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Free surface waves above turbulence RALPH SAVELSBERG, GERT-JAN VAN HEIJST, WILLEM VAN DE WATER, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands — Surprisingly little is known about the statistical nature of the shape of a free surface above turbulence. We study this in a free surface water channel in which turbulence is generated with an active grid. It produces turbulence with a Taylor-based Reynolds number Re_λ of $\mathcal{O}(300)$ and allows us to control the isotropy of the turbulence. Naively one would expect surface wrinkles to be primarily associated with low pressure in the cores of vortices attached to the surface. Although simultaneous measurements of the surface shape and the sub-surface velocity field show that part of the surface shape is indeed correlated with large sub-surface structures, spectra of the surface shape in time and space show that much of the surface actually consists of gravity-capillary waves. These waves are radiated from turbulent structures and travel in all directions across the surface. As a consequence the anisotropy of the surface shape is directly connected to the anisotropy of the sub-surface turbulence.

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