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Absolute secondary instability in variable-density round jets JEAN-MARC CHOMAZ, JOSEPH W. NICHOLS, PETER J. SCHMID, Laboratoire dHydrodynamique (LadHyX), CNRS-Ecole Polytechnique, Palaiseau, France — Side jet formation in variable-density round jets is investigated by means of direct numerical simulation (DNS) and linear stability analysis. From DNS, it is observed that a light jet with density ratio $S = \rho_0/\rho_j = 4$ supports sustained side jets which eject fluid from the center of the jet in a star-shaped pattern. It is conjectured that this behavior can be explained by a change in the local properties of the secondary instability from convective to absolute in nature. This hypothesis is tested by examining the spatio-temporal development of the wavepacket resulting from a small impulse, about non-diffusing periodic base states corresponding to the primary instability. Invoking Taylor's hypothesis, the local time periodicity of the primary instability is used to construct base states at varying axial locations in order to investigate the existence of a pocket of absolute secondary instability. The physical mechanism leading to side jet formation then may be identified by extracting the absolute mode at the upstream boundary of the pocket. Furthermore, azimuthal mode selection is considered by repeating this process for different integral azimuthal wavenumbers.

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