Characteristic Boundary Conditions with Transverse Effects: a Comparative Study GUIDO LODATO, HEINZ PITSCH, CTR, Stanford University — The inclusion of transverse effects in designing characteristic boundary conditions for the Euler and compressible Navier-Stokes equations was discussed by many authors and proved to give significant improvement in reducing numerical perturbations from open boundaries. Starting from the characteristic formulation of the Euler equations using generalized coordinates, an analysis of the different transverse terms is carried out. Based on the identification of different types of transverse effects, it is suggested that, in order to achieve the best performance for the numerical behavior of the boundary conditions, different transverse terms should be treated differently. The analytical check on well-posedness and reflection coefficients gives evidence that stability might not be an issue regardless of the way these terms are treated, but that numerical reflection from the boundary might be negatively affected by the occurrence of a direct coupling between outgoing vorticity modes and incoming acoustic modes. This analysis is supported by numerical tests on the inviscid convected vortex problem at different Mach numbers.

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