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High-order discontinuous-Galerkin simulations of flows over airfoils with curved boundaries[1] DANIEL NELSON, GUSTAAF JACOBS, San Diego State University — We compare the flow around a NACA 65-(1)412 airfoil using straight sided and curved sided boundary subdomains in a discontinuous-Galerkin spectral element computation. Specifically, we examine the structure of the vortex street wake and note significant differences in the wake dynamics between the two boundary subdomain implementations. At a Reynolds number of 20,000, the boundary layer on the suction side of the airfoil separates at approximately 60% of the cord length behind the leading edge. The resulting unstable shear layer interacts with vortices generated at the trailing edge to form a vortex street wake. When the subdomain boundary is fitted to the airfoil spline with a curved side, the location of the separation point is fixed and the vortex street is regular and periodic. When straight-sided subdomains are used, the separation point alternates erratically between subdomain corners, resulting in an aperiodic roll-up of the shear layer and subsequent aperiodicity in the near and far wake.

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