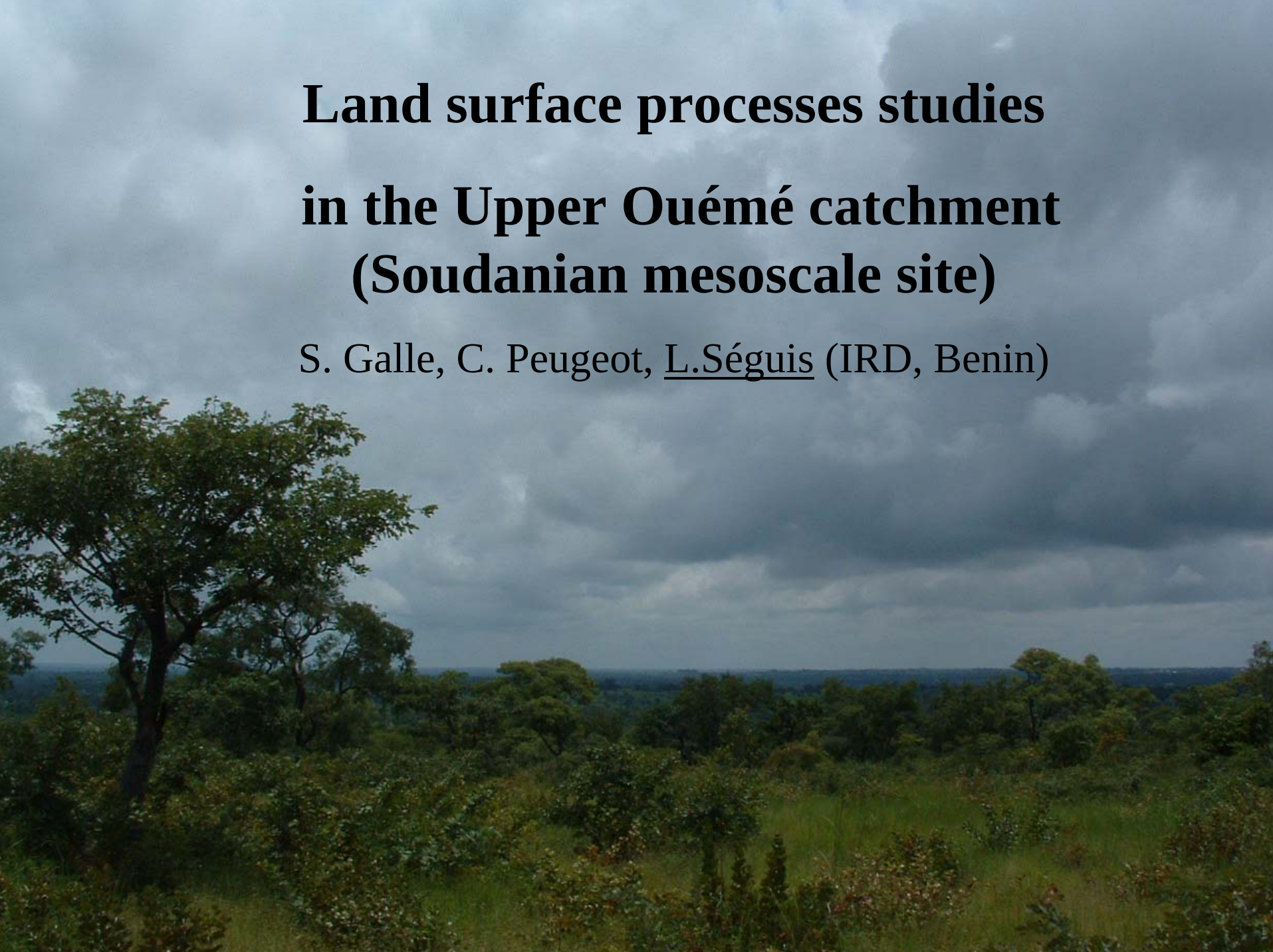


Land surface processes studies

in the Upper Ouémé catchment (Soudanian mesoscale site)

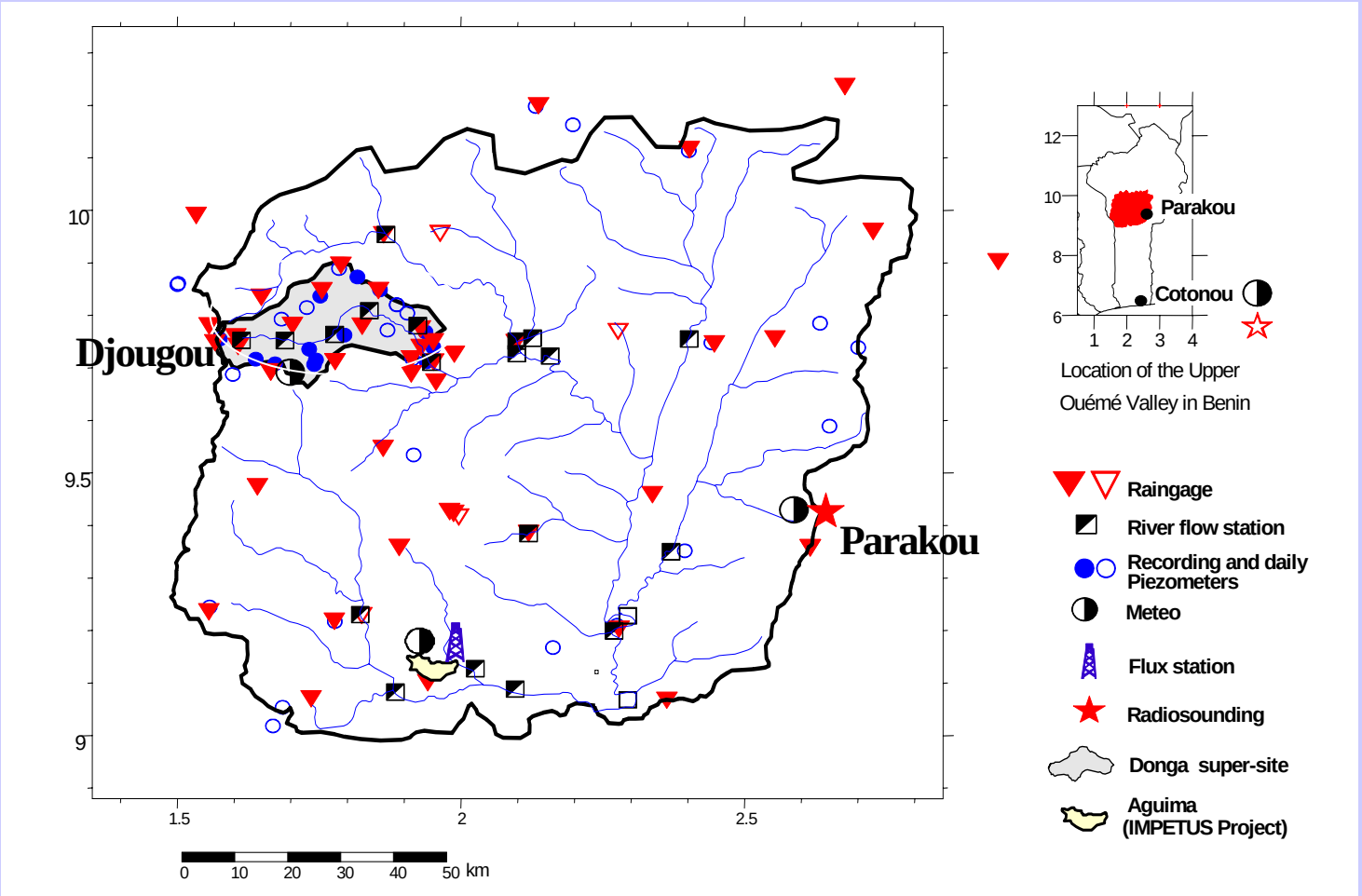
S. Galle, C. Peugeot, L.Séguis (IRD, Benin)

Objectives

- Understand the key processes involved in the Soudanian hydrological water cycle (groundwater and subsurface drainage to streamflow, runoff generation, unsaturated zone dynamic, deep drainage)
- Understand the response of vegetation to environmental constraints at seasonal and interannual temporal scales.
- Understand surface energy balance for a sudanian landscape through the analysis of flux stations data
- Understand the interactions between environmental variables and vegetation phenology
- Test and validate physical distributed models

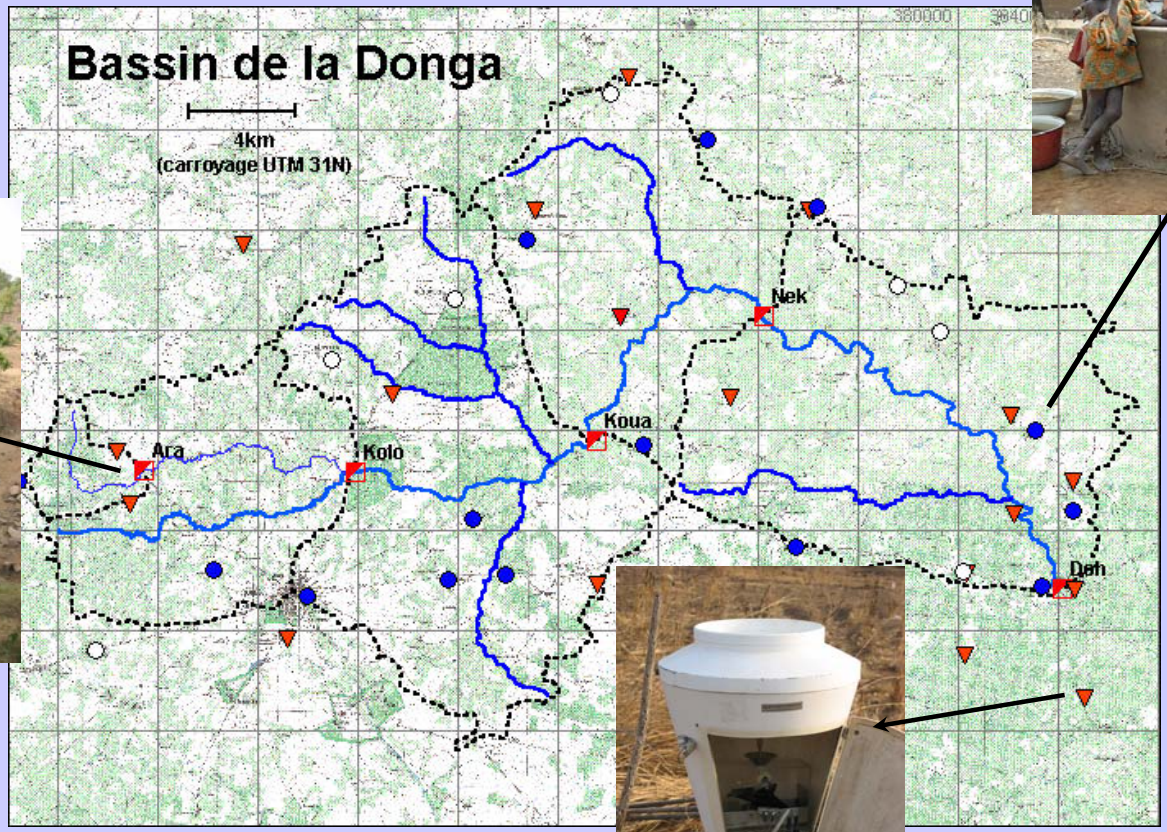
Observation location and strategy

Land surface processes studies are focused on a supersite, the Donga catchment (586 km2), a sub-catchment of the meso-scale Oueme site



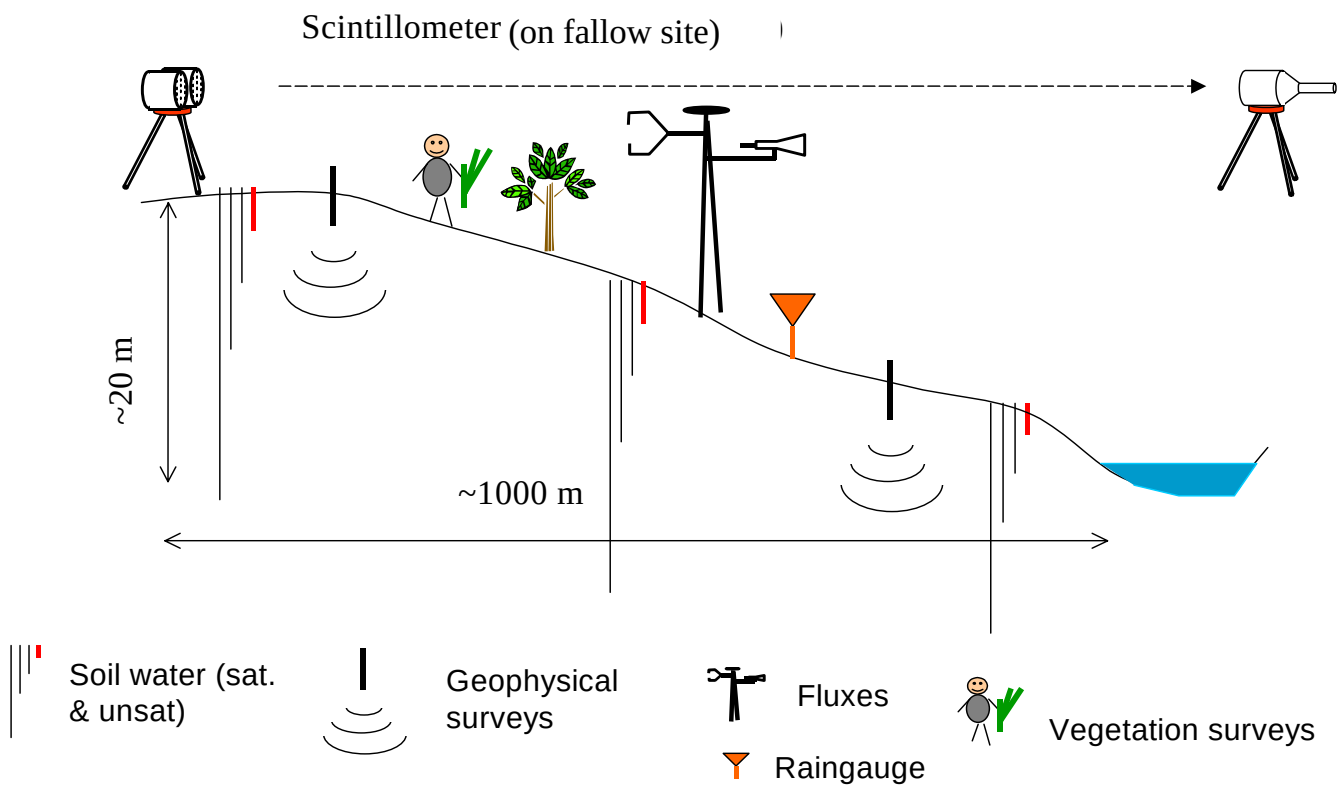
A multi-scale approach

Recording streamgauge



- Five nested catchments (12 to 586 km^2) with 18 automatic raingauges, and 21 traditional rural wells monitoring
- 3 catena on the dominant land covers (fallow, bush savanna and forest) of the bassin instrumented with soil water stations, piezometers and fluxes stations

Local scale (transects) instrumentation



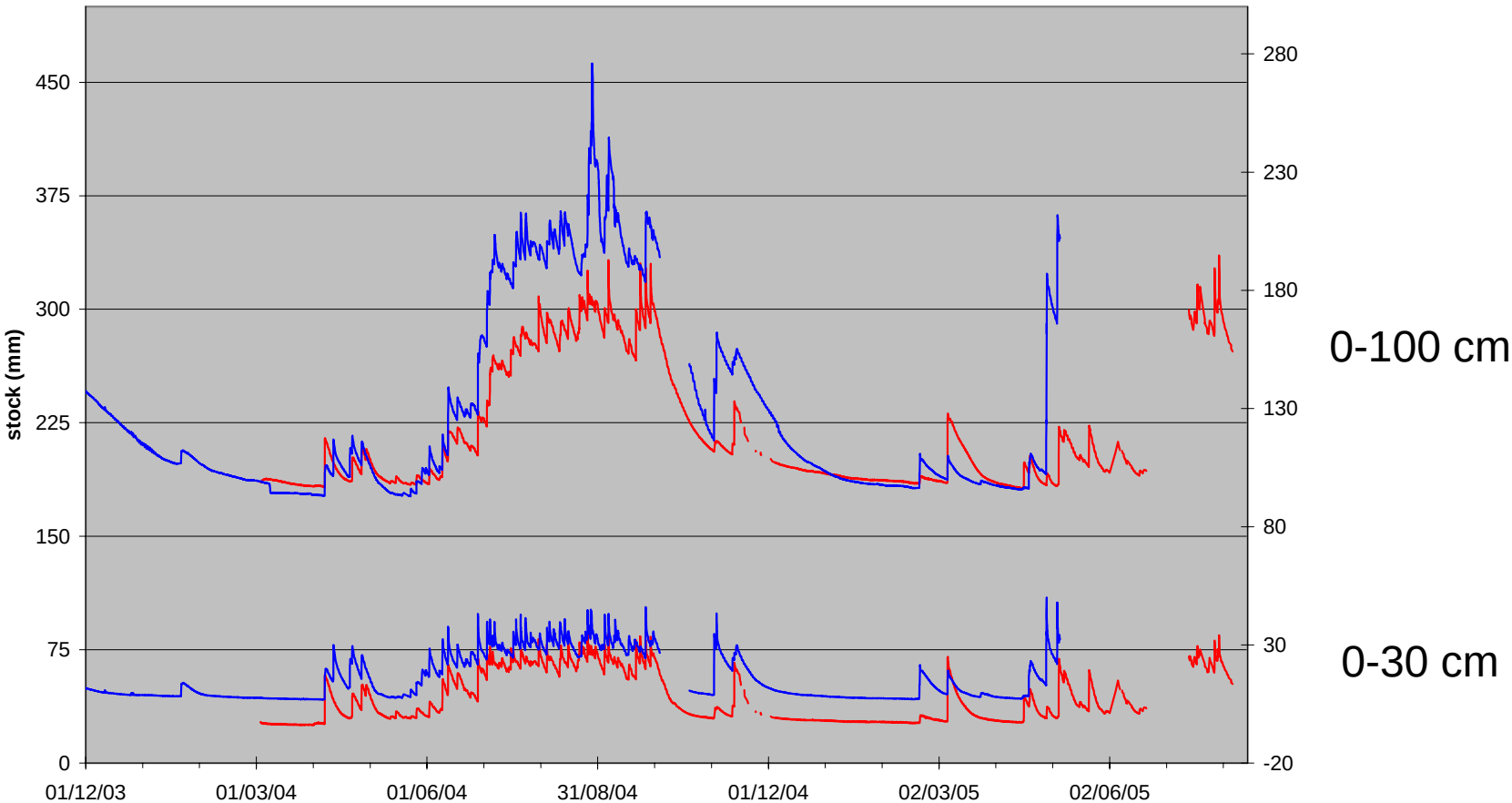
Local work content

- Identification of the seasonal vegetation dynamics for the major vegetation cov
- Study the dynamic of the vadose zone and the groundwaters (sub-surface flow and alterite groundwater) from uphill to downhill
- Geophysical characterisation of the groundwaters (localisation, thick, faults) and its seasonal dynamic along the hillslope
- Water chemical surveys of the compartments (surface, subsurface and ground involved in streamflow production and comparison to chemical composition of water in river to determine water origins, flow paths and transfer time.
- Documentation of the evapotranspiration according to vegetation and hydric res
- Implementation of the key processes into parametrisation

Super site work content

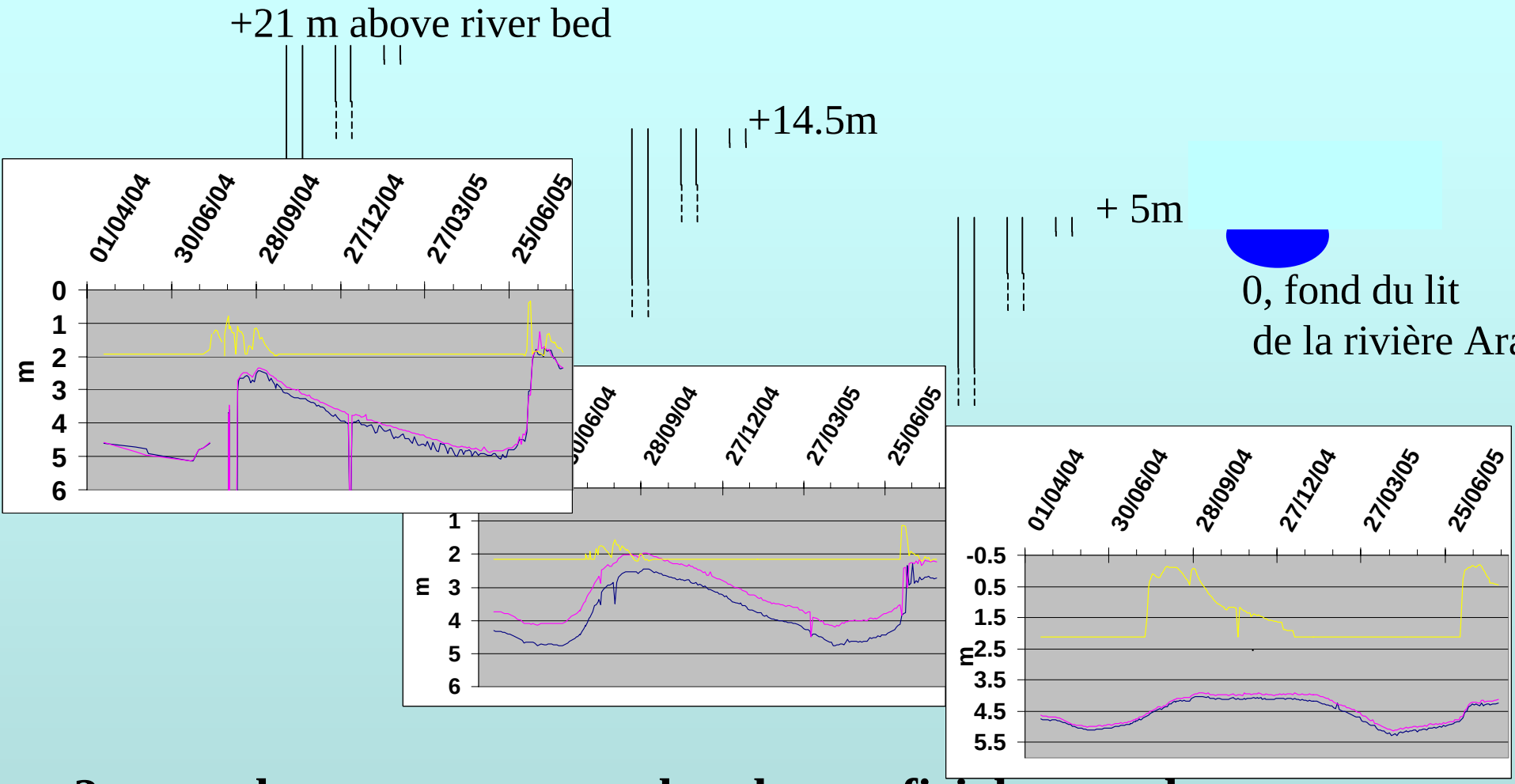
- Documentation of streamflow, water table and water chemical composition (rural wells, boreholes and rivers)
- Test and validation of local modelisation at Super site scale

Soil water content under forest and fallow catena



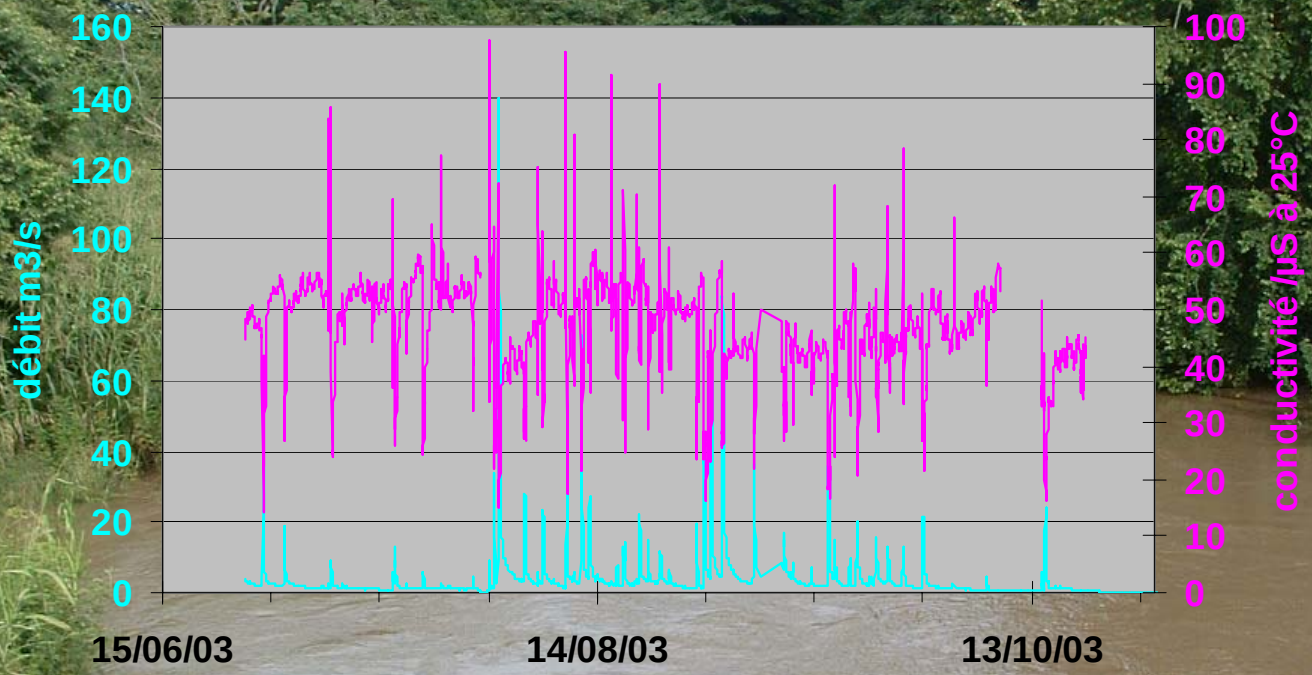
Fallow catena infiltrates more than forest catena

Water table dynamic along the fallow catena



- **2 groundwaters : a seasonal and superficial groundwater above the saprolithe groundwater**
- **During the dry season, saprolith watertable is only at 5 meters depth**

Discharge and water conductivity during the 2003 rainy season



During low flows, conductivity values are around 50µS.cm^{-1} and fall down to 30 µS.cm $^{-1}$ during flood evenment.
Saprolith groundwater conductivity is around 300 µS.cm-1.

Minor contribution of saprolith groundwater to streamflow.
Subsurface flow and direct runoff seems to be the major compartments involved in streamflow production.

Good agreement between observed and simulated discharge when the deep groundwater is disconnected from the river