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Turbulence and Large-Eddy Simulations

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After having discussed the limits of turbulence direct-numerical simulations, one presents large-eddy simulations methods, where small scales are filtered out and modelled by appropriate eddy coefficients in the evolution of large scales. Scalar mixing is studied as well. We concentrate on Grenoble models developed originally in Fourier space. One presents coherent-vortex dynamics obtained thanks to these models for incompressible isotropic turbulence at infinite Reynolds number, and statics of a channel flow. It is shown that the LES compressible formalism may be simplified by using a macro-pressure and a macro-temperature. One displays an animation of quasi-longitudinal vortices in a channel at low Mach. Then the compressible jet controlled upstream is studied at Mach 0.7 and 1.4 (Reynolds 36000). With a white-noise forcing, the supersonic jet is more focused than the subsonic one. With other types of forcings, one can generate a blooming jet.

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