Geophysical Research Abstracts
Vol. 21, EGU2019-11427, 2019
EGU General Assembly 2019

Trains of micro-scale capillaries observed over short wind waves

Guillemette Caulliez and Rémi Chemin

Mediterranean Institute of Oceanography, Aix-Marseille University, Marseille, France
(guillemette.caulliez@mio.osupytheas.fr)

As pointed out by earlier works in the seventies and further analyzed by Elfouhaily et al. (1997), a proper interpretation of remote sensing images of the sea surface requires a faithful description of wind wave spectra at short scales. In particular, the knowledge of the shape of the spectral tail at high wavenumbers is of crucial importance for modeling wave spectra on the basis of integral wave field properties as provided by observations. In this context, it is generally believed that only capillary waves of wavelength not shorter than five or six millimeters can be observed at the sea surface. In the present work, we show that trains of capillaries as short as one or two millimeters can form at the surface of longer short wind waves.

The observations of waves of millimeter scale were carried out in the 8 m long Marseille-Luminy wind-wave tank at fetches ranging from 1 to 3.5 m and wind speed up to 10 m/s. To that end, visualizations of both components of water surface slope were made over a 15 $\times$ 12 cm2 area with a spatial resolution of 0.1 mm by using a Color Imaging Slope Gauge as described by Jahne & Riemer (1990). Single-point measurements of wind and wave properties were also performed simultaneously.

Two types of micro-scale capillaries have been identified from the slope images. First, for wind speeds higher than 5 m/s, one or two well-formed capillaries of about one millimeter length were detected in the troughs of the steepest parasitic capillaries. We hypothesize that a nonlinear wave-wave interaction process leading to the formation of superharmonic wave components might be at the origin of this phenomenon. Second, long trains of millimeter-scale capillaries were observed at the front of gravity-capillary wave crests simultaneously with parasitic capillaries when microbreaking occurs. Consequently, this phenomenon might be generated directly by the disruption of the water surface. The conditions of the occurrence of both phenomena in terms of local and statistical properties of wind wave fields have been examined in detail.