Final Report JPL Contract 955528

Contractor: University of Washington, Seattle, Washington.

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Introduction:

The Joint Air Sea Interaction (JASIN) experiment took place off the Northwest coast of Scotland in the late summer and fall of 1978. Intensive measurements of sea surface and boundary layer parameters were taken. The activities performed under this contract involve the use of JASIN data as ground truth for various sensors on the SEASAT satellite.

Work Performed:

The first part of the contract was performed in the fall of 1979. Most of the JASIN data was stored at the Institute for Oceanographic Studies (IPS), Wormley, England. A University of Washington employee, Stewart Macklin, was sent to IOS to assist in calibration and processing of the JASIN surface wind, temperature and radiosonde data. This data was to be ready for the Workshop to be held at Pasadena in March 1980. To meet this deadline, additional employees were added.

Analysis of data from the NCAR Electra was performed at the University of Washington.

Travel for several British and University of Washington participants at the Pasadena workshop was funded by this contract.

After the workshop, an independent evaluation of the accuracy of the JASIN wind observations and derived wind fields was performed at the University of Washington under the direction of Dr. Robert Brown.

An analysis of the NCAR Electra wind and stress observations was performed by Mr. William Shaw. This used the data for September 1, 1973, the only day on which the aircraft underflew at SEASAT field of measurement.

The second part of the contract covered additional studies that were an outgrowth from the 1980 Pasadena workshop. The small scale wind fields of the JASIN array were reconstructed to allow for defective data at the W2 buoy.

The comparisons of JASIN and SEASAT data made at the workshop were extended to cover the full set of JASIN data available. The intercomparisons included investigation of the dependence of differences on wind speed and examination of the size of the foot print to be used in comparisons. Occasions of poor agreement were examined to establish limits for the validity of scatterometer winds.

The curl of the surface wind stress was calculated and a time series of the Ekman pumping constructed.

Particular attention was paid to the three day period August 30 to September 1 because of the passage of mesoscale systems and a well defined frontal system.

Most of this work was performed by Mr. Trevor Guymer under a subcontract from the University of Washington to the Institute for Oceanographic Studies.

(NASA-CR-169631) JOINT AIR SEA INTERACTION (JASIN) EXPERIMENT, NORTHWEST COAST OF SCOTLAND Final Report (Washington Univ.) 2 p HC A02/MF A01 CSCL 08C

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Additional work was done at the University of Washington under the direction of Dr. J. Businger, Dr. R. Brown and Dr. K. B. Katsaros.

Summary of Results:

The agreement between the Seasat-A Satellite Scatterometer (SASS) estimates of word speed and direction and the JASIN surface data is generally good, but there are occasions when the results are anomalous. The anomalous winds occurred in regions where deep mid-level convection was taking place, and could be due to rain modifying the surface roughness and thus invalidating the wind to reflectivity algorithm from which the SASS winds were derived, or to backscatter from localized rain cells within the mesoscale systems in the foot print.

The combined data sets allowed the surface heat budget to be examined on a daily basis. About 70% of the net flux (typically 100 Wm^{-2} in phase 1 and 70 Wm^{-2} in phase 2) is available for heating of the ocean. Of the remainder, over 75% goes into the atmosphere as latent heat. In these near neutral conditions, the mean wind speed across the JASIN triangle was 77% of the geostrophic wind speed and the cross isobar flow angle was 11° down gradient.

Systematic differences in the wind stress were examined. The curl of the wind stress was evaluated and a time series of the Ekman pumping constructed. The differences were related to synoptic and mesoscale events and especially with rainfall observations. Some evidence for modulation of the surface momentum and moisture fluxes by mesoscale sea surface temperature variations has been provided by the aircraft data.

Publications:

The results have been published in several articles. The following publications were supported in part by this contract.

Brown R. R., Cardone, Guymer, Hawkins, Overland, Pierson, Petcherych, Wilkerson, Wolcesbyn and Wartele. "Surface Wind Analyses for SEASAT", Journal of Geophysical Research, Vol. 87, C5 pp. 3355-3364.

Brown, R. R., "Surface Comparisons with SEASAT Scatterometer Measurements", Presented at A. G. U. Fall Conference, Baltimore, May 1981.

Guymer, T. H., J. A. Businger, W. L. Jones, and R. H. Stewart, "Anomalous Wind Estimates from the Seasat Scatterometer", Nature, 294, pp. 735-739.

Guymer, T. H., J. A. Businger, K. B. Katsaros, W. J. Shaw, P. K. Taylor, W. G. Large and R. E. Payne, "Transfer Processes at the Sea Air Interface", In preparation, 1982.