

FINAL REPORT PROGRAM LEFE

Program LEFE/IMAGO	EVREST Project : (E)volutions des REssources hydrologiques et végétales au Sahel agropastoral sous contrainte climatique et anThropique)	Years : 2017
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Other funding sources : Resources of SNO AMMA-CATCH observatory

Participating Laboratories : GET, IGE, G-EAU

Context: The question of the effects of global and local changes on the functioning of land surfaces and surface-atmosphere interactions is addressed through the evolutions of energy, water and carbon balances in the Sahel environment. A modelling approach is used, coupling a SVAT model (SiSPAT) with an ecological model (STEP) and an agronomic model (SARRA-H).

Objectives / scientific questions: The objective of the EVREST 1-year project supporting by LEFE program was to prepare the hydro-meteorological forcing fields required for the modelling. This task is derived from the hydro-climatic series that was previously generated from rainfall and climate observations acquired at the Niamey station in Niger, and has made it possible to build a 60-year history (1950-2009) of precipitation, air temperature and humidity, wind speed and incident solar and atmospheric radiation (Leauthaud et al., 2017). The characteristics of this history are compatible with the requirements of surface modelling (inter-variable consistency, no gaps, infra-hourly frequency), and the EVREST project was addressed to finalize this step. It should also be noted that the method also provides uncertainty generated during the gap completion phases, using a stochastic generation approach for different data sets. This data archive, completed by the series of observations acquired by SNO AMMA CATCH over the current period, contains information for the proposal of evolution scenarios. It constitutes a database that integrates natural climate variability and in which it is easy to draw to resample this variability in the scenarios.

Main results: The 1-year project allows finalizing the NAS database elaborated by Leauthaud et al., (2017a), presenting previous results in an international conference (Leauthaud et al., 2017b) and to develop a simple external toolbox that could be easily plug with modelling driver to ensure inter-variable consistency. Since surface processes are characterized across a wide range of time scales, the draw concerns all hydro-climatic variables in one block a priori and the approach retains the variability that exists at these different time scales (intraday, event, seasonal, decennial, etc.). An example of hydro-meteorological fields over the 1950-2010 period (top: annual rainfall; bottom: annual air temperature) and comparisons with, re-analysis data or global/local datasets are presented on the Figure 1. The NAS database can be uploaded from the AMMA CATCH web site at <http://www.amma-catch.org/spip.php?rubrique77>.

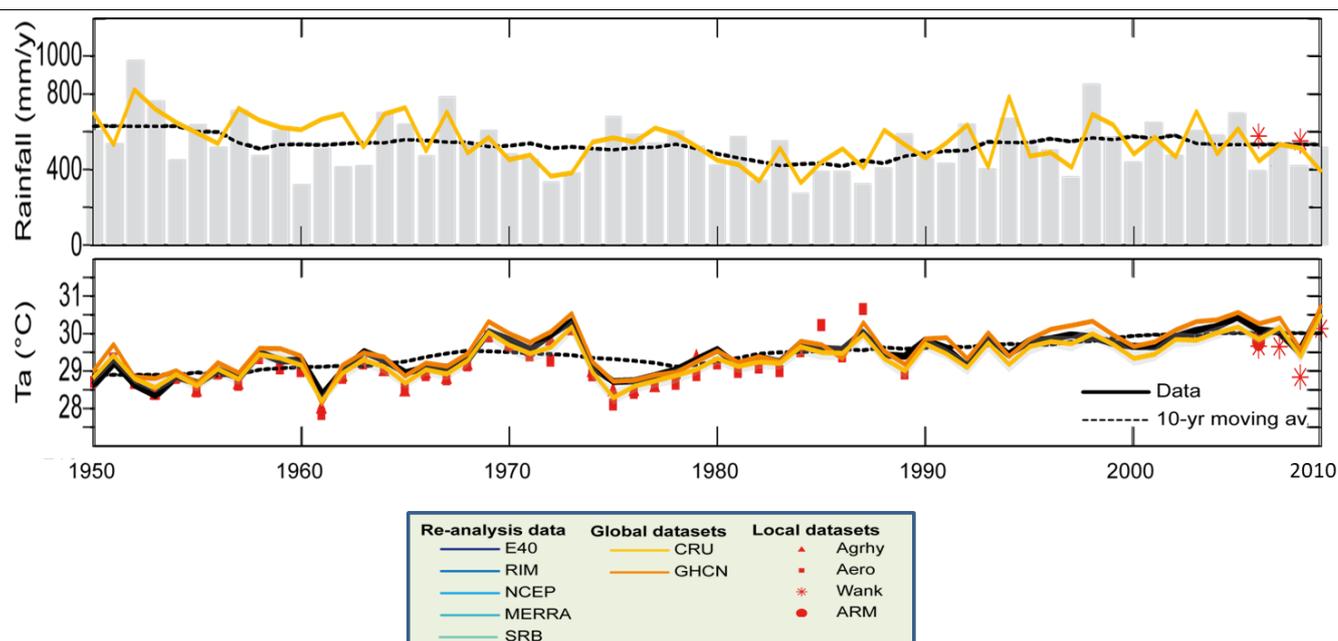


Figure 1 : Examples of hydro-meteorological fields built on the 1950-2010 period (top, grey bars: precipitations ;

bottom, black line: air temperature) and comparison to existing re-analyses, global or local databases

Future of the project: The project only received seed funding in 2017 to create forcing fields, the modelling part of the project is actually in standby. However, the objectives remain current within the lead team, which is therefore considering resubmitting of the project to achieve the scientific objectives described in the context section.

Leauthaud, C., Cappelaere, B., Demarty, J., Guichard, F., Velluet, C., Kergoat, L., et al. (2017). A 60-year reconstructed high-resolution local meteorological data set in Central Sahel (1950-2009): evaluation, analysis and application to land surface modelling. *International Journal of Climatology*, 37, 2699-2718. 10.1002/joc.4874.

Leauthaud C., Cappelaere B., Demarty J., Guichard F., Velluet C., Kergoat L., Vischel T., Grippa M., Mouhaimouni M., Moussa I.B., Mainassara I., Sultan B. (2017). A 60-year reconstructed high-resolution local meteorological data set in Central Sahel (1950-2009): evaluation, analysis and application to land surface modelling. In: EGU General Assembly 2017, Vol. Session HS2.4.4 Water, droughts, and biosphere-atmosphere interactions under climate change and variability, EGU2017-11952, Vienna (Austria).