

## **Geophysical flow modelling and structure preservation using mixed mimetic spectral elements**

This talk will detail the use of the mixed mimetic spectral element method for the preservation of conservation laws in the discrete form within the context of atmospheric flow simulations. By partitioning differential operators into their metric and topological components vector identities and the Stokes theorem are mimicked in the discrete form. This allows for the preservation of conservation laws and balance relations on the non-affine geometry of the cubed sphere, including the skew-symmetric structure of the non-canonical Hamiltonian representation of the 3D compressible Euler equations necessary for the balanced exchanges of energy associated with dynamical processes. Results will be presented for standard test cases of both the rotating shallow water equations and the 3D compressible Euler equations on a spherical geometry, demonstrating both the preservation of conservation laws and the spectral convergence of errors.