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Linear Stability of Flow through a Compressor Stage.[1] MIGUEL FOSAS DE PANDO, Department of Mechanical Engineering and Industrial Design, University of Cadiz, PETER J. SCHMID, Department of Mathematics, Imperial College London — Fluid systems of industrial interest often consist of a periodic assembly of identical subunits. For instance, a compressor stage in a jet engine is built by arranging a number of airfoil blades in annular rows, one rotating and one stationary. A typical analysis of these systems attempts to describe the flow dynamics by isolating a single subunit, i.e. a blade passage, and imposing periodic boundary conditions. Although this approach leads to problems that are easier to solve, it cannot account for global large-scale synchronization effects across multiple subunits. In this contribution, we first present a computational framework for the analysis of modal and non-modal stability of the full system, i.e. considering the contribution of each subunit to the global dynamics. This technique relies on the underlying properties of operators that are reminiscent of twisted Toeplitz matrices, which are in turn coupled through a time-dependent sliding interface. This framework will be then used to investigate the dynamics of the response of flow through an idealized compressor stage, consisting of a rotor and a stator, to small amplitude forcing.

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