Experiences with CUDA and OpenACC from porting ACME to GPUs

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The Accelerated Climate Model Energy (ACME), a fork from the Community Earth System Model, has undergone significant effort for porting to GPUs, specifically for the atmospheric component, the Community Atmosphere Model – Spectral Element (CAM-SE). Previously, tracer transport was ported to GPUs using the CUDA FORTRAN language. Many lessons were learned regarding overlapping MPI, PCI-e transfers, and kernel execution as well as altering algorithms for ideal performance on GPUs. This method of porting is considered infeasible for the ACME model at large, however, and a more readable, sustainable, and portable approach of using OpenACC directives is now preferred. This talk will cover our experiences in using recent OpenACC compilers from Cray and PGI for porting CAM-SE’s trace transport routines as well as other routines from ACME. This will include performance, code restructuring, maturity of compiler implementations, and necessary workarounds for various issues encountered in the compilers.