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## Overcoming the challenges of increasing resolution and complexity in GEOS

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The NASA Global Earth Observing System (GEOS) model supports an array of complex Earth system simulation and assimilation capabilities. These range from simple development frameworks such as dry atmosphere dynamics and single column physics cases, to fully coupled atmosphere-ocean-land-cryosphere-chemistry. Efficient use of available computational resources requires extensive scientific development within each of these components, and optimized frameworks for coupling and executing these components in a comprehensive manner. Ultimately, experiment design requires a compromise between complexity and increased resolution. This talk will explore these compromises within the array of global DYAMOND Phase II winter 40-day simulations completed with GEOS. These include: 1) A coupled 4km ocean and 6km atmosphere with interactive two-moment aerosol cloud microphysics. 2) A 3km 181-level atmosphere with single-moment 6-phase cloud microphysics including 1km global carbon emissions for chemistry transport. 3) A 1.5km 181-level atmosphere with simple parameterized chemistry.