TITLE: Automated Mesoscale Winds Derived from Goes Multispectral Imagery

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SIGNIFICANT ACCOMPLISHMENTS TO DATE IN FY84:

An automated technique for extracting mesoscale winds from sequences of GOES VISSR image pairs has been developed, tested extensively, and configured for quasi-real time/research applications on the Atmospheric Sciences Division's research computing system. This system is designed to give mesoscale wind estimates at the highest spatial/temporal resolution possible from the VISSR imagery down to a wind vector separation of 10 km. Major accomplishments have been made recently in three major areas:

1) Technique Development

Preprocessing of imagery using IR resampling, VIS edge-preserving filtering, and reduced VIS resolution averaging improves height assignments and vector extraction for 10, 15, and 30 min imagery.

An objective quality control system provides much greater than 99% accuracy in eliminating questionable wind estimates.

2) Diagnostic Evaluations

Comparisons of results with manually tracked winds are outstanding both statistically and structurally. Automated winds generally have better spatial coverage and density, and have random error estimates ($\sim$0.9 ms^{-1}) half as large as the manual winds.

Dynamical analysis of cloud wind divergence has revealed temporally consistent convergence centers on the meso-β scale that are highly correlated with on-going and future developing convective storms.

3) Real-Time/Research Testing

The entire system of computer codes was successfully vectorized for execution on an array processor resulting in job turnaround in less than one (1) hour.

Real-time/research data from the MSFC McIDAS can be directly inserted into the automated hardware/software system and results displayed and filed by McIDAS.

FOCUS OF CURRENT RESEARCH ACTIVITIES:

A journal paper is under preparation describing the entire cloud winds systems including its application to a severe thunderstorm case.

A major improvement in the systems is underway involving the use of VAS imagery. Both "water vapor" winds and improved cloud height algorithms will be added to the current system and tested using special "rapid scan" VAS dwell imagery scheduled for acquisition from NOAA this spring.

PLANS FOR FY-85:

Integration, testing, and evaluation of the VAS multispectral imagery as part of the VISSR automated cloud wind system will be accomplished. These results will be submitted for journal publication, thereby ending this research activity. Assistance in utilization of technique by other institutions will also be offered (University of Wisconsin-Madison is currently installing the system.)

RECOMMENDATIONS FOR NEW RESEARCH:

Since this study has shown the need for high resolution multispectral imagery (in $\sim$ 8 spectral bands) at high time frequency (5-15 minutes), a feasibility study should be undertaken to examine the possibility of developing a dedicated Multispectral Atmospheric Mapping System (MAMS) for stabilized geostationary spacecraft for the purpose of mapping atmospheric structure and determining both mesoscale and global winds.

Use of these research results by other NASA researchers and other Government agencies, i.e., NOAA, should be encouraged.

PUBLICATIONS:

Wilson, G. S., 1984: Automated mesoscale wind fields derived from GOES satellite imagery. Preprints, Conf. on Satellite Meteorology/Remote Sensing and Applications, Clearwater Beach, FL (in press).