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Double synthetic jets solely induced by acoustic wave MING-HAO WANG, LI-JUN XUAN, JIE-ZHI WU, UNIVERSITY OF TENNESSEE SPACE INSTITUTE, TULLAHOMA, TN 37388, USA TEAM, STATE KEY LABORATORY FOR TURBULENCE AND COMPLEX SYSTEM, PEKING UNIVERSITY, BEIJING, CHINA TEAM — The dynamic process of a traveling acoustic wave in a duct with an orifice plate, where the fluid is otherwise at rest, is studied numerically and analytically. The computation by a compressible Navier-Stokes scheme, 6^{th}-order in space and 4^{th}-order in time, shows that the pressure wave produces a vorticity wave at the wall via the viscous momentum balance and no-slip condition. If the frequency is low, the amplitude is large, and the opening of the orifice is small, the vorticity can build up near the orifice and become concentrated vortices at both sides of the plate. The vortices shed off and form two double-row vortex streets moving away from the plate in opposite directions due to self induction, with *two opposite synthetic jets* in between. In turn, the moving vortices emit new sound waves. This example may serve as a typical prototype of the closed-loop coupling between the shearing process measured by the vorticity and the compressing/expanding process measured by the pressure. An analytical solution for the generalized compressible Stokes layer with variable amplitude and wavelength in the straight-wall sections is obtained, of which all predicted flow variables are in excellent agreement with the numerical results.

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