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Probabilistic nowcasting of severe storms in Africa: workflow and online tools for monitoring

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Mesoscale convective systems (MCSs) dominate rainfall and its extremes in most parts of West Africa, frequently producing flash floods that result in major damage and loss of life. As West African storms are already intensifying, these effects are expected to become more frequent and severe under climate-change and rapid urban expansion. To help mitigate these impacts, the NFLICS (Nowcasting FLood Impacts of Convective storms in the Sahel) project has co-developed a prototype nowcasting system with West African meteorological services based on conditioned climatologies of organised convection as seen from the Meteosat Second Generation (MSG) satellites since 2004. Data on historical convective activity, conditioned on the present location and timing of observed convection, are used to produce probabilistic forecasts of convective activity out to six hours ahead. Verification against the convective activity analysis and the 24-hour raingauge accumulations over Dakar suggests that these probabilistic nowcasts provide useful information on the occurrence of convective activity. The highest skill (compared to nowcasts based solely on climatology) is obtained when the probability of convection is estimated over spatial scales between 100 and 200km, depending on the forecast lead-time considered. Furthermore, recent advances have included incorporation of land surface temperature anomalies to modify nowcast probabilities – this recognises that MCS evolution favour drier land. We present the workflow of this nowcasting system and discuss our current understanding of the land surface effects that play a role for storm development and prediction. The developed nowcasting system is crucially computationally inexpensive to run operationally and achieves skill in the absence of rainfall radar, as is the case over most of Africa. Operational trials over the 2020 and 2021 rainy seasons, and during intensive nowcasting testbeds with researchers and forecasters, has shown the utility of these new nowcast products to support Impact-based Forecasting, and are currently being extended for use during a testbed with meteorological services in southern Africa in 2024.

Latest West Africa nowcasts alongside pan-African cloud and surface state imagery are publicy accessible on https://eip.ceh.ac.uk/hydrology/sub-saharan-africa/nowcasting