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Linear frequency response analysis of a high subsonic and a supersonic jet OLIVER SCHMIDT, TIM COLONIUS, California Institute of Technology, GUILLAUME BRS, CASCADE Technologies — A linear frequency response, or resolvent analysis of two turbulent jet mean flows is conducted. The mean flows are obtained from two high-fidelity large eddy simulations of a Mach 0.9 and a Mach 1.5 turbulent jet at Reynolds numbers of 1×10^6 and 3×10^5, respectively. For both cases, curves of the optimal and sub-optimal output gains are calculated as a function of frequency for different azimuthal wavenumbers. The gain curves bring to light pseudo-resonances associated with different linear instability mechanisms. The same mechanisms are recovered in global stability analyses, and the results are compared. In the case of the Mach 0.9 jet, the resolvent analysis allows for a detailed study of trapped acoustic modes inside the potential core that were subject to previous stability studies. The structure of the resolvent and global modes are compared to POD mode estimates of the LES data. Additionally, the projection of the LES data onto the modes allows for quantitative assessment of how well the modal structures represent the coherent structures in the jet.

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