MASTER OF SCIENCE
IN
METEOROLOGY AND PHYSICAL OCEANOGRAPHY

VERIFICATION OF A ONE-DIMENSIONAL SURF PREDICTION MODEL FOR STEEP BEACH CONDITIONS

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Wave breaking is the only source of energy dissipation in the Battjes and Janssen (1978) wave transformation model, which is parameterized by a breaking wave parameter, g. The Battjes and Janssen (1978) wave transformation model was calibrated by Battjes and Stive (1985) and the calibration was refined by Morris et al (2001) for waves over shallow sloping beaches. The objective of this study was to further refine the calibration to include steep beaches for a range of wave conditions by analyzing data from a nearshore experiment at Sand City, California. Waves were measured by a cross-shore array of nine pressure sensors. The pressure data were analyzed for H_{rms} and compared with calculated H_{rms} by the model. Results were largely inconclusive, which is attributed to wave reflection from the steep beach, something not accounted for in the model. Excluding data collected at low tides and allowing the model to account for reflection would likely reveal a more interesting outcome.

KEYWORDS: Surf Forecasting, Surf model, Waves, Steep Beach

AN ASSESSMENT OF NOGAPS PERFORMANCE IN THE PREDICTION OF TROPICAL ATLANTIC CIRCULATION FORMATION

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The Navy requirement for 5-day tropical cyclone track guidance necessitates an assessment of the Navy Operational Global Atmospheric Prediction System (NOGAPS) in forecasting tropical cyclone formation. The Tropical Cyclone Vorticity Tracking Program is applied to NOGAPS analyses and forecasts through 120 h to identify and track circulations in the tropical Atlantic region from 25 July – 31 October 2001. Circulations over northern South America were not found to be related to Atlantic hurricane formation and the number of formations in the western Atlantic was insufficient for statistical analysis. Circulation formations over Africa tend to be forecast too early while those forming over the eastern Atlantic tend to be forecast late. About 70% of the NOGAPS forecasts and analyzed formations are within +/- 12 h regardless of forecast intervals, and about 12% of the formation forecasts are false alarms. Whereas the on-time formations tend to have small relative vorticity errors, the early (late) formation forecasts are at first too strong (weak), but then the model error growth dominates the expected timing error contribution. At the time the National Hurricane Center issues a tropical storm warning, the NOGAPS forecasts of relative vorticity, sea-level pressure, and circulation size generally have smaller amplitudes than the verifying analyzed values.

KEYWORDS: Tropical Meteorology, Tropical Cyclone Genesis, Tropical Cyclone Formation Forecasts

VARIABILITY OF REFRACTIVITY IN THE SURFACE LAYER

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The author and members of the Boundary Layer Studies Group collected atmospheric surface layer profile properties affecting RF propagation during the Roughness and Evaporation Duct experiment off the windward coast of Oahu. Temperature, humidity and pressure profiles were measured from the surface and up to 100 m by multi-level buoy-mounted sensors and a rawinsonde attached to a kite flown from a small vessel. The profiles were obtained concurrently with S-, X- and Ku-Band propagation measurements along a 26-km path. Using existing surface-layer bulk models, profiles of the gradient of modified refractivity were computed from the buoy data at one level and compared with the actual values obtained from the kite and the buoy. The bulk estimates did not agree well with the buoy data within the lowest 5 m. The kite and buoy data did not show the strong gradients just above the surface that were expected from theory. This same effect was noted when the kite experiment was repeated over much colder water near San Diego, CA. A refractive model was not able to forecast the variability of measured RF propagation characteristics when driven with the merged kite and buoy data. Using bulk estimates did result in some forecast skill.

KEYWORDS: RF Propagation, Boundary Layer, Refractivity, Bulk

UTILITY OF TACTICAL ENVIRONMENTAL PROCESSOR AS AN AT-SEA WEATHER RADAR

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Tactical Environmental Processor (TEP) is a through-the-sensor technique that converts radar returns from the AN/SPY-1 into environmental information known as spectral moments. TEP was installed aboard the *USS Normandy* (CG 60) in May 2000 to support a Limited Objective Experiment during Joint Task Force Exercise (JTFEX) 00-2. On 15 May, TEP observed severe weather associated with a line of passing thunderstorms. These weather events proved serious enough to suspend mid-cycle flight operations for the *USS George Washington* (CVN 73) during its simulated wartime scenario. TEP is a significant benefit to nowcast weather forecasting and supports at-sea METOC and warfighters in two primary areas: improved situational awareness and optimization of sensors, weapons and tactics. Results from this case study demonstrate the importance of TEP as a Doppler at-sea weather radar in support of naval operations.

KEYWORDS: Tactical Environmental Processor (TEP), Tactical Weather Radar, At-Sea Weather Radar, Nowcast