Abstract. We present a survey on some recent results concerning the different models of a mixture of compressible fluids. In particular we discuss the most realistic case of a mixture when each constituent has its own temperature (MT) and we first compare the solutions of this model with the one with a unique common temperature (ST). In the case of Eulerian fluids it will be shown that the corresponding (ST) differential system is a principal subsystem of the (MT) one. Global behavior of smooth solutions for large time for both systems will also be discussed through the application of the Shizuta-Kawashima condition.

Then we introduce the concept of the average temperature of mixture based upon considerations that the internal energy of the mixture is the same as in the case of a single-temperature mixture. As a consequence, it is shown that the entropy of the mixture reaches a local maximum in equilibrium. Through the procedure of Maxwellian iteration a new constitutive equation for non-equilibrium temperatures of constituents is obtained in a classical limit, together with the Fick’s law for the diffusion flux.

Finally, to justify the Maxwellian iteration, we present for dissipative fluids a possible approach of a classical theory of mixture with multi-temperature and we prove that the differences of temperatures between the constituents imply the existence of a new dynamical pressure even if the fluids have a zero bulk viscosity.

References