



Some convincing evidences of a deep root system within an interfluve aquifer of Northeast Thailand

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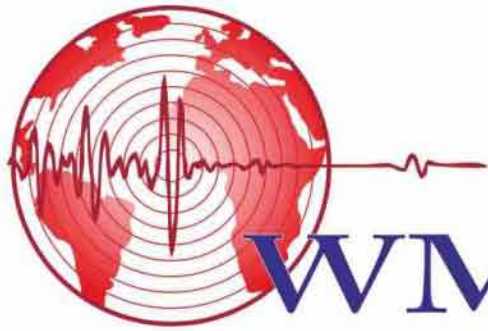
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ABSTRACT

The northeast of Thailand (NT) is dominated by a landscape of low hills with elevations ranging from 170 m (lowlands) to 240 m (highlands). Dipterocarpus forest originally occupied the highlands, but was heavily destroyed during the last half of the twentieth century. Intensive deforestation has favored the development of cash crops such as cassava, sugarcane, kenaf and maize. It is widely accepted that the change in land use has led to a radical change in the hydrological balance within the NT, namely a rise in groundwater due to the increase in deep aquifer recharge, an evapotranspiration decrease of seasonal crops and an extension of the saline contamination in the bottom of slopes and in lowlands. Studies on the deep roots of tree species are relatively limited because the investigative tools access to limited information. The purpose of this study is to (i) characterize the mineralogy of the deep surface formations along an interfluve toposequence; (ii) detect traces of root biomass in the geological substrate; (iii) if possible, interpret the origin of the deep roots. Located near the village of Ban Nong Tun and about 20 km southwest of the city of Khon Kaen, in the district of Phra Yun, the studied watershed has an area of 2 km². The soil profile includes a clay layer of varying thickness over bedrock (sandstone-siltstone) and below a sandy surface layer. The depth of the clayey layer is less than one meter at the top of the slope and increases along the slope up to a few meters. The sandy layer has iron oxide stains which reflect the mobility of iron under reducing conditions. Three boreholes (worm screw) were implemented for deep piezometry (PB1K, PB2K and PB5K). Disturbed materials were sampled every meter for a mineralogical analysis by X-ray diffractometry. On each sample the root biomass was weighed. Isotopic measurements (¹³C and ¹⁴C) and scanning electron microscopy observations were performed on some root samples. The main results show that quartz, kaolinite and smectite are the predominant minerals in the clay fraction with some illite. Quartz is the major component of the non-clay fraction with a small amount of feldspar and traces of goethite. The distribution of root biomass as a function of depth indicates a high amount of root biomass (from 0.1 to 1.8 g 1000g⁻¹) at a depth ranged from 20 m to 30 m. The root biomass occurs below the actual groundwater level. The deep roots are in a good state of preservation and assigned to trees. The current presence of a water table suggests that the roots of the past trees had to reach a water-saturated zone, probably deeper, to meet the water and nutrient requirements with minimal energy. In conclusion, root biomass was observed and quantified at several tens of meters in depth. The proximity of a groundwater body is a favourable environment for the development of a deep root system which is probably widespread throughout the deforested environment insofar textural discontinuities do not prevent the root progression in depth.

Key words: Root biomass; mineralogy; groundwater; watershed; rubber tree; Northeast Thailand.

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Preface

This Abstract Collection consists of the abstracts of papers presented in the "World Multidisciplinary Earth Sciences Symposium" in the city of romance Prague (Czech Republic) during 5-9 September 2016. The World Multidisciplinary Earth Sciences Symposium (WMESS) aims to provide a forum for discussion of the latest findings and technologies in different fields of Earth Sciences, to give opportunities for future collaborations. WMESS wants to be a platform for sharing knowledge and experiences in the fields of Earth Sciences, to lead for providing a forum for early career researchers for presentation of their work and discussion of their ideas with experts in different fields of Earth Sciences such as; Tectonics & Structural Geology; Engineering Geology; Geotechnics; Hydro-Hydrogeological Sciences; Natural Hazards; Geomorphology; Geochemistry, Mineralogy, Petrology & Volcanology; Stratigraphy, Sedimentology & Palaeontology; Geophysics & Seismology; Geodesy, Photogrammetry & Cartography; Informatics, Geoinformatics & Remote Sensing; Mining Engineering; Mineral Processing; Blasting & New Technologies; Natural Resources; Environmental Sciences; Energy, Resources & Pollution & the Environment; Environmental Legislation; Biogeosciences; Geological Heritage & Geoparks; Urban Planning; Atmospheric Sciences – Climate; Modelling and Soft Computing Techniques in Earth Sciences; Medical Geology; Occupational Health and Safety.

WMESS 2016 will be the 2nd of the Annual series and the main mission of the "World Multidisciplinary Earth Sciences Symposium - WMESS" is to lead to contribute in multidisciplinary studies related with atmosphere, biosphere, hydrosphere, lithosphere and pedosphere of the Earth and interaction of the human with them. As another mission, it provides a forum for this diverse range of studies, which report very latest results and document emerging understanding of the Earth's system and our place in it. The Scientific Committee and Institutional Scientific Partners of WMESS was completed by paying strict attention, and all members were selected from well-known, very much appreciated, productive and representatives of the different countries. We are deeply grateful to the members of the scientific committee and institutional scientific partners (International Association for Engineering Geology & the Environment – **IAEG**, International Union of Soil Sciences – **IUSS**, International Geographical Union – **IGU**, The International Association of Hydrogeologists – **IAH**, Geological Sciences of Italy – **SGI**, Czech Soil Science Society – **CSSS**, Arabian Geosciences Union – **ArabGU**, The Society of Economic Geology of Romania – **SEGR**, World Meteorological Organization – **WMO**, International Medical Geology Association – **IMGA**, Russian Mineralogical Society – **RMS**, University of Petrosani) of WMESS.

We would like to express our sincere gratitude to all participants of WMESS 2016 from 50+ different countries all over the world for their interests and contributions in WMESS 2016. We wish you enjoy the World Multidisciplinary Earth Sciences Symposium – WMESS 2016 and have a pleasant stay in the city of romance Prague. We hope to see you again during next event WMESS 2017 which will be held in Prague (Czech Republic) approximately in the similar period.

Prof.Dr. Işık YILMAZ

President of WMESS – Chair of WMESS 2016