

### **5B.3 Evaluation of the performance of different WRF-Chem configurations with a focus on the gas-phase mechanisms**

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We present select results from the Air Quality Model Evaluation International Initiative (AQMEII) phase 2 in which several WRF-chem configurations as well as other regional chemistry transport models were pitted against each other in year long simulations over North America and Europe. The results are compared against a suite of ground-based measurements as well as vertical profiles. In our presentation we show that there are considerable differences in the performance of the different WRF-chem configurations even though identical emissions and chemistry boundary conditions were used during the exercise.

A box model study of the different gas-phase chemical mechanisms available in WRF-chem highlights that notable discrepancies arise in the prediction of major trace gas concentrations simply due to the choice of mechanism. Further, there are potentially compensating interactions with the remainder of the model configuration that lead to results in the 3-D simulation that mask the performance of the gas-phase mechanism. The results show that the diagnostic evaluation of building blocks of a 3-D model in an isolated fashion under tight constraints is a critical component in 3-D model intercomparisons in order to obtain meaningful insights into directions for further model development.