MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Fluid and Materials Sciences (2)

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# IVIDIL EXPERIMENT ON ISS: DIFFUSIVE PROCESSES UNDER CONTROLLED VIBRATIONS

**Abstract**

Precise measurements of heat and mass transport coefficients under terrestrial conditions are often perturbed by buoyancy-induced flows. The microgravity environment minimizes the effect of gravity. On the other hand, the background g-jitter encountered in many space experiments may alter the benefits of microgravity environment. Although g-jitters seem to have a major impact on the measurement of diffusion coefficients, very few preliminary studies have been carried out on this topic. The ability of numerical modeling to provide reliable predictions of vibrational effects for the interpretation and planning of future space experiments is still limited by a lack of well-documented experimental results that can be used for verification. In the frame of the present project IVIDIL (Influence of Vibration on Diffusion and Thermodiffusion in Liquids), a detailed investigation of the spectral influence of g-jitters on molecular diffusion and thermodiffusion measurements is proposed. The experiment is scheduled to fly on ISS in August 2009. The study of the effect of controlled vibrations (i.e. vibrations with the prescribed frequency and amplitude) will provide quantitative information on how vibrations affect the measurements of different physical quantities in Space experiments. IVDIL concept is focused on two physical phenomena: diffusion and vibration-induced convection, which have very different time scales. The first is very slow (characteristic time  20h) and the latter one is fast (characteristic time is about a few minutes). Comprehensive numerical modeling can combine both phenomena. Thus, preparation of the experiment is undertaken in three different ways: numerical simulations, laboratory investigation of slow process (diffusion) and study of fast processes (vibrational convection) during Parabolic flights[1]. All these activities use geometry, liquids, observation technique, and environmental conditions as close as possible to the ISS experiment.

References

Mialdun A., Ryzhkov I. I., Melnikov D., Shevtsova V. Experimental evidence of thermal vibrational convection in a non–uniformly heated fluid in a reduced gravity. Phys. Rev. Lett. 2008; 101: 084501.