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Generation of Homogeneous and Isotropic Turbulence with Small Mean Flow ROBERT ZIMMERMANN, MPI Dynamics & Self-Organization (MPIDS) and International Collaboration for Turbulence Research (ICTR), HAITAO XU, MPIDS and ICTR, EBERHARD BODENSCHATZ, MPIDS and ICTR and LASSP, Cornell University — We designed an apparatus that generates nearly homogeneous and isotropic turbulence with small mean flow. The apparatus is shaped as an icosahedron containing 140 liters of water. The flow is driven by 12 independently controlled propellers, each at one of the vertices of the icosahedron. We carried out Lagrangian particle tracking measurements experiments with measurement volumes up to size of $10 \times 10 \times 10[cm^3]$, comparable with the integral length scale. The results show that the apparatus is able to provide nearly homogeneous and isotropic turbulence with a Taylor microscale Reynolds number $R_\lambda \approx 600$. The measured mean flow is less than 20% of the fluctuating velocity throughout the observed volume. We also measured the Lagrangian structure function of position and velocity in this flow and compared with theoretical predictions by Zybin et al [PRL. 100, 174504 (2008)].

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