PROGRESS REPORT

through

October 1980

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

After 12 years of feasability studies, plans, and preparations, VAS is now a reality. The GOES-D satellite was launched on Sept. 9. The first images were received Sept. 24 and the first VAS soundings were produced at Wisconsin on Oct. 11.

In preparation for the GOES-D launch Paul Menzel, Bill Smith, and Fred Mosher attended the VAS Working Group Meeting. The results of the link tests and the launch readiness of the Wisconsin VAS processing system were presented along with planned use of early VAS data.

The prelaunch study report of the VAS-D performance with regard to calibration, registration, noise correlation, and spin budget was submitted in Sept. 1980.

II. Data Processing System Development

The VAS processing system is now routinely ingesting VAS data and soundings are being produced daily. The ingest and processing system was completed prior to the reception of the first VAS data during the check out period. However, there were several system problems which needed correction during the check out period. The GOES-D data was considerably noisier than the link test data and there were many problems with the common documentation and check sums. Since our ingest system monitored the documentation to start and stop ingests, the system experienced difficulties with false starts and stops. The ingest and preprocessor algorithms were modified to ignore spurious and inconsistant documentation. The preprocessor also had a byte slip problem which was identified and fixed. The ingest software was very cpu intensitive and caused other data transfer programs on the data base manager to run very slowly during VAS ingests. The ingest program was

optimized to use 75% fewer cpu cycles. The mode AA frame sync also created problems during the check out period. It would sometimes work well and sometimes work poorly. Even though a considerable effort was made looking for the cause of the problem, it was never completely fixed. It appears that the design of the original mode A frame sync which was modified into a mode AA device is marginal at meeting the demands of the VAS data. While the frame sync is now working most of the time, the long term solution appears to be a newly designed frame sync.

The phone modem link to Wallops still has problems at the SDB end. If a schedule interrogation request is performed while the SDB is transmitting an image, the SDB will halt. This appears to be caused by a problem in the SDB operating system in transfers between the foreground and the background. Likewise, the SDB still has problems accepting navigation information.

III. VAS Instrument Support

The prelaunch study of the GOES-D instrument concluded that VAS-D can dwell sound a 60 km swath in 110 seconds if all the detectors are working properly. The dwell sounding requires that the different spectral bands all view the same scene within the same field of view. The prelaunch study concluded that clear column radiances can be retrieved with 10% or less misregistration of the various spectral bands. The calibration study showed that the instrument can be calibrated to within .1 to .2 ergs/etc. rms for the VAS sounding channels.

During the VAS working group meeting, it was confirmed that the upper large HgCdTe detector had failed. The impact of this is that the spin budget increases by a factor of 1.5 and that MSI images have venetian blinds

for all but 3 bands when using the large detectors.

The UW participated in the preparation of the engineering checkout of GOES-D by generating PDLs and test schedules in cooperation with GSFC. As part of the checkout, UW was asked to perform an inflight evaluation of VAS with regard to the linearity of the electronic calibration ramp, the the detector responsivity variation with temperature during cooldown, and the spin budget with the servoed detectors.

During the checkout, the SDB had numerous problems. UW helped in identifying these problems, suggesting remedites, and then UW documented the proper VAS instrument and SDB behavior. By the end of the checkout, the linearity of the electronic calibration ramp was verified. The spin budget at servo was shown to be within 10% of the prelaunch evaluation. However the detector responsivity with temperature variations could not be determined because of SDB problems during the cooldown of the spacecraft.

IV. Technique Development

Activities in the sounding program were devoted during this period to modifying TIROS interactive sounding software to apply to geostationary sounding. The changeover was quite easily accomplished, since the original design recognized the future application. Virtually all interactive programs can now be used with VAS sounding files, SDS data structures, and McIDAS universal grid files. The most notable exception is the program dealing with winds generated from the remote soundings, but this will soon be converted.

Upon initial receipt of the GOES-D dwell sounding data very little difficulty was encountered in identifying, accessing, and locating the raw data. The individuals responsible for ingesting the data did that

task well and also provided sufficient information to make the data accessible to the sounding program. The data themselves offered some problem, especially in terms of calibration, but successful temperature moisture profiles were obtained on October 11, 1980.

Beginning October 1 the TIROS "operational" sounding algorithm was changed from a statistical technique to an iterative technique to serve as a prototype for VAS. There were two reasons for this change. First, the VAS satellite with its variable spectral filter usage and variable spin budgets does not lend itself to statistical retrievals. A nearly infinite number of coefficient sets would be necessary. Secondly, since we will be looking for temporal changes in the weather, we would like to retrieve on changes to a first guess profile and the iterative scheme is better suited to the problem. Several comparisons were made between new and old retrieval methods and there was surprising consistency. The iterative technique which begins with a temperature profile generated from the LFM forecast model gives somewhat more consistent results and is thus easier to edit. It appears to have slightly less variance than the statistical method, particularly in moisture deviations, but this can probably be "tuned" by experimenting with the iterative weighting functions.

Comparisons have also been made between VAS and TOVS retrievals coincident in time. These have been astonishingly close. Also, the VAS soundings have been demonstrated to change the initial guess in the right way by experimenting with initial guess profiles before and after the VAS time of observation.

SPACE
SCIENCE AND
ENGINEERING
CENTER

1225 West Dayton Street
Madison, Wisconsin 53706

THE UNIVERSITY OF WISCONSIN

November 4, 1980

Ms. Vanessa Scott
Code 269, Bldg. 16
NASA/Goddard Space Flight Center
Greenbelt, MD 20771

Dear Ms. Scott:

In accordance with Article III of Contract NAS5-21965, I am submitting the required Progress Report for activities through October, 1980.

If you have any questions or desire further information, please contact me at (608) 262-3755.

Sincerely,

Frederick R. Mosher

Frederick R. Mosher
Program Manager

FRM:ac
Encl.
cc: H. Montgomery, (10 copies)