An overview of breaking wave measurements during RaDyO

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Two intensive field experiments using R/P FLIP were staged within the Office of Naval Research's Radiance in a Dynamic Ocean (RaDyO) field program in the Santa Barbara Channel (SBC) and in the central Pacific Ocean south of Hawaii (Hawaii) during 2008 and 2009. The two field sites were chosen to provide different sea state conditions – sheltered with moderate winds and sea states (SBC) and open ocean with higher winds and sea states (Hawaii). The SBC conditions were characterized by: (1) low to moderate westerly wind speeds with a strong diurnal cycle and (2) complicated wind and swell conditions with a wind sea that also showed a diurnal cycle.

As part of our contribution within RaDyO, we gathered and analyzed a comprehensive suite of sea surface roughness measurements including breaking wave contributions, designed to provide optimal coverage of fundamental optical distortion processes associated with the air-sea interface. We measured mean breaking wave crest length spectral density $\Lambda(c_b)$, where c_b is the breaker speed, and the mean breaking strength parameter *b*.

A primary result is that the overall mean level of $\Lambda(c_b)$ is larger in Hawaii than in the SBC, even though the mean wave age was considerably older. While the wave age effects did conform to the anticipated perspective within each RaDyO experiment, the overall lower mean level of $\Lambda(c_b)$ in the SBC compared with Hawaii appears linked to the complex currents operative in the SBC. The breaking crest length spectral density derived from visible imagery is shown to be modulated by the development of the wave field (wave age) and alignment of the wind and surface currents at the intermediate (dominant) scale of wave breaking.