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Enhancement of Heat Transfer by Vibrations VALENTINA SHEVTSOVA, ALIAKSANDR MIALDUN, DENIS MELNIKOV, ILYA RYZHKOV, YURI GAPONENKO, University of Brussels (ULB) — An experimental evidence of convection caused by translational vibration of non-uniformly heated fluid in low gravity is reported. The theory of thermovibrational convection in weightlessness has been well developed but direct experimental proof of this type of motion was missing. An innovative point of the experiments is the observation of temperature field in front and side views of the cubic cell using digital optical interferometry. In addition, particle tracing is employed. The evolution of temperature field is studied systematically in a wide range of frequencies and amplitudes. The mean flow structures previously reported in theoretical studies are confirmed. The behavior of integral and local Nusselt numbers demonstrate strong enhancement of heat transfer during short periods of microgravity time, which is about 20s. The obtained results show, that mean vibrational flows can cause strong heat transport in the fluid. It was found that this transport becomes more intensive with increasing the vibrational impact. It opens the possibility of using vibrations as an alternative way of transferring heat and matter in space. The experimental results are supported by direct numerical simulations.

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