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MONTHLY REPORT

for

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VISSR Atmospheric Sounder (VAS)
Development and Performance Evaluation

Contract No.: NAS5-21965

Prepared by

Space Science and Engineering Center
The University of Wisconsin
Madison, WI

for

National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, MD

I. General

On December 12, 1979 P. Menzel of SSEC travelled to Greenbelt, MD to attend a meeting where the VAS Instrument Failure Reports were discussed. The possible loss of one of the large HgCdTe detector was discussed at length.

The Final Design Report on the UW VAS Data Processing System was prepared in December for early January 1980 submission.

II. Data Processing System Development

Preparations for installation of the wideband communications link (WCL) are nearly all completed. The hardware boxes have all been constructed, and most of them have been successfully tested. All known problems in the software have been corrected. Data transfers an order of magnitude faster than before are being realized in test runs.

Reconfiguration to two Data Base Managers (DBM), for increased capacity and extra reliability, will occur mid January. System software rewrites to best utilize two DBMs and the WCL are underway. New data handling software will gradually replace obsolete software as successful testing is completed. An effort of several months is anticipated.

The ADCCP communications network with GSFC and Wallops has been moderately redesigned for more general application. Separate microprocessor units will interface between SSEC's DBMs and the remote CPUs (one at the SDB and one at GSFC). All control is via an Intel 8080A microprocessor. Two hardware/software communications submodules are employed in each unit; one controls communications to and from the remote site via modem using a subset of the ADCCP protocol, the other module controls communications to and from SSEC's DBMs using a subset of the Bisync protocol. ADCCP I/O is accomplished under DMA control using an Intel 8273 SDLC/HDLC protocol controller chip; Bisync I/O is accomplished using an SSEC developed pseudo Bisync transceiver board. Data transfers of up to 60 kbaud are visualized; transfers up to 38.4 kbaud have already been accomplished in

tests. All hardware is built and all system software has been written. ADCCP specific software is written but untested; Harris DBM specific software must still be written. The first link up tests with GSFC are scheduled for February 1980.

The modifications on the VAS user terminal have been completed. VAS now has two user terminals each with 260 analog image frames, 12 bit enhancement, and 4 solid state graphics levels.

APT signal reception from TIROS-N (and NOAA-6) satellites will happen in early 1980. The hardware trouble shooting is nearly completed on the board for A/D conversion, frame synchronization, and DMAing data into the main microprocessor of the TIROS-N receiving system. The microprocessor software is written; the necessary McIDAS software is being written.

III. VAS Instrument Support

Band 8 calibration coefficients were redetermined using a modified algorithm which includes the detector nonlinearity explicitly. Assuming a nonlinear detector response where radiation amount relates to detector voltage by $N = a + bV + cV^2$, one can write for target radiance

$$N_T = N'_R \frac{b\,(V_T - V_Z) + c\,(V_T^{\,2} - V_Z^{\,2})}{b\,(V_R - V_Z) + c\,(V_R^{\,2} - V_Z^{\,2})}$$

where

N'_R = effective external reference blackbody radiance,

T = target,

Z = space, and

R = reference blackbody.

This replaces the usual

$$N_T = N'_R \frac{V_T - V_Z}{V_R - V_Z}\,.$$

Including the detector nonlinearity in the calibration coefficient determination in this way, it was found for band 8 (with fractional nonlinearity $\frac{cN_{320°K}}{2b} = .3\%$) that the baffle forward and secondary mirror shield coefficients did not change appreciably ($\Delta C_{BF}/C_{BF} = 1.5\%$, $\Delta C_{SMS}/C_{SMS} = .4\%$). This reaffirms the vacuum test data calibration analysis assuming linear detector response.

IV. VAS Data Processing Technique Development

Complete and consistent data sets for April 10 and May 2, 1979 have been prepared. They are available to VAS scientists for further study.

A technique for clear column radiance determination for fields of view with low lying stratus cloud cover has been developed. It involves locating the low stratus with surface data, and then utilizing the HIRS window channels (11, 4.3, and 3.7 microns) for cloud correcting. Initial tests are favorable.

Thesis work has been completed wherein a technique was devised by which an entire satellite geostrophic wind profile can be corrected using a real wind observation at just one level. In this way geostrophic winds derived from fields of satellite temperature soundings can be made considerably more accurate and reliable. This method was applied in several case studies in which geostrophic wind data was combined with cloud motion winds to produce meteorologically reasonable three dimensional wind fields.

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10 January 1980

Ms. Vanessa Scott
Code 269, Bldg. 16
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Dear Ms. Scott

In accordance with Article III of Contract NAS5-21965, I am submitting the required Progress Report for the month of December, 1979.

If you have any questions or desire further information, please contact me at (608)262-6361.

Sincerely,

Paul Menzel

Paul Menzel
Program Manager

WPM/klv

Enclosure

cc: H. Montgomery, Code 942 (10 copies)