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Rayleigh-Bénard Convection in Liquid Metal under Influence of Vertical Magnetic Fields[1] FELIX SCHINDLER, Institute of Fluid Dynamics, Helmholtz-Zentrum Dresden-Rossendorf, Germany, TILL ZUERNER, Institute of Thermodynamics and Fluid Mechanics, Technische Universität Ilmenau, Germany, TOBIAS VOGT, SVEN ECKERTZ, Institute of Fluid Dynamics, Helmholtz-Zentrum Dresden-Rossendorf, Germany, JOERG SCHUMACHER, Institute of Thermodynamics and Fluid Mechanics, Technische Universität Ilmenau, Germany
— In the presented Rayleigh-Bénard convection experiments the turbulent 3d-flow of the liquid gallium-indium-tin alloy is investigated by use of ultrasound Doppler velocimetry, temperature and contactless inductive flow tomography measurements. We reconstruct for the first time near-wall as well as bulk flow, momentum and heat transport as well as long-term behaviour of the large-scale liquid metal flow at a low Prandtl number of 0.029 and high Rayleigh numbers up to $5 \cdot 10^9$. Also the influence of a strong magnetic field on the turbulent liquid metal is investigated. The results of the experiments are compared to direct numerical simulations and other experiments. Simulations are also considered for the interpretation of the measured turbulence statistics.
Our experiments aim to provide a deeper understanding of the turbulent convection and its interaction with magnetic fields in turbulent low Prandtl number flows as those in molten steel, aluminum or in geo- and astrophysical flows.

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