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## From Monitoring to Forecasting the Land Surface Condition Using a Land Data Assimilation System: Application over the Contiguous United States

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LDAS-Monde is a global Land Data Assimilation System developed in the research department of Météo-France (CNRM) to monitor Land Surface Variables (LSVs) at various scales, from regional to global. With LDAS-Monde, it is possible to assimilate satellite derived observations of Surface Soil Moisture (SSM) and Leaf Area Index (LAI) e.g. from the Copernicus Global Land Service (CGLS). It is an offline system normally driven by atmospheric reanalyses such as ECMWF ERA5.

In this study we investigate LDAS-Monde ability to use atmospheric forecasts to predict LSV states up to weeks in advance. In addition to the accuracy of the forecast predictions, the impact of the initialization on the LSVs forecast is addressed. To perform this study, LDAS-Monde is forced by a fifteen-day forecast from ECMWF for the 2017-2018 period over the Contiguous United States (CONUS) at  $0.2^\circ \times 0.2^\circ$  spatial resolution. These LSVs forecasts are initialized either by the model alone (LDAS-Monde open-loop, no assimilation, Fc\_ol) or by the analysis (assimilation of SSM and LAI, Fc\_an). These two sets of forecast are then assessed using satellite derived observations of SSM and LAI, evapotranspiration estimates, as well as in situ measurements of soil moisture from the U.S. Climate Reference Network (USCRN). Results indicate that for the three evaluation variables (SSM, LAI, and evapotranspiration), LDAS-Monde provides reasonably accurate predictions two weeks in advance. Additionally, the initial conditions are shown to make a positive impact with respect to LAI, evapotranspiration, and deeper layers of soil moisture when using Fc\_an. Moreover, this impact persists in time, particularly for vegetation related variables. Other model variables (such as runoff and drainage) are also affected by the initial conditions. Future work will focus on the transfer of this predictive information from a research to stakeholder tool.