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A conservative adaptive wavelet method for the shallow water equations on the sphere NICHOLAS KEVLAHAN, MATTHIAS AECHTNER, McMaster University, THOMAS DUBOS, Ecole Polytechnique — This talk presents the first dynamically adaptive wavelet method for the shallow water equations on a staggered hexagonal C-grid on the sphere. Pressure is located at the centres of the primal grid (hexagons) and velocity is located at the edges of the dual grid (triangles). Distinct biorthogonal second generation wavelet transforms are developed for the pressure and the velocity. These wavelet transforms are based on second-order accurate interpolation and restriction operators. Together with compatible restriction operators for the mass flux, circulation and Bernoulli function, they ensure that mass is conserved and that there is no numerical generation of vorticity when solving the shallow water equations. The shallow water equations are discretized on the dynamically adapted multiscale grid using a mass and potential-enstrophy conserving finite-difference scheme. The method is applied to a zonal jet test case, turbulence on the rotating sphere and western boundary current flow. Solid boundary conditions are implemented using a new multiscale penalization of the shallow water equations.

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