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A coordinate based semi-Lagrangian algorithm

Abstract: In this talk it is shown how an advection algorithm (available in a dycore for example) can be used to create a semi-Lagragian algorithm of arbitrary order of accuracy in time and space using operator integrating factor splitting (OIFS). This algorithm can potentially transport hundreds of tracers with only k-interpolation(s) per tracer per time-step to yield k-th order accuracy in time. The method is more efficient than advecting the the tracers individually after some small number of tracers has been exceeded. This threshold decreases with decreasing order in time and increasing polynomial order and is bounded below by the number of coordinates advected (6 for a sphere). Preliminary results in 1D and 2D are presented where the underlying discretization scheme is the discontinuous Galerkin method (DG) in strong and weak form.