

## Title:

An Ensemble Forecast and Verification Framework for WRF versus MPAS Twin Experiments

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## Abstract:

The Center for Western Weather and Water Extremes (CW3E) of the Scripps Institution of Oceanography, University of California San Diego, has developed a version of WRF optimized for the prediction of the extreme events associated with atmospheric rivers over the Western US called West-WRF. West-WRF has been running in Near-Real-Time (NRT) since 2021 as a regional, 200-member ensemble with a 9-km horizontal resolution, including 100 distinct WRF multi-physics configurations, 82 sets of initial and boundary conditions from global models, and kinetic energy backscatter perturbations applied to each member. The existing system has been shown to achieve high levels of forecast skill when compared to the US and European global ensemble systems. CW3E is currently evaluating the potential advantages of the MPAS modeling framework, including its global spherical geometry, its smoothly varying horizontal resolution and its scale aware physical parameterizations, which could allow the CW3E ensemble forecast to make predictions of extreme events in other regions beyond the Western US. In order to objectively evaluate the costs and the benefits of transitioning to the state-of-the-art MPAS modeling framework from the legacy WRF model, CW3E is working to produce an end-to-end framework for statistically robust ensemble forecast skill verification metrics for both of the WRF and MPAS models using the Model Evaluation Tools (MET) framework of the Development Testbed Center. To prototype future versions of the West-WRF ensemble forecast system, we are currently developing workflows for verifying precipitation and integrated vapor transport (IVT) forecasts versus a variety of publicly available data sets in NRT. The open-source experimental framework utilizes the development of existing NRT workflows at CW3E for ensemble forecast and verification to produce multi-model, end-to-end twin experiments for objective, reproducible, portable, and robust analysis of forecast skill.