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# Distributed Hydro Meteorological modelling in complex topography areas of the USA: a physical process study at the catchment scale using the National Water Model.

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The National Water Model (NWM) became operational in August 2016, producing the first ever real-time distributed continuous forecasts over the Continental United States (CONUS) and providing forecasts and analyses of streamflow for 2.7 million river reaches and other hydrologic information on 1km and 250m grids.

Because the CONUS domain includes a wide variety of landscapes, terrain (from Great Plains to the Western US mountain ranges), and climate regions, the physically-based mathematical representation of the NWM model is highly challenged in reproducing the wide heterogeneity of hydrological processes (e.g., snow melting, ice freezing, droughts and flash flooding events) that are included in the domain. Thus, region- and weather-specific hydrologic verification studies are needed for NWM error reduction and encourage further improvement of the model for calibration and application needs.

We will present preliminary results from a regional prototype study in California. We first compare the performance of the NWM historical runs forced by North American Land Data Assimilation System (NLDAS) in two watersheds with complex topography: the Tuolumne river in the Sierra Nevada, CA, whose hydrology is dominated by snow-melt processes, and the Russian River in California's coastal mountains, that has similar characteristics in size and latitude but is primarily rain-driven. The evaluation focuses on understanding the physics of the hydrological processes which control catchment response not only in terms of streamflow but also in terms of snowmelt, soil moisture dynamics, precipitation, and runoff partitioning. We assess the NWM's skill in reproducing the different components of the water and energy budget and the possible added value of having distributed hydrological and land model output in complex topography terrain and ungauged locations.
Limitations and advantages of using the NWM model are evaluated and future guidelines for model improvements are put forth.