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Micro-scale breaking from wave blocking on strong opposing currents CHIN WU, AIFENG YAO, University of Wisconsin-Madison — Blocking of surface water waves by strong opposing currents is one of intriguing phenomena in wave-current interactions. In this study, the effects of spectral bandwidth and nonlinearity on wave blocking or/and breaking processes are examined. Well-controlled laboratory experiments on varying amplitudes of monochromatic, narrow-banded, and broad-banded waves on strong spatially varying opposing currents achieved by a raised bottom were conducted. For narrow-banded or monochromatic waves of lower incident amplitudes, the spatial wave profile showed that a series of short capillary waves at the front of the blocked wave appeared and the amplitude of capillary waves significantly decreased due to viscous damping. With increasing amplitudes, the reflected waves became higher and pushed the blocking point further downstream, indicating the importance of wave nonlinearity. The wave profile was replaced by a short wave with parasitic capillary waves riding on the forward face of the crest. The growth and the relative motion of the parasitic capillary waves on the underlying crest led to a so called micro-scale breaking during the wave blocking process. For broad-banded waves, so-called partial blocking was observed.

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