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Toward the foundation of a global modes concept ANATOLI TUMIN, The University of Arizona — Recent progress in using global modes for the analysis of a variety of complex (and "simple") flows led to their applications in flow control. The progress in computational capabilities brings this advanced technique to common practice in studies of flow perturbations. However, the formulation of global eigenvalue problems is accompanied by uncertainties in the choice of boundary conditions. Today, the choice of boundary conditions has a heuristic nature, and this provokes questions regarding the suitable formulation of the eigenvalue problems. A simple model can help us to understand the effect of the upstream and downstream boundary conditions on the eigenvalues and eigenfunctions. I consider the "box formulation" in a uniform flow. In the limit of an infinite domain in the y-direction, the problem is reduced to a system of ODEs with constant coefficients using the Fourier transform in y. There are boundary layers in the vicinity of the upstream and downstream boundaries. The pressure wave penetrates upstream at a distance about the characteristic scale of the perturbation in the y direction. Discussion of Dirichlet and Neumann boundary conditions for the model problem is accompanied by comparisons with available publications for boundary layer flows. The model helps to understand the spectrum features in published results.

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