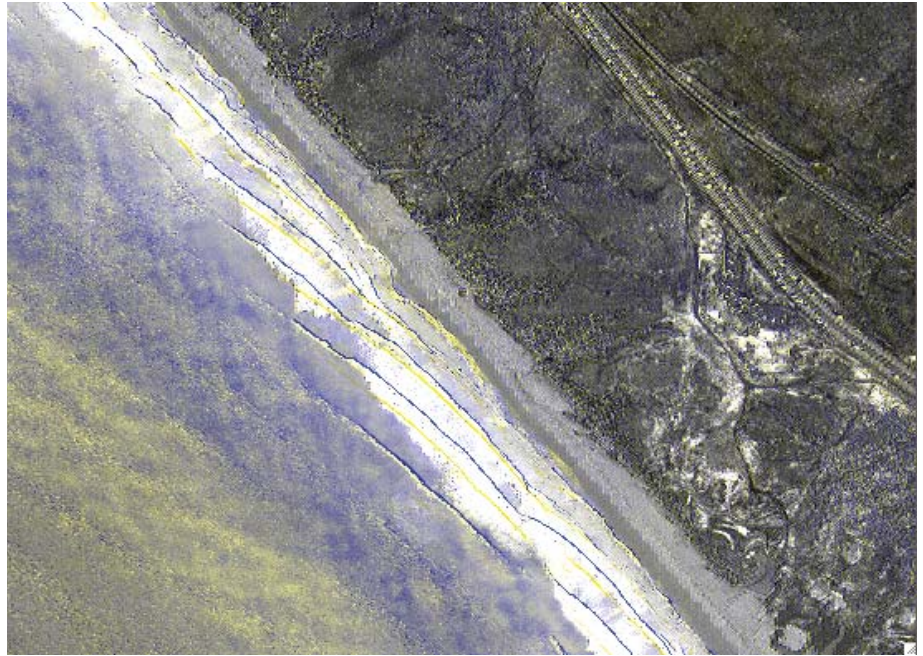


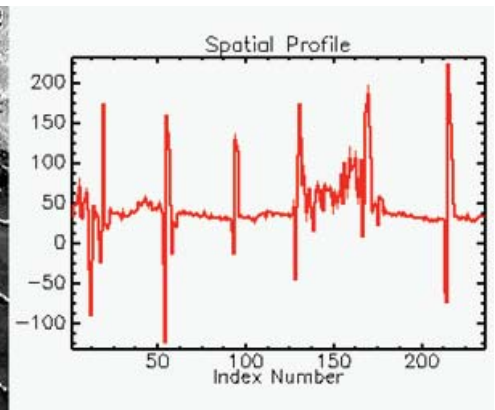
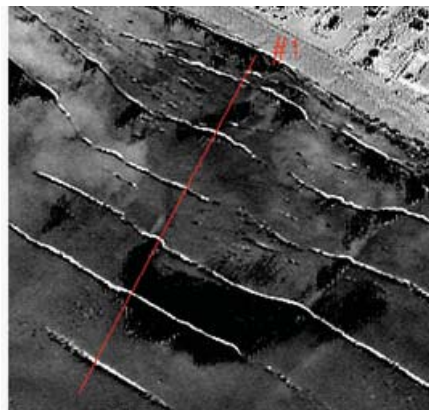
Using 8-color Multispectral Satellite for Observation of Wave Motion

Coastal bathymetry near Camp Pendleton, California was measured using wave motion as observed by the WorldView-2 commercial satellite imaging system. The linear finite depth dispersion relation for surface gravity waves was used to determine nearshore ocean depth from successive images acquired of the coastal area. Principal component transformations of co-registered 8-color multispectral images were found to very effectively highlight wave crests in the surf zone. Time sequential principal component images then contain both spatial and temporal information. From these change detection images, wave celerity could be determined and depth inversion could be performed. For waves farther from shore, the principal component transformation no longer highlighted wave crests, but crests could be resolved within a single RGB composite image with equalization enhancement. The wavelength of a wave above a point of known depth was measured. The wave period method was used to determine depth for other waves in the propagation direction of this wave. Depth calculations using these methods compared favorably to reference bathymetry. The spatial resolution for this method of determining depth is higher and perhaps more accurate than the reference bathymetry used in this study, particularly in the surf zone.

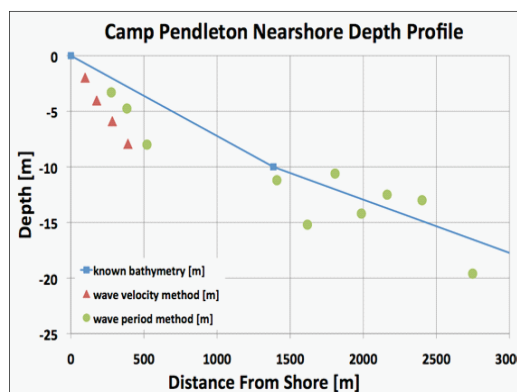
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An RGB display of images acquired at three separate times illustrates the motion of waves as they travel towards the shore.



A principle components transform of the time-series images creates an image in which wave crests are highlighted in the nearshore area. A spatial profile of a principle component band demonstrates the ease with which wavelength can be measured.



Bathymetry derived along a single profile using the wave velocity or wave period method as compared to reference bathymetric data.

