GPU Accelerated Spectral Element Methods: 3D Euler equations

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The Euler equations are
\[
\begin{align*}
\frac{\partial u}{\partial t} + \nabla \cdot (u u) &= -\nabla p + \frac{\partial \tau}{\partial x} + f, \\
\frac{\partial \rho}{\partial t} + \nabla \cdot (\rho u) &= 0, \\
\frac{\partial E}{\partial t} + \nabla \cdot (E u) &= -\nabla \cdot (\rho f),
\end{align*}
\]

where \( u \) is the velocity vector, \( p \) is the pressure, \( \tau \) is the viscous stress tensor, \( f \) is the external force, \( \rho \) is the density, and \( E \) is the internal energy. These equations can be solved using various discretization methods, such as continuous Galerkin (CG) and discontinuous Galerkin (DG).