TRANSITION OF RESEARCH TO OPERATIONS WITHIN THE FRAMEWORK OF CREWS-BURKINA FASO PROJECT

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1. INTRODUCTION

CREWS (Climate Early Warning System) is supporting the improvement of operational capabilities in Burkina Faso to produce and deliver hydro-meteorological services for early warning, contributing to risk reduction for relevant national sectors with an emphasis on flood-related risks and improved early warning and risk information for agriculture and food security.

Météo-France is accompanying the National Meteorological Service of Burkina Faso in the elaboration of sub-seasonal and seasonal forecasting methodologies, as well as in the use of remote sensing (including Land Data Assimilation Systems – LDAS) in agrometeorological services.

2. SEASONAL PREDICTION

Results from multi-model, statistical downscaling tools (CPT) and the comprehension of well-known predictors are all taken into account in our work. The reference period considered for anomalies is an important key component.

3. SUB-SEASONAL PREDICTION

In 2018, a heuristic strategy has been adopted by using indicators based on well-known modes of variability in western Africa, as well as relevant parameters for which numerical models have better skill than precipitation (column water vapor, velocity potential).

Semi-operational bulletins have been issued in 2019, taking advantage of feedbacks from Burkina Faso's Weather Service and experience from ongoing monitoring of the African monsoon. (MISVA: http//misva.sedoo.fr).

West Africa is characterized by a very strong spatial variability of precipitation due to very mobile convective systems. It makes any sub-seasonal behavior difficult to recognize, even in the observation.

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4. MONITORING THE LAND SURFACE CONDITIONS USING DATA ASSIMILATION

One of the major scientific challenges in relation to the adaptation to climate change is observing and simulating the response of land biophysical variables to extreme events, making land surface models (LSMs) constrained by high-quality gridded atmospheric variables and coupled with river-routing models key tools to address these challenges. The modelling of terrestrial variables can be improved through the dynamical integration of observations. Remote sensing observations are particularly useful in this context because of their global coverage and higher spatial resolution (10 km and below). The current fleet of Earth observation missions holds an unprecedented potential to quantify land surface variables (LSVs) and many satellite-derived products relevant to the hydrological and vegetation cycles are already available at high spatial resolutions. However, satellite remote sensing observations exhibit spatial and temporal gaps and not all key LSVs can be observed. LSMs are able to provide LSV estimates at all times and locations using physically-based equations, but as remotely sensed observations, they are affected by uncertainties (e.g., parametrization representation, atmospheric forcing, initialization). Through a weighted combination of both, LSVs can be better estimated than by either source of information alone; data assimilation techniques enable one to spatially and temporally integrate observed information into LSMs in a consistent way to unobserved locations, time steps, and variables.

Within the SURFEX modeling platform of Météo-France (Surface Externalisée, Version 8.1), the global Land Data Assimilation System (LDAS-Monde) developed in the research department of Météo-France, the CNRM (Centre National de Recherches Météorologiques) permits integrating satellite products into the ISBA (Interaction between Soil Biosphere and Atmosphere) Land Surface Model (LSM) using a data assimilation scheme (Albergel et al., 2017). LDAS-Monde offline integration of satellite derived Surface Soil Moisture (SSM) and Leaf Area Index (LAI) in the ISBA Land Surface Model has been operated over Burkina Faso to monitor the land surface conditions (e.g. soil moisture, leaf area index, evapotranspiration, above ground

biomass) in the context of CREWS. LDAS-Monde has also forecasting capabilities and it has been demonstrated that a 10-day forecast of LSVs is of better quality when initialized by LDAS-Monde analysis than when initialized by a model alone.

Simulations with the LDAS (Land Data Assimilation System) were performed over Burkina-Faso. LDAS-Monde offline system was forced by the latest European Centre for Medium-Range Weather Forecasts (ECMWF) atmospheric reanalysis ERA5, leading to a 0.25° x 0.25° spatial resolution reanalysis of the LSVs.

Some agro-metorological indices –and their climatology - were derived from LDAS outputs (LAI, biomass, soil water content) and will expand the information used by the Burkina Faso national Meteorological Service to provide services to agriculture.

4.1 *Paper Number*

4.2 *References*

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