduction process

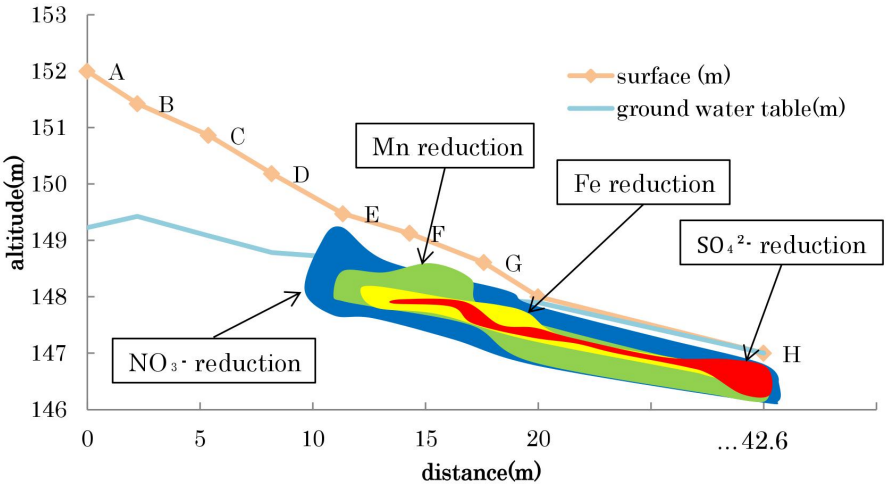

Fig.1 The distribution of reduction zone in forested watershed.

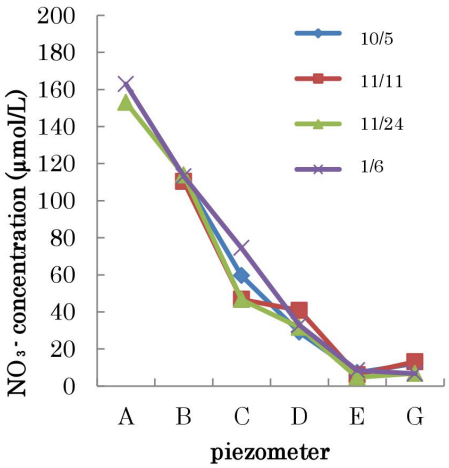

Fig.2 NO_3^- concentration of ground water

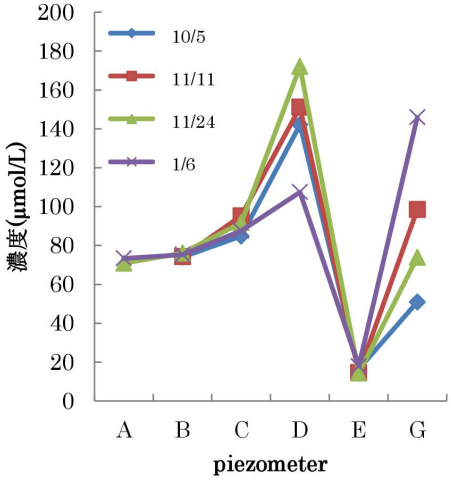

Fig.3 SO_4^{2-}concentration of ground water

