

---

**JOSE PABLO LUCERO LORCA**, University of Colorado at Boulder

*Nonoverlapping Schwarz Preconditioners in linear and nonlinear settings applied to radiation transport problems.*

We explore the application of multilevel, nonoverlapping domain decomposition to solve integro-differential problems of radiation transport colliding in media with the inclusion of a local thermodynamic equilibrium (LTE) nonlinearity. We discretize using discontinuous Galerkin finite elements, making the local problems small versions of the global problem.

By including a coarse space and minimizing the size of the local domains but ordering the application of the local solvers, we robustly achieve a constant amount of iterations for a fixed residual reduction in all regimes. We sequentially *sweep* local solves when collisions are low, and solve in parallel when they are high.

Our implementation takes advantage of the achievable parallelization while sweeping and complete parallelization while in the high-collision regime. With this preconditioner architecture, we apply the same philosophy for local non-linear solves, which are shown to be very effective for a local nonlinearity such as LTE and are promising for problems where the nonlinearity effect has a dominant direction.