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Phoresis-induced clustering of particles in turbulence LUKAS SCHMIDT, ETH Zurich, ITZHAK FOUXON, Yonsei University Seoul, DOMINIK KRUG, University of Melbourne, MAARTEN VAN REEUWIJK, Imperial College London, MARKUS HOLZNER, ETH Zurich — We demonstrate phoresis-induced clustering of non-inertial particles in turbulent flows. Phoretic mechanisms such as thermophoresis, chemotaxis or diffusiophroesis are known to create a particle drift with respect to the fluid. Theory, based on the framework of weakly compressible flow, predicts that particles in turbulence streaked by salinity gradients experience a diffusiophoretic drift and will thus form particle cluster. An inclined gravity current setup is used to analyse clustering due to the diffusiophoretic effect in turbulent flow experimentally. Simultaneous 3D particle tracking velocimetry and laser induced fluorescent measurements provide the full Lagrangian velocity field and the local salt concentration in the observed 3D domain. Two independent methods show consistent evidence of the theoretically predicted particle clustering in turbulence. This clustering mechanism can provide the key to the understanding of spontaneous clustering phenomena such as the formation of marine snow in the ocean.

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