Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

**Quantifying Numerical Dissipation due to Filtering in Implicit LES**[1] FRANCOIS CADIEUX, Johns Hopkins University, JULIAN ANDRZEJ DOMARADZKI, University of Southern California — Numerical dissipation plays an important role in LES and has given rise to the widespread use of implicit LES in the academic community. Recent results demonstrate that even with higher order codes, the use of stabilizing filters can act as a source of numerical dissipation strong enough to compare to an explicit subgrid-scale model (Cadieux et al, JFE 136-6). The amount of numerical dissipation added by such filtering operation in the simulation of a laminar separation bubble is quantified using a new method developed by Schranner et al, Computers & Fluids 114 . It is then compared to a case where the filter is turned off, as well as the subgrid-scale dissipation that would be added by the $\sigma$ model. The sensitivity of the method to the choice of subdomain location and size is explored. The effect of different derivative approximations and integration methods is also scrutinized. The method is shown to be robust and accurate for large subdomains. Results show that without filtering, numerical dissipation in the high order code is negligible, and that the filtering operation at the resolution considered adds substantial numerical dissipation in the same regions and at a similar rate as the $\sigma$ subgrid-scale model would.

[1]NSF grant CBET-1233160

Francois Cadieux
Johns Hopkins University

Date submitted: 29 Jul 2015 Electronic form version 1.4