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Advances in Turbulence Studies Near T=0[1]

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Many advantages are beginning to be realized in the study of turbulence at cryogenic temperatures. However, the classic method of investigation, optical visualization, is increasingly difficult as the temperature of the test fluid is lowered toward absolute zero. In this presentation, the advantages of cryogenic fluid dynamic studies will be listed, and difficulties in realizing these methods will be listed as well. Many other details will be elucidated in the following presentations. Here, in particular, the extreme difficulties encountered very near absolute zero, where liquid helium has zero viscosity and almost zero heat capacity, will be discussed. Techniques for generating turbulence using rotation, vibration, and pulled grids will be explained. Visualization methods such as measuring local and global heating, and temperature and pressure fluctuations in sub-millimeter size fluid volumes, will be developed. Future exciting possibilities for untested methods of visualization will also be considered.

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