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PACIFIC WEATHER CENTRE GEOSTATIONARY METEOROLOGICAL SATELLITE DATA RECEPTION AND ANALYSIS SYSTEM

Mert Horita, Senior Development Meteorologist
Pacific Weather Centre, Vancouver B.C.

INTRODUCTION

A geostationary satellite data reception and analysis system has been contracted to be built as part of the alternative data program to mitigate the effects of the loss of data from the recently decommissioned ship PAPA (decommissioned June 1981). This new facility will be located at the Pacific Weather Centre. The design and functional specifications have been completed and work has begun to assemble the necessary hardware and software. Delivery is expected in two phases. At the time of the writing, a portion of the first phase has been implemented. The entire system is expected to be available by the summer of 1982.

OVERVIEW OF THE SYSTEM

The Pacific Weather Centre Geostationary Meteorological Satellite Data Reception and Analysis System is basically comprised of two parts (see configuration in figure 1). The first part, Weather Information Processing System II (WIPS II), captures the satellite signal and stores it. WIPS II also automatically or under operator control extracts a subportion of the raw stored image, grids it, enhances it and transmits the image to the Atmospheric Environment Service photofacsimile circuit.

The second part, Meteorological Data Analysis System (METDAS) uses the raw stored image provided by WIPS II via shared disks. The METDAS is then capable of extracting various subportions into several files to build up a continuum in time of like images. The METDAS then can present on a video monitor the images in still or animated form.

WIPS II

A seven meter dish antenna will normally capture the time stretched Visible and Infrared Spin Scan Radiometer (VISSR) data from GOES-W. However the antenna is motorized and can be directed to receive signals from other satellites between 70°W and 155°W. Every half hour the data stream received consists of an infra-red (IR) image, a visible image (daylight required) and the corresponding grid for geographic and political boundaries.

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The large volume and data rate are such that it would take 18 minutes for WIPS II to ingest the two full disk IR and visible images. For this reason, and because the full disk image would exceed the available disk space, only approximately 1/3 of the full disk image is retrieved. See figure 2. Since each half hourly data set requires approximately 64 mega bytes of storage, the two available 67 mega byte disks are used alternately. Therefore the raw images are available for up to 54 minutes before being overwritten by the latest image.

Subportions of the raw IR and visible image can be extracted and transmitted with or without a grid to the photofacsimile output ports. This is done either interactively or by schedule. Further, by operator command or schedule, various enhancements can be chosen for the IR image; annotation and two grey scales are also available. See figure 3 for sample output.

METDAS - DATA FLOW

The source of satellite images for METDAS is provided by WIPS II through the shared disks. The raw image stored on the shared disks are in full pixel resolution with each IR pixel having a range of 256 contrast values (8 bits) and each visible pixel having a range of 64 contrast values (6 bits). From this raw image, subsets are extracted automatically or manually and stored on the METDAS disk in either the animation files or in the single frame files. See figure 4.

The animation files are automatically updated as each new raw image arrives. Four different image sector sequences are made available. Any image sequence can be changed, however a continuum of 24 like image sectors would not obviously be available until each has been updated. The animation images are stored in a 256 X 256 pixel format with a full 8 bit contrast for IR and 6 bit for visible.

Single frame sector files (these images cannot be animated, they are to be displayed singly) are either stored from the raw image automatically or by operator request. Up to 8 IR and 8 visible images in 1024 X 1024 pixel format with full 8 bit IR and 6 bit visible contrast can be stored automatically before one of them becomes overwritten. Up to 5 IR and 5 visible images can be stored by operator request.

Another source of data for METDAS is the gridpoint field values from numerical models. Initially only CMC model gridpoint data will be available. Gridpoint values such as heights, isotachs, streamlines, vorticity, thickness, temperature, vertical velocity, relative humidity, etc. will be automatically or manually contoured by METDAS. Storage is provided for up to 706 analysis and prognosis fields.

METDAS - WORKSTATION FUNCTIONS

The capabilities of the workstation primarily revolve around the

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electronic technology of the video graphics monitor. The monitor is supported by a trackball and CRT. Basically two modes of operation are available; animation mode and single frame mode.

In the animation mode one of the four sequences containing 24 images is loaded into the monitor's memory. These then can be displayed with or without a geographic grid and with a desired enhancement. These images can be rolled, stepped or flipped (backward or forward).

In the single frame mode, three single frame images can be loaded into the monitor's memory along with four overlays (contour fields and/or geographic grids). These three sectors can be displayed with or without the overlays. If several overlays are used they can be differentiated by colour. The three sectors themselves can be displayed with various contrast enhancements and these enhancements can be in colour if desired. Flipping between the sectors is available. Statistical analysis of the contrast enhancement of the sectors can be accomplished by using the trackball and cursor to define a rectangular area within which the calculations are to be performed.

Hard copies can be generated in "black and white" of the single frame images or animation frames with or without geographic grid and/or field contours. Overlayed coloured line structure can be differentiated with varying line structures. Hard copies are made by directing the image to WIPS II and instructing WIPS II to create a hard copy on the local facsimile port.

CONCLUDING REMARKS

The capabilities of the Pacific Weather Centre Geostationary Meteorological Satellite Data Reception and Analysis System will provide the meteorologist with the most up-to-date technology for the analysis of satellite images. Furthermore, the significance of this system is that it is located at a forecast office, therefore providing the on-line forecasters with immediate interactive response. Added benefits will accrue from the operational research and development that will be done to further the forecasting aspect of meteorology.

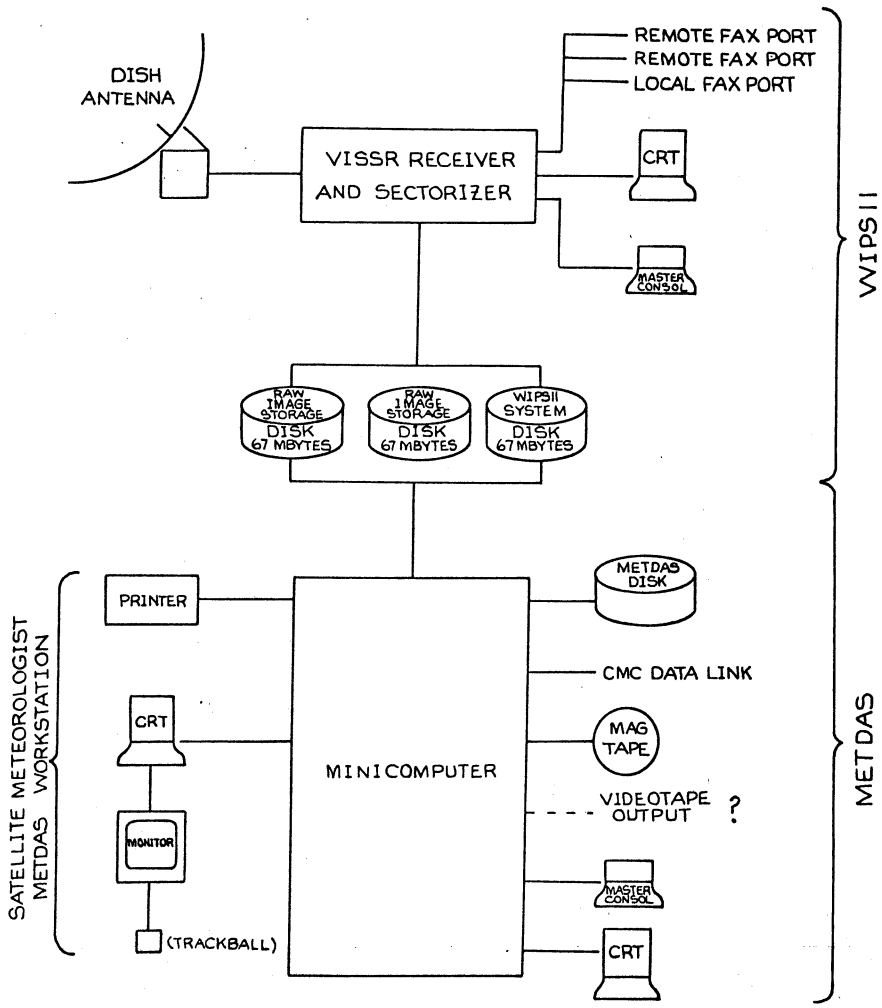
REFERENCE

MacDonald Dettwiler and Associates Ltd., Vancouver, B.C. VGOES WIPS and METDAS Design and Functional Specification Manuals.

FIGURE 1

SCHEMATIC OF

PWC SATELLITE IMAGE PROCESSING SYSTEM



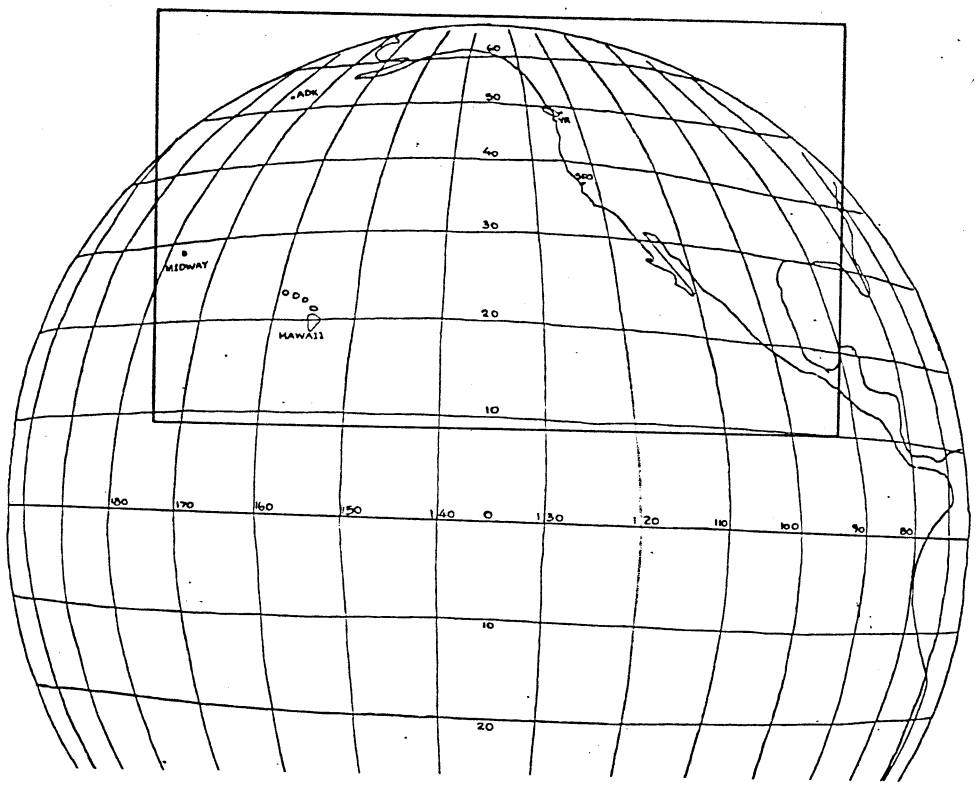
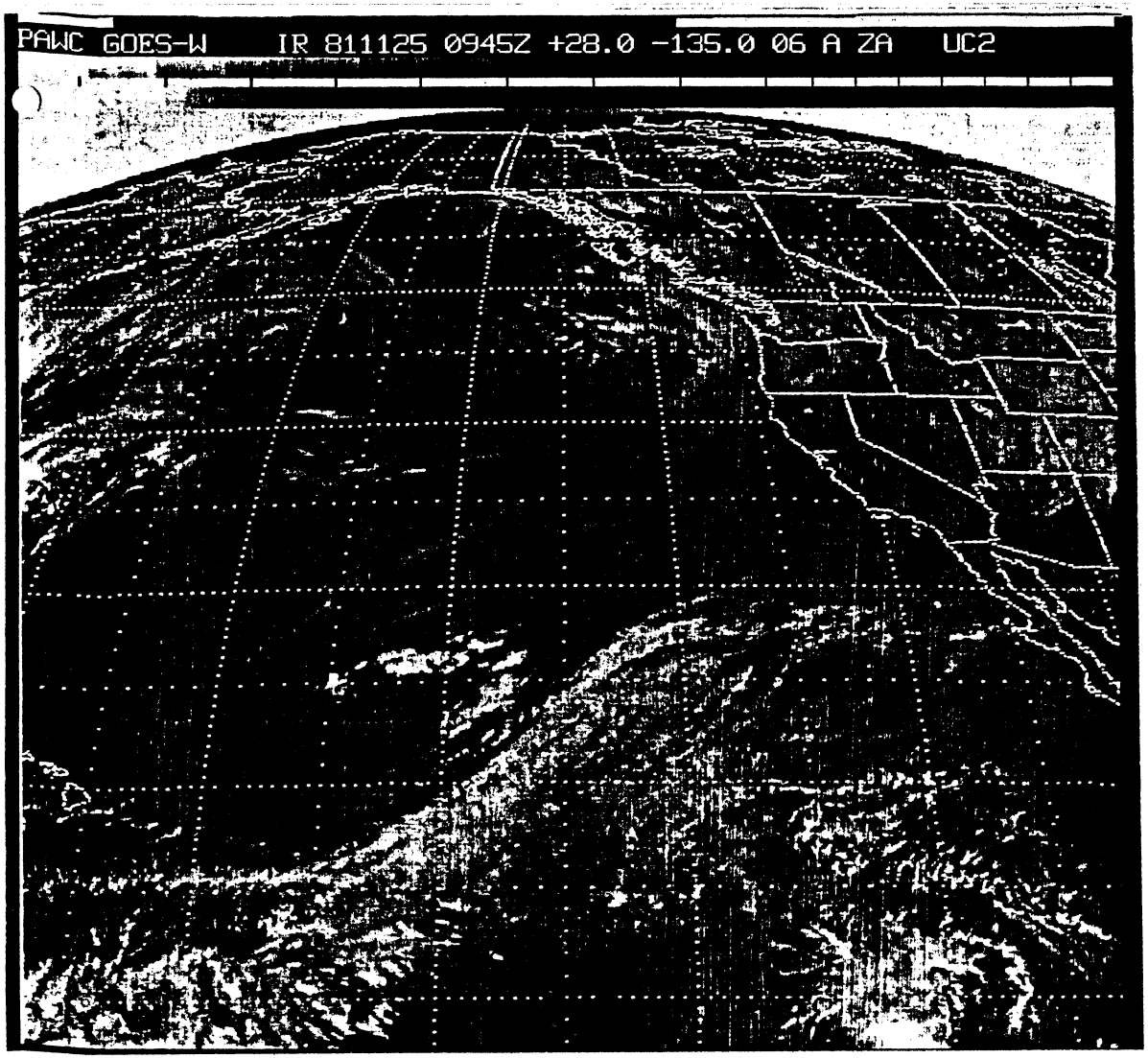


FIGURE 2.

AREAL EXTENT OF IMAGE DATA STORED BY PWC SATELLITE RECEIVER (WITHIN BOX)

FIGURE 3.

SAMPLE OUTPUT FROM PWC GEOSTATIONARY METEOROLOGICAL SATELLITE DATA RECEPTION AND ANALYSIS SYSTEM



ANNOTATION

PAWC GOES W....	OPERATOR COMMENT
IR	SPECTRAL BAND IR OR VIS
811125	DATE
0945Z	TIME
+28.0 -135.0	LATITUDE AND LONGITUDE OF CENTER OF IMAGE
06	SCALE FACTOR IN THOUSANDS, 6000X6000 PIXELS OF RAW DATA Q = 250X250 H = 500X500 01 = 1000X1000 02 = 2000X2000 ETC.
A	GOES W TRANSMISSION MODE
ZA	ENHANCEMENT
UC2	SECTOR NAME

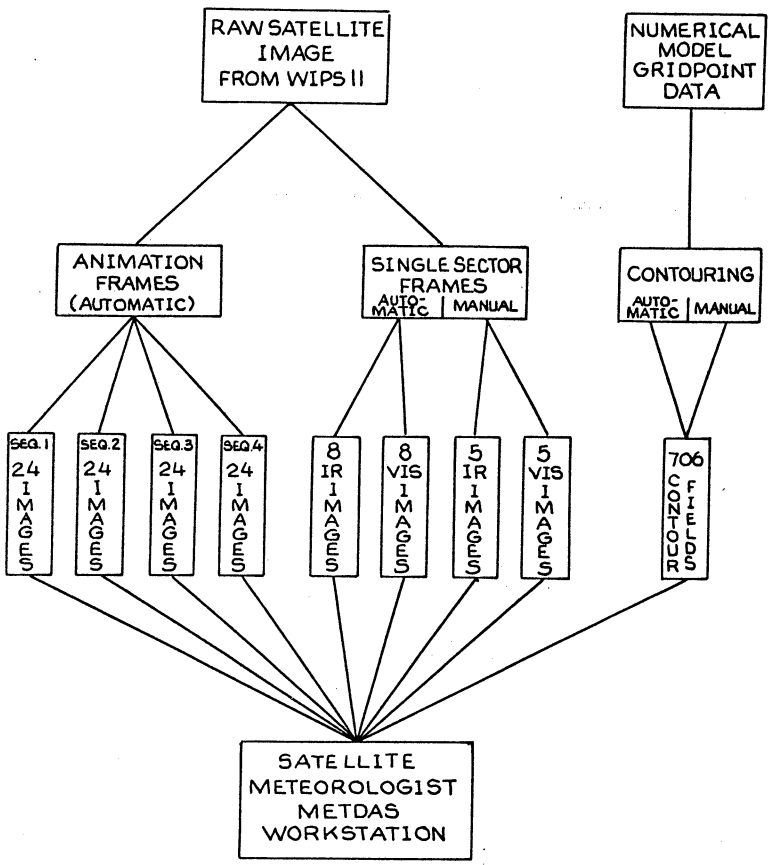


FIGURE 4

FLOW OF DATA THROUGH METDAS