Supersolidity Mimics Superfluidity in Other Scale

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This work is devoted to our new and wider insight into the problem of supersolidity. In contrast with many other studies where only a short temperature interval (mainly T<0.5 K) is considered we propose a different overview of the whole range of solid helium existence. Comparing temperature dependences of NCRI, heat capacity and shear modules we conclude that all unusual effects can be of the same nature and successfully explained within the suggested theory of rotational excitations in solid helium (first introduced at QFS'2010[1]) with smaller (at higher T), larger (at lower T) domains of correlated rotations and frozen approaching T=0. Shorter correlations (short-range order) could be inherent as well in superfluid helium that may explain the temperature dependence of viscosity. Because of negligible contribution of dislocations in the specific heat ($\sim 10^{-21}$ k_B at 0.1 K, k_B - Boltzmann constant)[2] and irrelevance to liquid helium we conclude that dislocations may not be responsible for similarities in temperature dependences of all mentioned properties.

1. N.V. Krainyukova, J. Low Temp. Phys. **162**, 441 (2011)
2. A. Granato, Phys. Rev. **111**, 740 (1958)

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