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# S1-08 New hydro-climatic observatory in a hotspot of global change – Mahafaly plateau southwestern of Madagascar

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## Résumé

The Mahafaly plateau in southwestern of Madagascar is a semi-arid region and a hot-spot of global change where the populations survive in quasi permanent water stress. We have chosen to develop a methodological approach for a sustainable exploitation of the groundwater resources. This approach combined several prospecting tools (e.g. geology, hydrogeology, geophysics, hydrochemistry) and was divided in 4 phases: (1) Regional scale prospection, (2) Village scale prospection, (3) Drilling campaign, (4) Groundwater and climate monitoring. We identified two main groundwater resources within the same hydrosystem: a deep one (below 150m) located within the karstified formations and a shallow one located in the near surface (< 20m) within the continental Neogene sediments overlying the karst formations. Hydrochemical results from several campaigns at the hydrosystem scale highlighted the vulnerability of the deeper aquifer to saline water intrusion. Hence, the second phase focused on the shallow hydrogeological target. A piezometric survey (127 measurements) combined to high precision GPS measurements revealed a general flow in the west direction. A combination of geophysical measurements at moderate cost (262 TEMfast soundings, 2588 Slingram points, 35 electrical soundings) was used to investigate the complex and discontinuous geology of the recent sediments overlying the karstified formations. 6 positive boreholes and 3 wells were implemented accordingly. Despite the numerous measurements the study area remains insufficiently known. In order to prevent any over-exploitation, we installed a meteorological station and several piezometric sensors to monitor the groundwater resource. The 4 years of monitoring shows a very strong inter-annual heterogeneity in groundwater recharge. The year 2018 is the driest of the last 30 years and the recharge is almost zero. The developed methodology was successful in a complex area and requires to be tested on other sites. This unique hydroclimatic observatory in addition to the previous multidisciplinary results will help: (i) non-governmental organization (NGO) and local institutions to prevent future water shortage in this area of Madagascar and (ii) scientists to better understand how global change will affect one of the largest karst hydrosystem of the south hemisphere.

**Mots-Clés:** hydro, climatic observatory, humanitarian hydrogeology, TDEM, Slingram, electrical sounding, piezometry, karst Mahafaly plateau

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