Long term montoring of soil electrical resistivity in a Laotian catchment of the OZCAR network. Impact of land use change, soil type and rainfall

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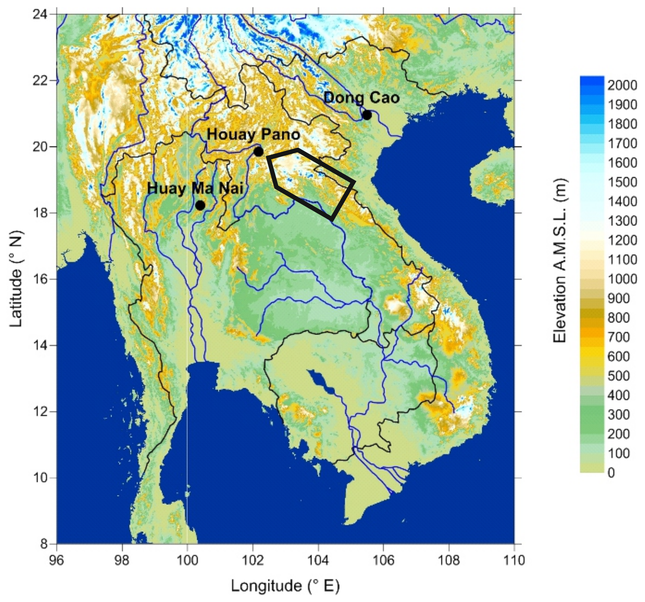
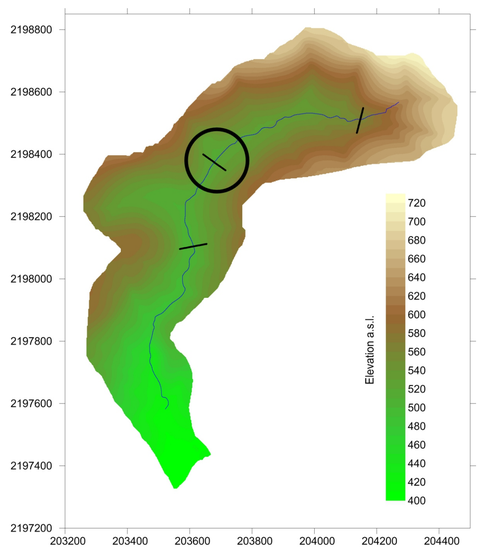
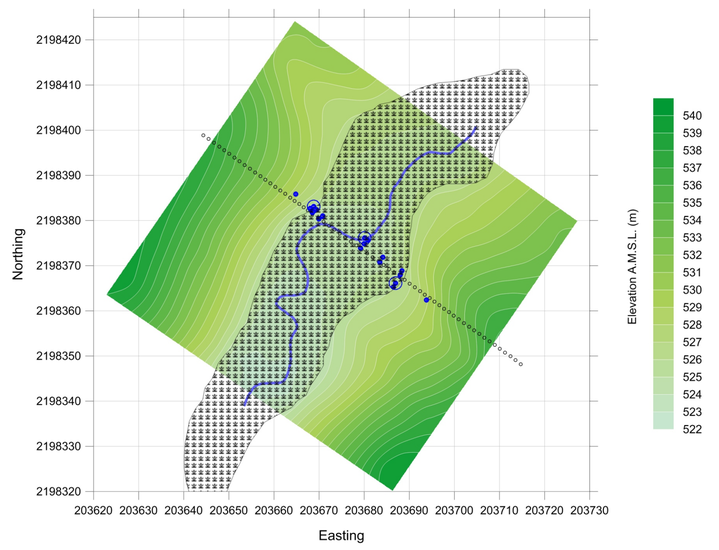


The MSEC observatory of the critical zone in south-east Asia, which is part of the OZCAR Network has been monitored since 1999 (Laos, Thailand, Vietnam) to study the long term impact of land use changes in tropical mountainous regions, in terms of soil properties (porosity, depth, SOC, nutrients…), biodiversity (weeds, soil macro fauna), plant roots (architecture, functions,…), and transfers within the critical zone at various temporal and space scales: partition between infiltration and runoff water quality (physical, chemical and bacteriological) and erosion processes (splash, inter-rill and rill, tillage, mass-movement). In the Houay Pano catchment located in Northern Laos, a long-term monitoring system was implemented in 2006 combining Electrical Resistivity Tomography (ERT), soil and hydrological equipments to better analyse the interactions between bank and hillslopes groundwater, and streamwater, in a context of steep slopes (>50%) and rapid land use change (conversion of annual crops to teak plantation).



Hydro-geophysical monitoring Station

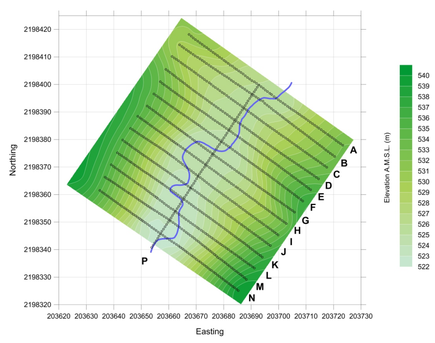
-1 automatic limnimeter
-3 automatic piezometers
-12 manual piezometers
-4 TDR tubes
-ERT monitoring since 11/2006
(RIB33 and RIB72
from 08/2006 to 04/2013)



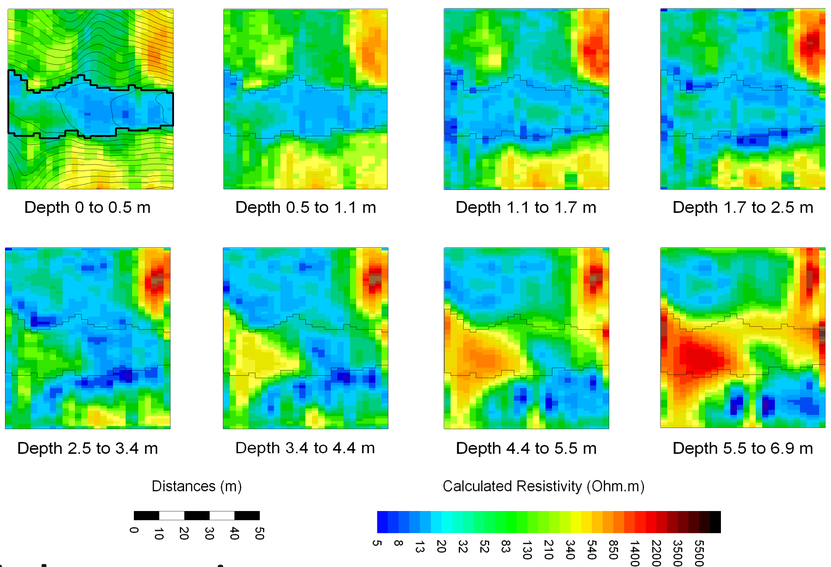
This continuous ERT monitoring has been carried out along a representative 100 m long transect in the middle of the 65 ha catchment perpendicular to the stream. The data were collected every week during rainy season and every second week during dry season. It has been associated with hydrological monitoring (piezometers, limnimeters, gauging weirs). Such high resolution geophysical monitoring data set provides an invaluable non-invasive proxy of soil water content variations in the different layers of the vadose zone. It demonstrates: i) the influence of plant cover on water infiltration; ii) the pathways for vertical and horizontal water fluxes within the soil cover; iii) the control of soil organisation along the hillslope over the hydrological behaviour of the unsaturated part of the critical zone.

Spatial Variability

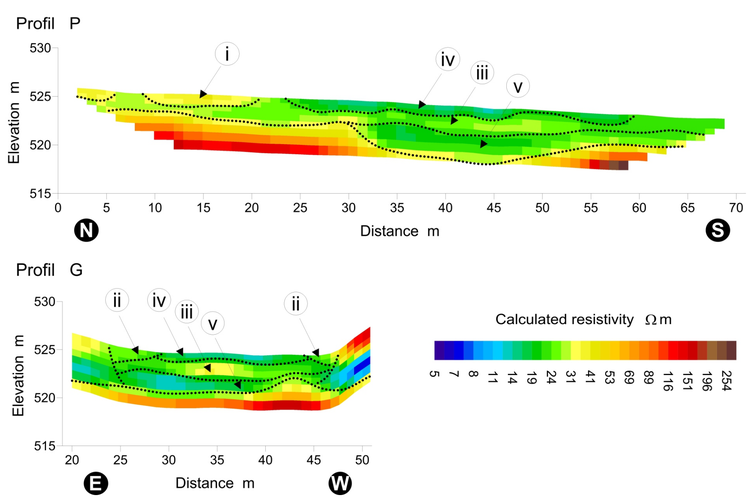
pseudo-3D ERT next to observation transect



Iso-Depth Layers

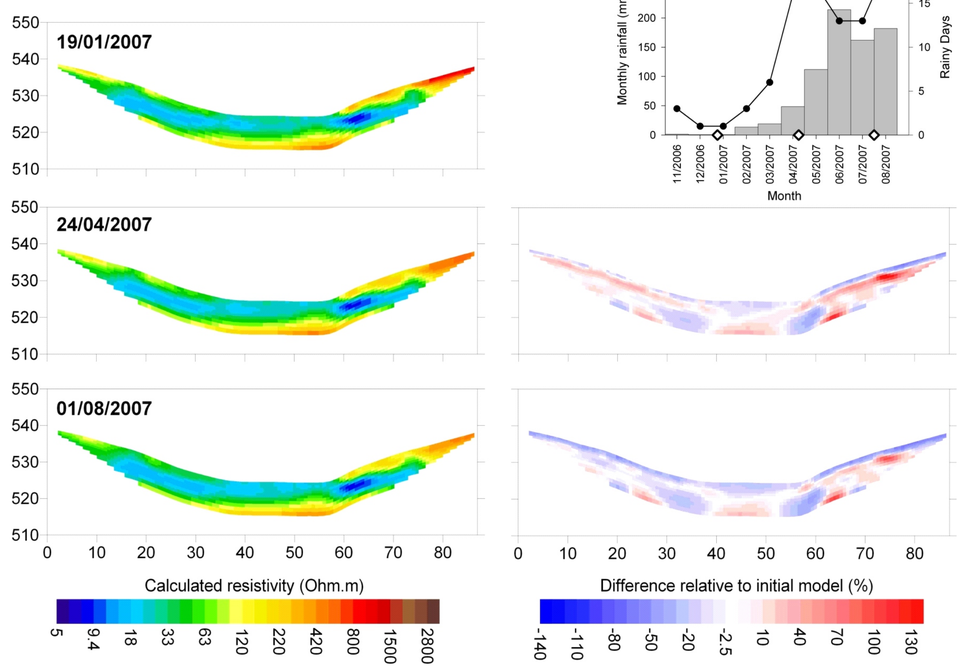


Vertical cross-sections

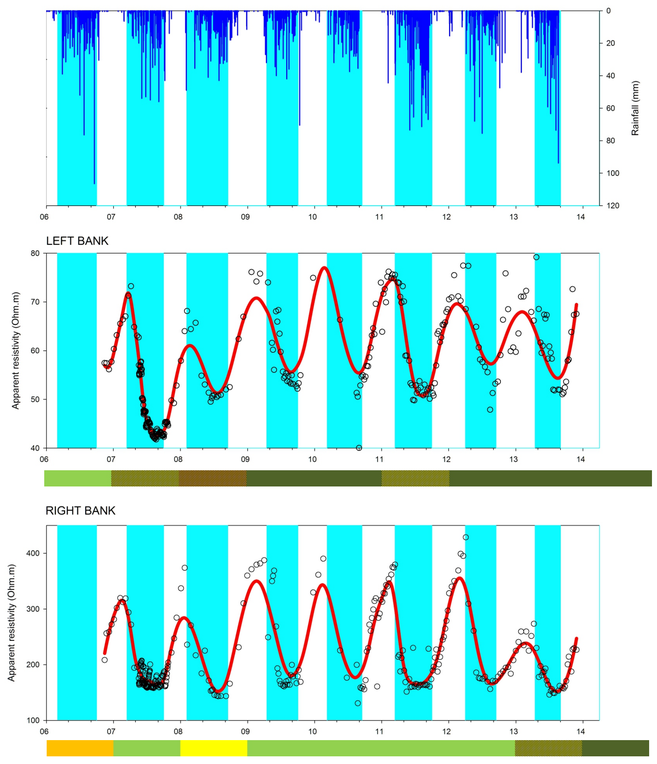


Temporal variability

Inter-seasonal



Inter-annual



Maize
Rice
Fallow
Teak
Teak & Rice
Teak & Maize