PACIFIC REGION TECHNICAL NOTES

85-002

August 21, 1985

PACIFIC WEATHER CENTRE GEOSTATIONARY METEOROLOGICAL SATELLITE DATA RECEPTION AND ANALYSIS SYSTEM - 1985 UPDATE

Mert Horita, Senior Development Meteorologist
and John Spagnol, Satellite Development Meteorologist
Pacific Weather Centre, Vancouver, B.C.

INTRODUCTION

Horita, 1981 described the "workings" of the Pacific Weather Centre Geostationary Meteorological Satellite Data Reception and Analysis System (hereinafter called the PWC Satellite System). Since then the system has been delivered and treated to a series of upgrades. An updated description of the system is found below.

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 data to any of three photofacsimile circuits.

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. There the imagery may be manipulated and overlaid with various types of graphics.

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 and the corresponding geopolitical grid.

.../2

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 captured and stored. 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. The raw data is available for up to 52 minutes before being overwritten by another data set.

Subportions of the raw IR and visible image can be extracted, processed and transmitted to the photofacsimile lines. This is done either interactively or by schedule. See figure 3 for sample output.

METDAS - DATA FLOW

The source of satellite images data 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. Five 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 are either stored from the raw image automatically or by operator request. Up to 12 IR and 12 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 20 IR and 20 visible images can be stored by operator request.

Another source of data for METDAS is the gridpoint field values from the CMC numerical model. 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 workstations primarily revolve around the electronic technology of the video graphics monitor. The monitor is supported by a trackball, CRT and graphics tablet. Basically two modes of operation are available; animation mode and single frame mode.

.../3

In the animation mode one of the five sequences containing 24 images is loaded into the Video Display Processor's (VDP) memory. These then can be displayed on the workstation's monitor with a desired gray shade or coloured enhancement. These images can be rolled, stepped or flipped (backward or forward). Using the graphics tablet, the operator can draw on one of the four graphics planes with freehand lines or predefined characters/symbols. Motion vectors may be generated by "flipping" between two images and "marking" positions of features.

In the single frame mode, three images can be loaded into the VDP's memory. These three images can be displayed individually with a gray shade or color enhancement or together using a "false coloring" procedure. Motion vectors can be generated by flipping between images and marking features. Statistical analyses may be performed on any subset of image data. Up to four graphics fields can be displayed simultaneously.

Hard copies of the satellite imagery or graphics fields are generated using either a Unifax facsimile recorder or a color 35mm/polaroid camera system. Imagery and graphics may be meshed together on the same image.

CONCLUDING REMARKS

The capabilities of the PWC Satellite System has provided the meteorologist with up-to-date technology for the analysis of satellite image data. Furthermore, the significance of the system is that it is located at a forecast office, therefore providing the on-line forecasters with immediate interactive response. The data can then be processed and transmitted in real time to subordinate weather offices. Additional benefits have and will continue to accrue from the operational development and use of the system to further the forecasting aspect of meteorology.

REFERENCE

1. Horita, M. 1981. Pacific Weather Centre Geostationary Meteorological Satellite Data Reception and Analysis System, Pacific Region Technical Notes 81-028.

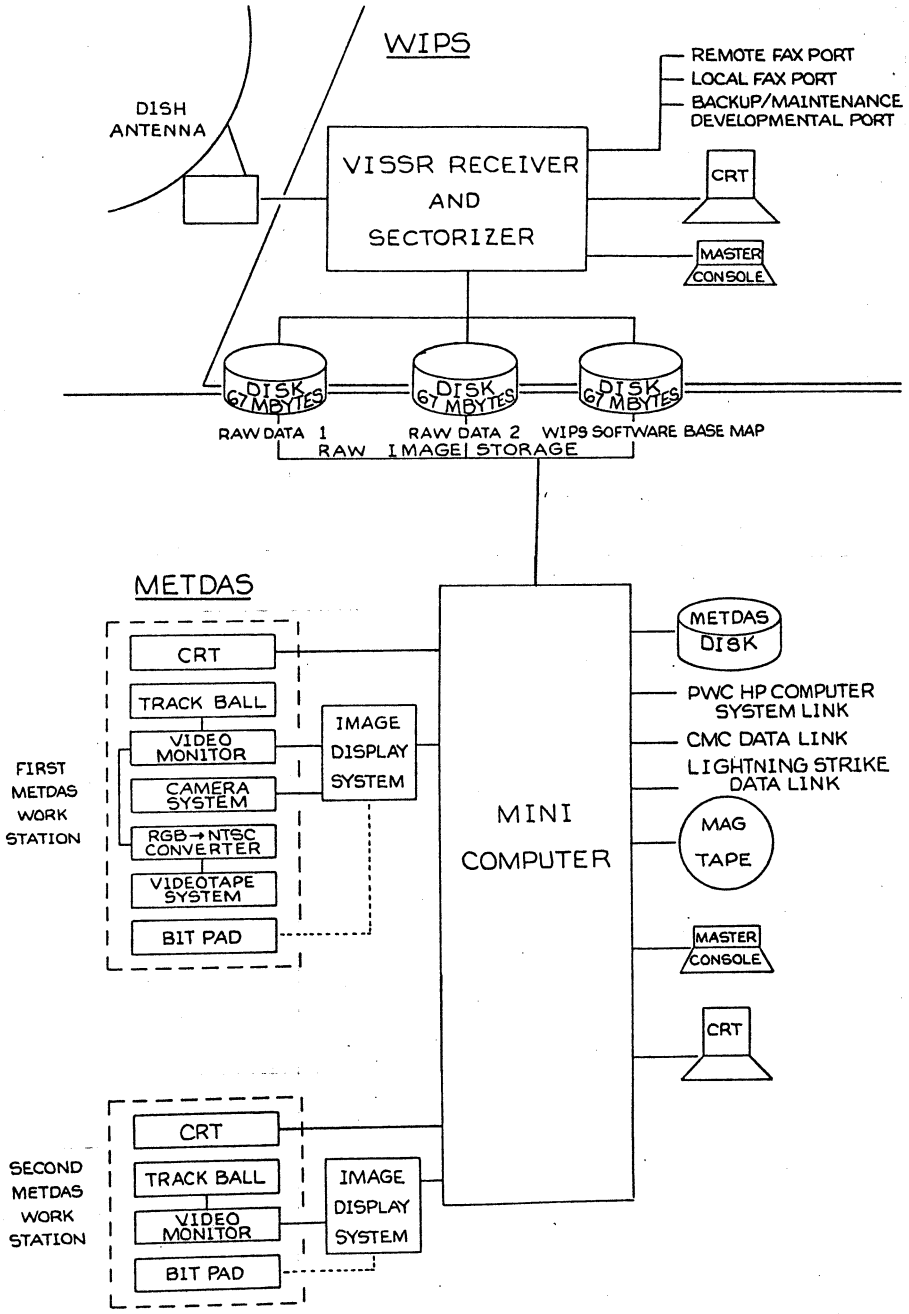


FIGURE 1.

SCHEMATIC OF PWC SATELLITE IMAGE PROCESSING SYSTEM

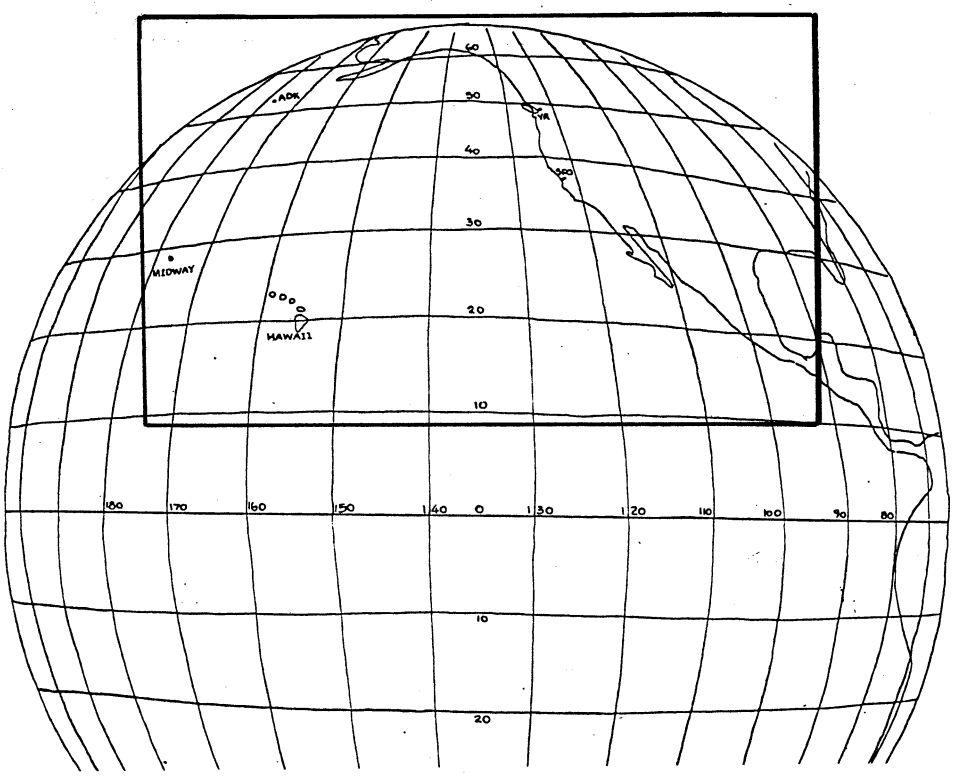
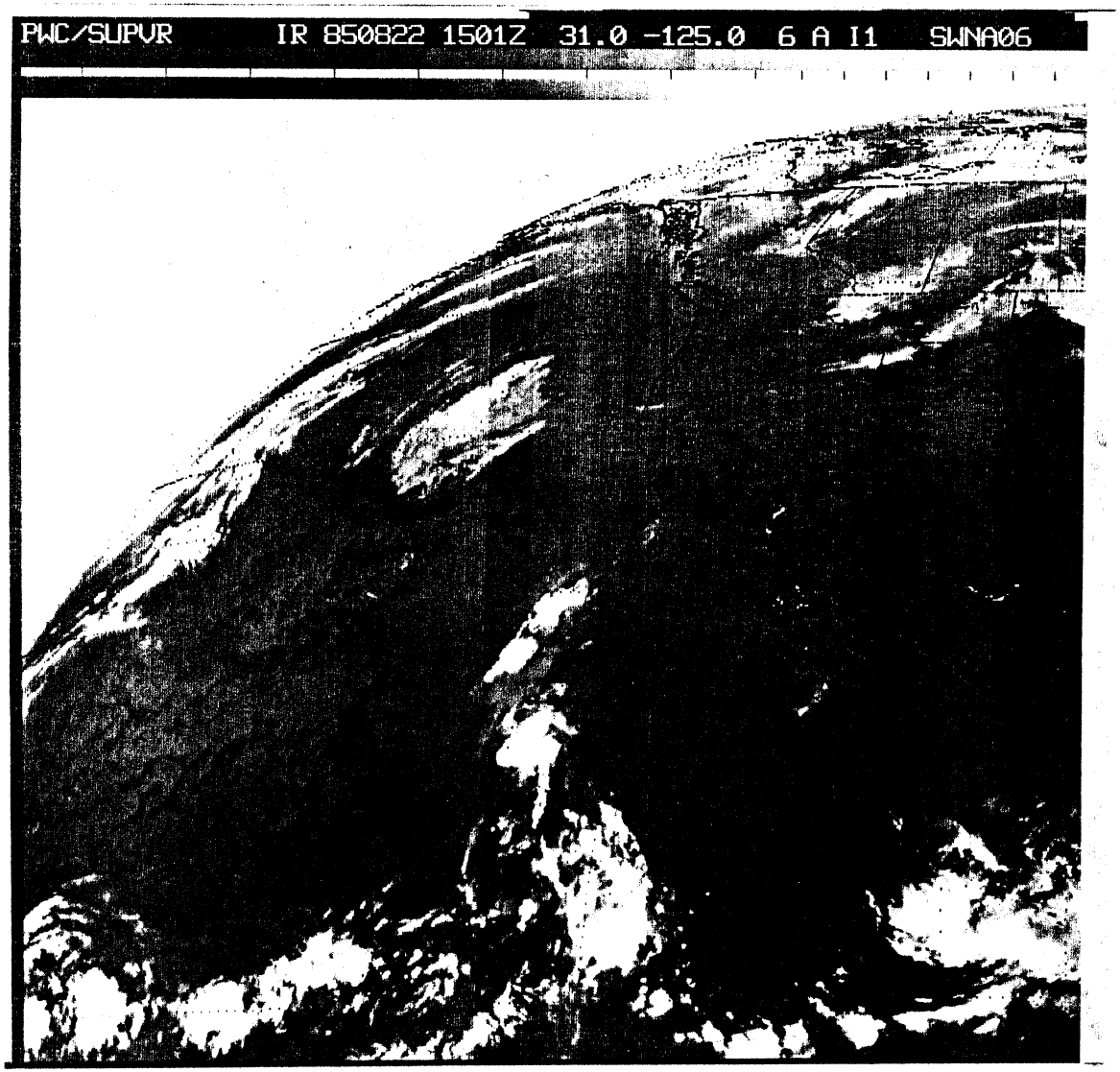


FIGURE 2.

AREAL EXTENT OF FULL DISK GOES-W IMAGE CAPTURED AND STORED BY PWC SATELLITE SYSTEM (WITHIN BOX)

FIGURE 3.

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



ANNOTATION

PWC	ORIGIN (PACIFIC WEATHER CENTRE)
SUPVR	USER (SUPERVISOR AT PWC)
IR	SPECTRAL BAND
850822	DATE
1501Z	TIME
31.0 -125.0	LATITUDE AND LONGITUDE OF CENTER OF IMAGE
6	SCALE FACTOR IN THOUSANDS, 6000X6000 PIXELS OF RAW DATA
A	GOES W TRANSMISSION MODE
I1	ENHANCEMENT
SWNA06	SECTOR NAME

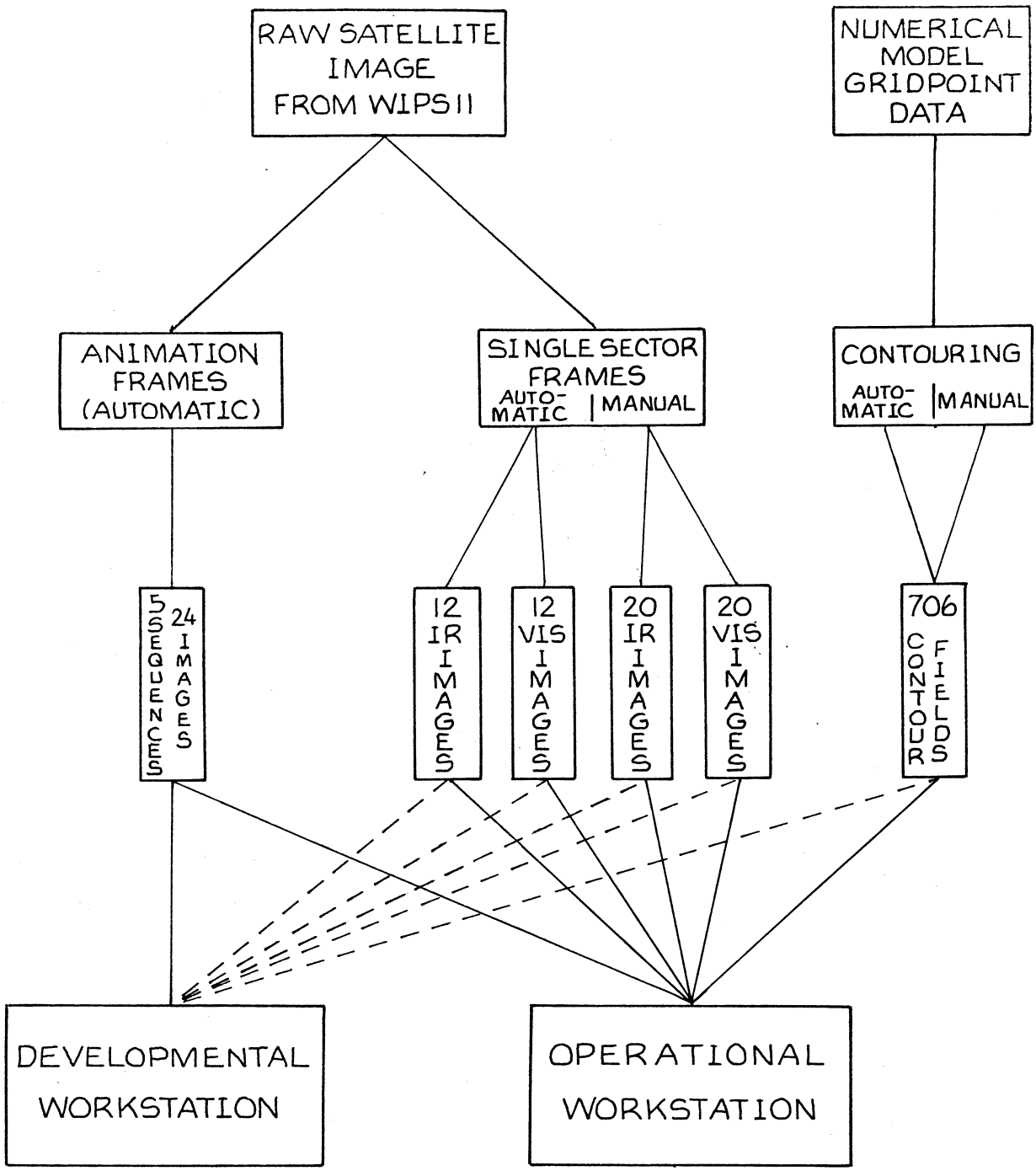


FIGURE 4

FLOW OF DATA THROUGH METDAS