Identification of an average temperature and a dynamical pressure in a multi-temperature mixture of fluids

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We first present the different models of a mixture of compressible fluids and we discuss in the case of Euler fluids the local and global well-posedness of the relative Cauchy problem for smooth solutions. Then we present a classical approach of mixture of compressible fluids when each constituent has its own temperature. The introduction of an *average temperature* together with the entropy principle dictates the classical Fick law for diffusion and also new constitutive equations associated with the difference of temperatures between the components. The constitutive equations fit with results obtained through the *Maxwellian iteration* procedure in extended thermodynamics theory of multi-temperature mixtures. The differences of temperatures between the constituents imply the existence of a new *dynamical pressure* even if the fluids have a zero bulk viscosity. The non-equilibrium dynamical pressure can be measured and may be convenient in several physical situations as for example in cosmological circumstances where - as many authors assert - a dynamical pressure played a major role in the evolution of the early universe.

References

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