The C-grid Staggering
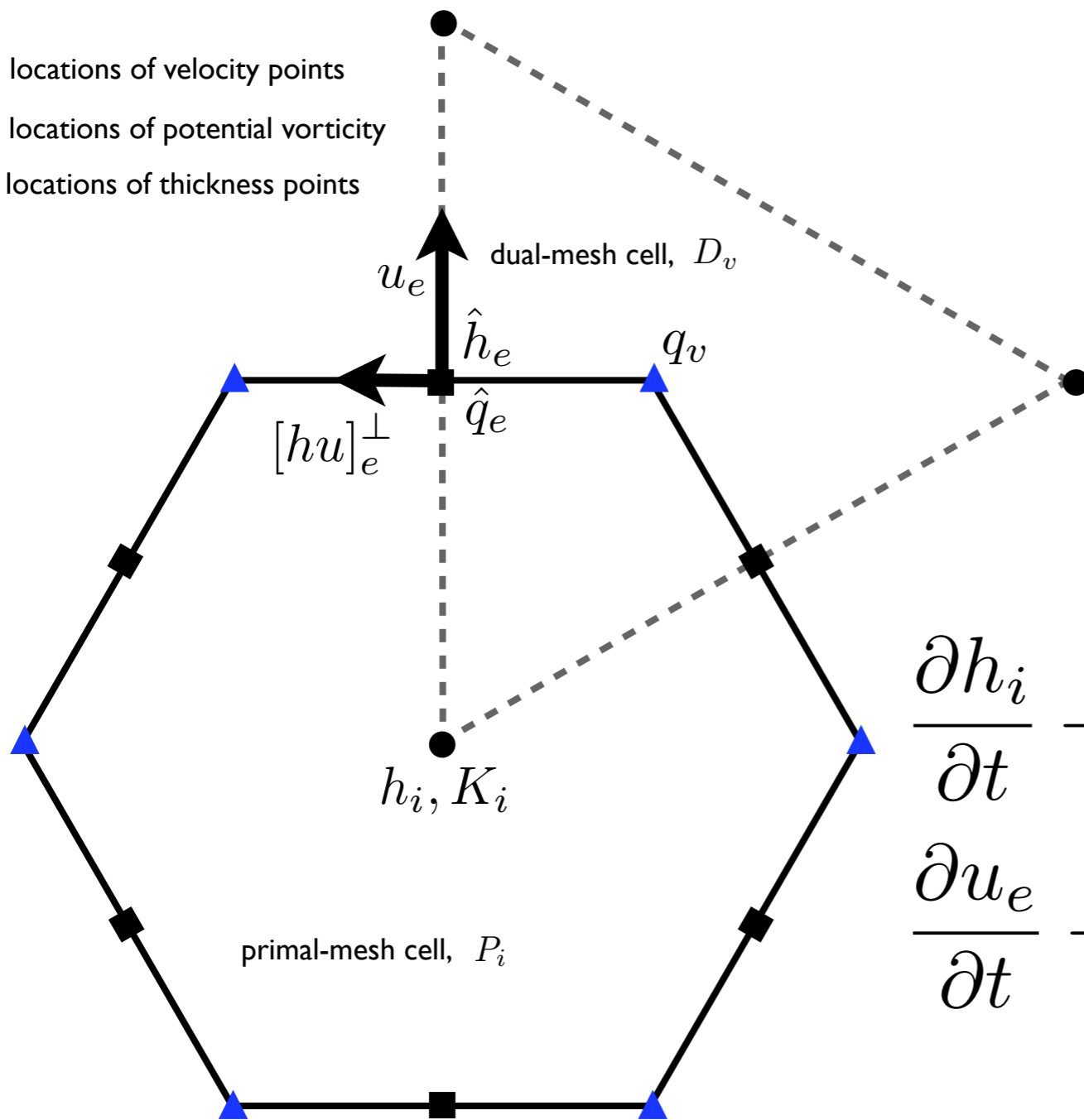

locations of velocity points

locations of potential vorticity

locations of thickness points

u_e

dual-mesh cell, D_v

$\hat{h}_e$

q_v

$[hu]_e^{\perp}$

$\hat{q}_e$

h_i, K_i

primal-mesh cell, P_i

When using a C-grid staggering, the component of velocity normal to cell edges (u_e) is retained as a prognostic equation.

The tangential component of the velocity ($u_e^{\perp}$) must be reconstructed from the normal components of velocity in order to compute the nonlinear Coriolis force.

$$\frac{\partial h_i}{\partial t} + \left[\nabla \cdot \left(\widehat{h}_e u_e \right) \right]_i = 0$$

$$\frac{\partial u_e}{\partial t} + \widehat{q}_e \left[hu \right]_e^{\perp} = \left[\nabla \left(gh_i + K_i \right) \right]_e$$