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MAPPING OF OFFSHORE BOUNDARY LAYER STRUCTURE USING A SCANNING LIDAR

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LONG-TERM GOAL

Develop a rugged, active optical instrument (lidar) that can be used from shore sites, airborne, and ship platforms to characterize the 3-D dynamics of the clear-air boundary layer. Measurements should include not only profiles of temperature, water vapor, the wind vector, and turbulence, but also a 4-D multi-parameter image of the boundary layer.

SCIENTIFIC OBJECTIVES

Measure boundary layer depth, stability of boundary layer, 3-D aerosol structures, and wind field off Wallops Island, Virginia during an ONR-sponsored experiment on shoaling wave clutter propagation scheduled for March 1998. Use the evolution of aerosol structures to statistically measure the wind vector. Also provide 3-D images of coherent boundary layer structures and visualize their 3-D evolution.

From simple single-site profiles, most meteorological models must derive second order flux terms that can be used to derive the change of the temperature, water vapor, and wind fields. The 3-D lidar measurements should provide a direct measurement of key wind variance tensor components that are critical for accurate model development.

APPROACH

During FY-98, the Volume Imaging Lidar (VIL) will be relocated to Wallops Island, Virginia and make measurements as part of the planned field experiment. As part of this experiment, RHI, PPI and specialized scans will be made. Boundary layer depth, stability, and wind fields will be derived from these data.

WORK COMPLETED

During FY-97, lidar was upgraded, tested, and calibrated in preparation for field experiment at Wallops Island, Virginia.

RESULTS

FY-97 is the first year of funding. Results will be reported after the Wallops Island experiment.

IMPACT/APPLICATION

FY-97 is the first year of funding. Expect results from Wallops Island experiment to improve understanding of Coastal Boundary Layer and air-sea interaction.

TRANSITIONS

None, FY-97 is the first year of funding.

RELATED PROJECTS

As part of ONR funded research at NRL, the lidar is also being used to (1) characterize the generation and processing of aerosol in coastal regions and (2) develop techniques for measuring optical refraction.

REFERENCES

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