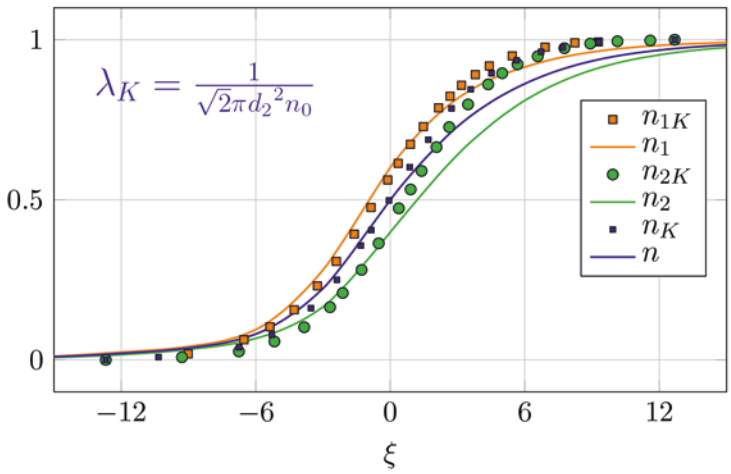
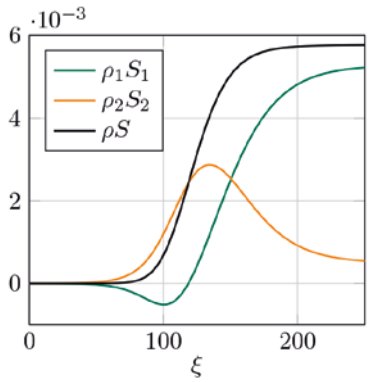
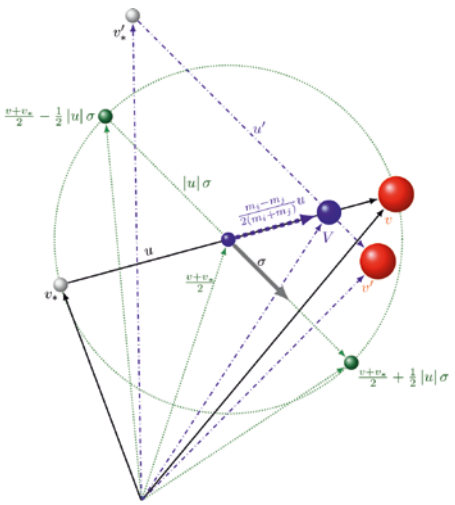
Mathematical Modelling in the Kinetic Theory of Gases

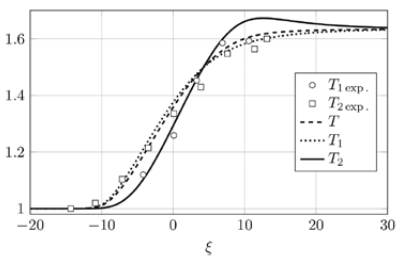
kinetic theory, non-equilibrium thermodynamics, mixtures of gases, polyatomic gases

The research activities of our group focus on mathematical modelling and analysis in the collisional kinetic theory of monatomic and polyatomic gas mixtures, and on study of non-equilibrium phenomena arising in extended thermodynamics. On the one hand, we consider spatially homogenous system of Boltzmann equations for gas mixtures, and analyze its properties, such as existence and uniqueness of its solution, generation and propagation of its L^p norms, question of convergence towards equilibrium. At the same time, we study linearised problems in a non-homogenous setting and investigate existence of perturbed solution as well as its stability around global equilibrium. On the other hand, we analyze macroscopic models of mixtures from the standpoint of extended thermodynamics – a macroscopic theory which bridges the gap between macro and meso scale. It yields the models in the form of hyperbolic PDEs that are thermodynamically consistent. They are capable of capturingnon-equilibrium processes, such as shock waves and detonations, with sufficient accuracy.









SELECTED PROJECTS

Title: *ON174016 "Mechanics of nonlinear and dissipative systems - contemporary models, analysis and applications"*
Type: national project, funded by Ministry of Education, Science and Technological Development of the Republic of Serbia
Duration: from 2011
Contact person: Dr Srboljub Simić

Title: *PICS CNRS No. 278838 "Kinetic and hyperbolic models for gaseous mixtures and granular media",*
Type: bilateral project between France and Serbia
Duration: 2 years, 2018-2019
Contact person: Dr Milana Čolić, Dr Laurent Boudin

COLLABORATIONS

- Université Paris Diderot, France (Laurent Desvillettes),
- University of Texas at Austin, USA (Irene M. Gamba)
- University of Minho, Portugal (Ana Jacinta Soares)

CONTACT PERSONS

Dr Srboljub Simić;
srboljub.simic@dmi.uns.ac.rs
Dr Milana Čolić;
milana.colic@dmi.uns.ac.rs