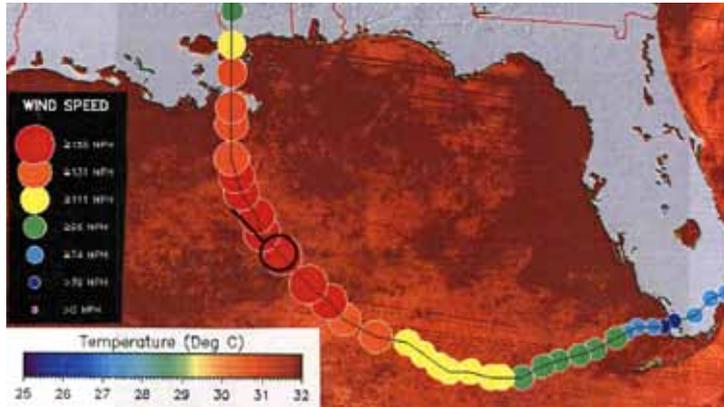


Sea Surface Waves of Hurricanes

Edward J. Walsh, C. Wayne Wright, NASA/GSFC and Peter G. Black, Mark D. Powell, NOAA/AOML/HRD

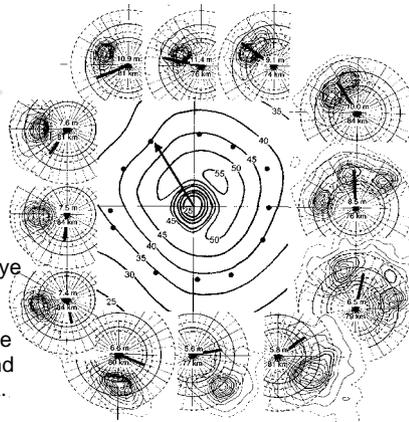
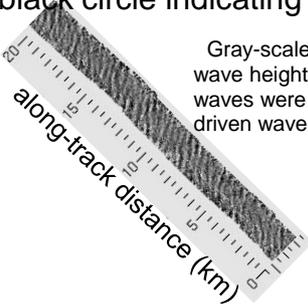
Mounted onboard a NOAA hurricane research aircraft, the NASA Scanning Radar Altimeter has measured hurricane waves since 1998.

Hurricane Katrina



Katrina track and intensity (<http://fermi.jhuapl.edu/hurr/>). NOAA aircraft 8/28/05 flight track (black line) extending from black circle indicating radius of maximum wind (RMW).

Gray-scale-coded SRA wave topography of 12 m significant wave height and 320 m dominant wavelength. The dominant waves were swell generated near the RMW. A secondary wind-driven wave system propagates across the swath.

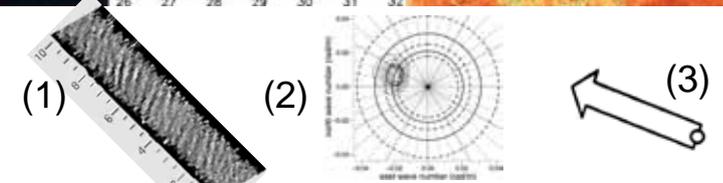
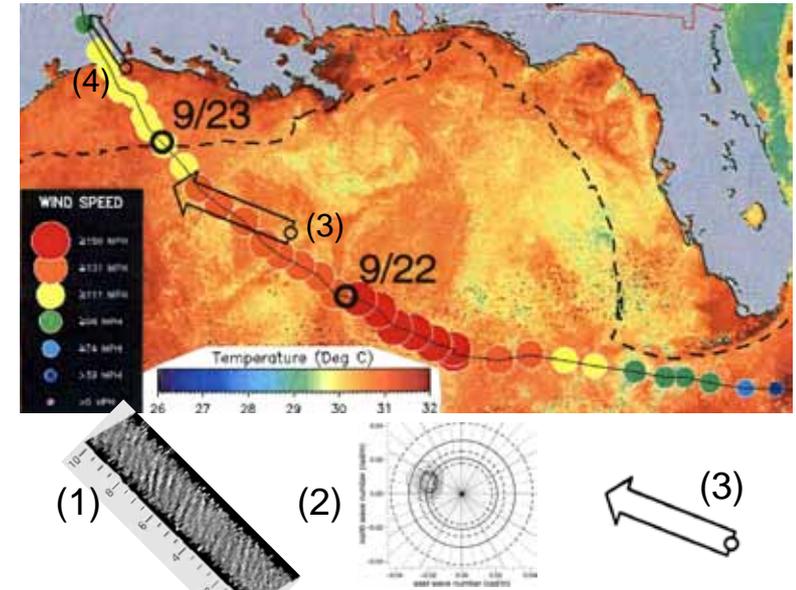


Directional wave spectrum azimuthal variation 80 km from eye of Hurricane Ivan on 14 SEP 04 (top number is significant wave height, bottom number is distance from eye). Center plot is m/s wind speed with arrow indicating track.

SRA measurements and the wave spectra produced from them provide the ground truth needed to verify and improve the numerical wave models used by planners.

Hurricane Rita

- (1) SRA wave topography measured 150 km ahead of Rita on 9/22/05,
- (2) Can be transformed into a directional wave spectrum to determine the 310 m dominant wavelength and 7.1 m significant wave height,
- (3) And then represented as an arrow extending from the observation point (circle) in the wave propagation direction with width proportional to wave height and length proportional to wavelength.
- (4) The wave height the same distance ahead of Rita on 9/23/05 was only 2.7 m and the wavelength 150 m because much wave energy was lost crossing 150 km of shoaling water on the continental shelf whose boundary is indicated by the dashed line.

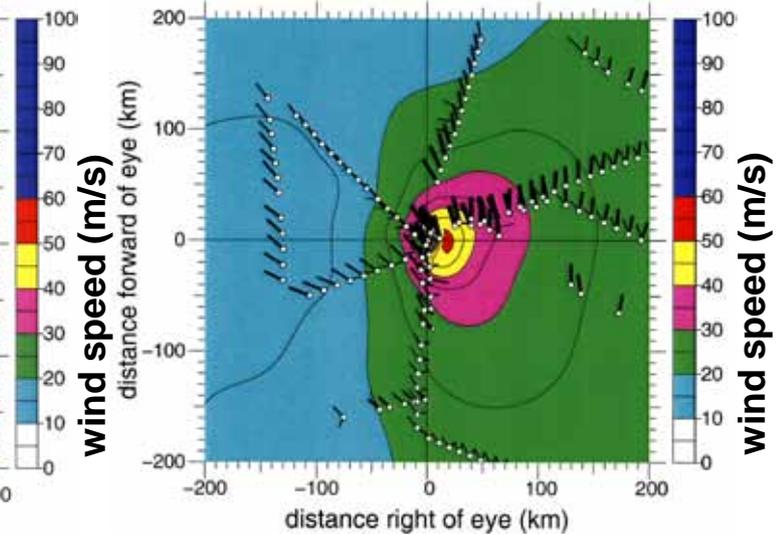
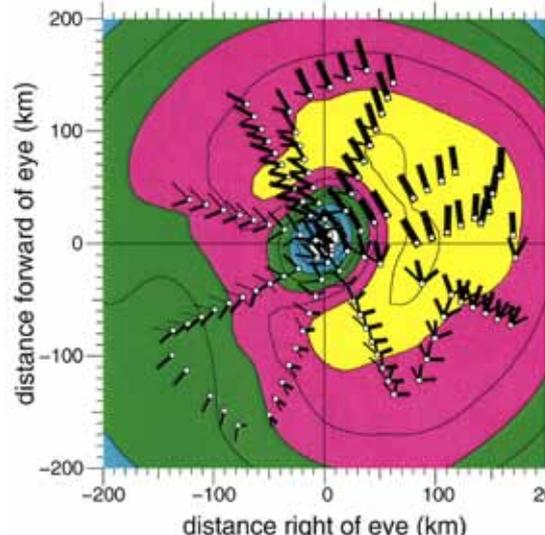


Wave field is determined by hurricane size, intensity, forward speed.

Hurricane Bonnie was Category 2, but its much larger size produced significantly greater waves than those generated by Category 3 Hurricane Lili.

Bonnie 24 AUG 98, 10.8 m Hs, 280 m wl

Lili 2 OCT 02, 8.2 m Hs, 295 m wl



Black radials extend in the wave propagation direction a distance proportional to the ocean wavelength (wl). Their width is proportional to the significant wave height (H_s). Wind contours at 5 m/s, color changes at 10 m/s intervals.