High-order, property-preserving physics-dynamics-grid remap in E3SM

In the E3SM Atmosphere Model (EAM) version 1, physics parameterizations are the dominant computational cost. In EAM version 1, a physics and chemistry parameterization column is assigned to each HOMME spectral element (SE) dynamical core's (dycore) Gauss-Lobatto-Legendre (GLL) grid point. But the dycore's effective resolution permits a coarser physics grid than the GLL grid. A coarser physics grid means there is less computational work and data volume for a given dynamics grid resolution. EAM version 2 uses separate dynamics and physics grids. The physics grid is formed by subdividing each spectral element into four squares. This configuration results in 4/9 as many parameterization columns as in EAMv1. To enable this configuration, we developed a high-order, property-preserving remap algorithm to remap data between grids. This talk will describe our remap method and show accuracy and performance results.