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Laboratory measurements of the inception and evolution of Langmuir Turbulence YI MA, FABRICE VERON, University of Delaware, ANDRES TEJADA-MARTINEZ, AMINE HAFSI, University of South Florida — When wind starts to blow over a quiescent air-sea interface, both currents and surface waves are initially generated. The interaction between the wind-driven waves and currents leads to the generation of Langmuir circulation (LC) consisting of counter rotating vortices aligned with the wind. Shortly thereafter, Langmuir turbulence (LT), that is multiple scales of LC, appear. In LT, length scales range from several centimeters when short capillary waves first appear up to tens of meters when the spectrum of waves broadens. We present results from a laboratory experiments where the evolution of the air-water interface starting from rest and the accompanying development of centimeter-scale Langmuir turbulence is investigated. We present surface infrared imagery and subsurface Particle Image Velocitmetry. We show that evolution of from organized small scale LC to LT is very rapid leading to intense surface mixing whereby momentum initially transferred to the surface through viscosity efficiently mixes the near surface layers. Subsurface turbulence measurements are presented in the context of scalar (gas) flux through the air-water interface.

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