

## A Tale of Three Applications: NCAR Experiences in Performance Portability

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NCAR is aggressively exploring ways to affordably expand the performance-portability of key science applications. Ongoing efforts now encompass three models, and each has a slightly different tale to tell. The first is an effort to achieve good performance-portability in an atmospheric model through significant refactoring and adding OpenACC directives. The target here is the Model for Prediction Across Scales (MPAS), an atmospheric model written in Fortran with MPI. The second effort involves the MPS/University of Chicago Radiative MHD (MURaM) solar physics model. Written in C plus MPI, the strategy for the performance-portability of MURaM entails adding OpenACC directives along with a focused refactoring of the dominant radiative transport routine. The third model is Fast Eddy, a large eddy simulation (LES) model which represents an ab initio rewrite in CUDA plus MPI. Performance results, optimization strategies, best practices, and lessons learned will be presented.