

Urthecast Video Imaging from Earth Orbit: A New Tool for Mapping Coastal Bathymetry

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Video methods for near coast phenomena have been used for decades, but so far only from airborne, balloons, or fixed tower platforms. Urthecast now provides 3-fps 1-m pixel resolution full-color video from the space station Iris camera. The 2 km x 4 km image footprint tracks the AOI for 60 seconds. The images are stabilized and orthorectified, ready to process into coastal products with minimal effort. Urthecast plans deployment of a constellation of 8 video capable satellites as part of their planned Opti-SAR constellation. The paper discusses use of such video for mapping bathymetry in the surf zone (depth range of 0-2m), and beyond the surf zone (2–10m).

Video in the surf zone was pioneered by Holland, Lippmanm, and Holman with a tower-based video at Duck, NC around 1980. That work eventually evolved into the permanent “Argus” system operated by Oregon State University at Agate Beach, OR. There are now thirty Argus installations world-wide. The basic algorithm is inverting the shoreward progressing breaking wave front into depth. Time averaging the video also reveals submerged topography. We present similar analysis with the space-based Iris video.

Video beyond the surf zone was pioneered by Dutch and German teams starting in the 1980s, imaging ocean waves from a tower mounted radar, and later with airborne video by USA researchers. Depth is determined by fitting the shallow depth wave dispersion equation to the wave temporal spectrum. (The algorithm also provides currents.) We propose using this method for periodic inspection of dredged channels by remote sensing.

Videos from satellites can access remote coastal areas and can be cost effective relative to airborne deployments or fixed towers.