A 18 MOMENTS MODEL FOR DENSE GASES: ENTROPY AND GALILEAN RELATIVITY PRINCIPLES WITHOUT EXPANSIONS

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The 14 moments model for dense gases, introduced in the last years by Arima, Taniguchi Ruggeri, Sugiyama, is here extended up to 18 moments. They have found the closure of the balance equations up to a finite order with respect to equilibrium; it is also possible to impose for that model the Entropy and Galilean Relativity Principles up to whatever order with respect to equilibrium but by using a Taylor's expansion. Here the exact solution is found, without expansions, but a bigger number of moments has to be considered and reasons will be shown suggesting that this number is at least 18.

References

- Liu, I.-S.; Müller, I. Extended Thermodynamics of Classical and Degenerate Ideal Gases. Arch. Rat. Mech. Anal. 1983, 83, 285–332.
- [2] Liu, I.-S.; Müller, I.; Ruggeri, T. Relativistic thermodynamics of gases. Ann. Phys. (N.Y.) 1986, 169, 191–219.
- [3] Müller, I.; Ruggeri, T. Rational Extended Thermodynamics, 2nd edn.; Springer Tracts in Natural Philosophy. Springer, New York, NY, USA, 1998.
- [4] Trovato, M.; Reggiani, L. Quantum maximum entropy principle for a system of identical particles, Phys. Rev. E 2010, 81, 021119:1– 021119:11.
- [5] Carrisi, M.C.; Mele, M.A.; Pennisi, S. On Some Remarkable Properties of an Extended model for dense gases and macromolecular fluids. *Proc. R. Soc. A* 2010, *466*,1645–1666.

- [6] Arima, T.; Taniguchi, S.; Ruggeri, T.; Sugiyama, M. Extended Thermodynamics of dense gases. *Continuum Mech. Thermodyn.* 2012, 24, 271–292.
- [7] Arima, T.; Taniguchi, S.; Ruggeri, T.; Sugiyama, M. Extended Thermodynamics of real gases with dynamic pressure: An extension of Meixner's theory. *Phys. Lett. A.* 2012, *376*, 2799–2803.
- [8] Pavić, M.; Ruggeri, T.; Simić, S. Maximum entropy principle for rarefied polyatomic gases. *Physica A* 2013, 392, 1302–1317.
- [9] Arima, T.; Mentrelli, A.; Ruggeri, T. Molecular Extended Thermodynamics of Rarefied Polyatomic Gases and Wave Velocities for Increasing Number of Moments. Ann. Phys. 2014, 345, 111–132.
- [10] Arima, T.; Barbera, E.; Brini, F.; Sugiyama, M. The role of the dynamic pressure in stationary heat conduction of a rarefied polyatomic gas. *Phys. Lett. A* 2014, *378*, 2695–2700.