Equilibrium Shape of ^{4}He crystal under m$G_{\rm E}$

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The gravity on the Earth ($G_{\rm E}$) has not been taken seriously except for some critical phenomena of superfluid ^{4}He, though it could definitely mask the fundamental phenomena on quantum solids and liquids. We are investigating the effect of gravity on the equilibrium shape of solid ^{4}He at low temperatures. The experiment has already got started and some preliminary results are obtained.[1] The reduced gravity less than 10 m$G_{\rm E}$ is obtained by a jet plane's parabolic flight for a period of 20 seconds.
Recently we successfully cooled solid ^{4}He down to 0.6 K on the small jet plane and were able to observe the crystal shape under m$G_{\rm E}$. Before the entry of the reduced gravity, it experienced 2.0 $G_{\rm E}$ and the interface became sharper due to the reduced capillary length. As soon as m$G_{\rm E}$ was achieved, the crystal began to change its shape to the equilibrium in a second. The time constant is consistent with the calculation based on the surface tension and the growth coefficient. The crystal remained stuck all the time of the 20 seconds to the wall. We also applied acoustic waves to the crystal to shake it during the parabolic flight and observed some responses to the waves.

[1]T. Takahashi, M. Suzuki, R. Nomura and Y. Okuda, J. Low Temp. Phys. **162**, 733 (2011).