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Mechanisms for wave generation in a turbulent air-water flow FRANCESCO ZONTA, MIGUEL ONORATO, Dept. Physics, University of Torino, ALFREDO SOLDATI, Center for Fluid Mechanics and Hydraulics, University of Udine — Momentum and scalar transport phenomena across an air-water interface are important in many geophysical processes (absorption of CO_2 by the ocean) and industrial applications (dynamics of steam-air mixtures flowing into nuclear reactors). We used Direct Numerical Simulations (DNS) to explore the dynamics of countercurrent air/water flow. The motion of the air/water interface was computed by solving an advection equation for the interface vertical elevation (boundary fitted method). At each time step, the physical domain was mapped into a rectangular domain using a nonorthogonal transformation. Continuity and Navier-Stokes equations were first solved separately in each domain, then coupled (velocity/stress) at the interface. We performed DNS in the Weber, Froude and Reynolds number (We,Fr,Re) parameter space. Depending on We, Fr and Re, we obtained different transients for wave evolutions, from small capillary waves to longer gravity waves. For steady-state conditions, we observed that interface deformation echanced turbulence activity/transfer mechanisms across the interface.

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