Method of Characteristic Galerkin Scheme on Spherical Geodesic Grid

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Classical longitude-latitude grids result in singularities at the two poles, where the meridians converge. Dealing with those singularities requires the use of filtering with operators, which are non-local and thus significantly reduce the efficiency. This difficulty has recently renewed the interest for numerical work on the idea of using Cartesian grids on sphere. This work focuses on building a systematic method to generate Cartesian grid over sphere, developing the necessary mathematical formulation to solve the advection dominated scalar transport problems on the surface of sphere. In this work we present method of characteristics Galerkin method, which is high-order accurate, and highly efficient. The element level integrals can be analytically calculated and this fact contributes towards the computational efficiency of this method.