GROUNDWATER DYNAMICS RELATED TO SALINIZATION AND EROSION OF SOILS (PHRA YUN DISTRICT, NORTHEAST THAILAND)

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Abstract: The northeast of Thailand is mainly occupied by a large sub-watershed of the Mekong River where two major rivers are flowing through sedimentary deposits affected by upward movement of deep saline groundwater. Upstream of the Chi River, two study sites were selected in the west and east of the village of Phra Yun (16°20'N, 102°39'), one in the lowlands cultivated with flooded rice near the village of Ban Daeng (16°21'N, 102°36'), the other in the uplands within a large rubber-tree plantation near the village of Ban Non Tun (16°20'N, 102°44'30"). In lowlands during dry season, discrete saline patches of various sizes and shapes cover soil surface with white efflorescences. In uplands features of soil erosion are widespread and a sudden soil redistribution occurs downstream during heavy rainfall events. Salinization and erosion of soils are enhanced by human activities, namely deforestation (wood cutting), land use changes (denudation of soils), water storage (dam, pond) and groundwater abstraction for salt production (pumping). The buildup and spread of both soil processes have resulted in major economic and environmental impacts.

The position and the chemical composition of groundwater were monitored in the lowland site using four boreholes 20m deep, two inside saline patches, two outside, and in the upland site along a slope using eight deep piezometers (from 10 to 32m in depth). At each site, the device has been complemented by a network of shallow piezometers (< 3m in depth). The pedological and mineralogical characteristics of the soils and bedrocks were determined at laboratory and on site. In lowlands, groundwater salinity has a heterogeneous distribution, vertical and lateral, and is controlled by the structure and nature of sedimentary deposits. The hydrogeological system is similar in both sites and characterized by two aquifers. One is deep and fractured, the other is shallow and sandy. The two aquifers are separated by a clayey layer thicker downstream and weakly permeable. A conceptual model linking the groundwater dynamics of both sites is proposed. It shows the interdependence of the two hydrosystems in dry conditions (saline contamination in the uplands) and in wet conditions (water dilution and prolonged waterlogging in the lowlands).