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Conserved integrals of compressible fluid flow in $n > 1$ spatial dimensions

I will present a summary of recent work on conservation laws of compressible fluid flow in $n > 1$ spatial dimensions. This work applies the general method of Euler operators and multipliers to give a complete classification of local conservation laws and conserved integrals for two primary cases of physical and mathematical interest in the study of fluid flow:

(1) kinematic conservation laws, like mass, energy, momentum and angular momentum, for which the conserved density and flux depend only on the fluid velocity, pressure and density (but not their spatial derivatives), in addition to the time and space coordinates;

(2) vorticity conservation laws, such as three-dimensional helicity and two-dimensional circulation, where the conserved density and flux have an essential dependence on the curl of the fluid velocity in a form exhibiting odd parity under spatial reflections.

In particular, all kinematic and vorticity conservation laws holding for special equations of state or in special dimensions are explicitly obtained.