JP1.9 EXPERIMENTAL SATELLITE PRODUCTS USAGE ON AWIPS

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1. INTRODUCTION

Experimental satellite products from numerous sources have been ingested and displayed on AWIPS for the last several years. This paper will describe the type of experimental satellite products that have been added to AWIPS. Allowing forecasters to have access to experimental or prototype satellite products on AWIPS is very useful in determining if the experimental products will become baseline products on AWIPS. Some experimental products from the past have already been included as baseline products in AWIPS. This paper will also describe how the process of adding experimental products to AWIPS could be improved to help in the requirements process for getting the products into the baseline data stream.

The Western Region (WR) of the National Weather Service (NWS) has taken the lead in ingesting experimental and prototype satellite products into AWIPS.

In 1997 AWIPS began to be deployed to all NWS WFOs, all WR WFOs had AWIPS by 1999. AWIPS allowed for the ingest and display of digital satellite data. However, the early versions of AWIPS were only supplied with basic image data from GOES (VIS, IR, WV). At the present time only GOES derived product imagery (DPI) has been added to the delivery of satellite data to AWIPS.

To alleviate this limitation, WR developed a method to easily ingest digital satellite data from various sources into AWIPS. The data is retrieved from various sources, reformatted to be compatible with AWIPS, and then sent to all 24 WR WFOs using LDM and the Local Data Acquisition and Dissemination (LDAD) system. AWIPS was modified to store this data and menus were modified to make the data displayable.

Several examples of the supplemental data that are being ingested and displayed on AWIPS will be presented. It will also be shown how these new GOES and POES images and products can be combined with other AWIPS data to aid in the forecast process at a WFO.

2. REQUIREMENTS FOR SATELLITE DATA

To aid the development of the ingest and display process for the supplemental satellite products, a simple set of requirements were formulated. The requirements for these supplemental (non-AWIPS SBN) data sets are:

1) Conversion of data into AWIPS compatible format (netCDF)
2) Automatic ingest of data into the AWIPS database via LDAD
3) Ability to display these data in a meaningful way, this means:
    3a) Allow "hot cursor" readout of digital data
    3b) Allow integration of these data with other data available in AWIPS
    3c) Allow display of data on appropriate map backgrounds

3. SATELLITE DATA TRANSFER TECHNIQUE

The data flow presented here is that currently used in the NWS Western Region (WR). Some of the satellite data is being transferred to other NWS Regions for delivery to other WFOs around the United States. The data flow from originating source to the AWIPS database follows these steps:

1) The ingest of data from originating source (NESDIS, NWS/NCEP/AWC, WR direct GOES readout system, NESDIS-RAMMT/CIRA) is accomplished using a McIDAS-X server (this machine is the WR AWIPS satellite server).
2) Individual data products are converted into AWIPS compatible netCDF files using a java-based conversion program. This conversion to netCDF generally takes less than one minute (dependent on file size and system load).
3) Data products are transferred from the WR AWIPS satellite server to an individual AWIPS site's LDAD server using LDM. As soon as a data product is converted into netCDF it is placed in the LDM queue for retrieval by the LDM running on each AWIPS sites' LDAD server.
4) Data is transferred from the LDAD server to the AWIPS database on the AWIPS data server using the LDAD software. A special script was written that places the satellite data products into specific locations in the database.

The total amount of data transferred from the WR AWIPS satellite server into AWIPS is about 15 MB/hr.

4. SUPPLEMENTAL SATELLITE DATA AVAILABLE ON WR WFO AWIPS

Numerous satellite products are being sent to WFOs in WR. Table 1 lists the products that are available for display on AWIPS in WR.

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Table 1. Supplemental satellite products available on AWIPS via LDAD.

Product	Source
GOES fog/reflectivity product	WR
GOES TPW	CIMSS
GOES low-level PW	CIMSS
GOES mid-level PW	CIMSS
GOES high-level PW	CIMSS
GOES 24hr TPW difference	WR and CIMSS
GOES CAPE	CIMSS
GOES LI	CIMSS
GOES cloud top pressure	CIMSS
SSM/I TPW	NESDIS
SSM/I rain rate	NESDIS
SSM/I ocean surface wind speed	NESDIS
NOAA-15/AMSU TPW	CIRA and NESDIS
NOAA-15/AMSU rain rate	CIRA and NESDIS
NOAA-15/AMSU 89 GHz	CIRA and NESDIS
NOAA-15/AMSU cloud liquid water	CIRA and NESDIS
NOAA-15/AMSU snow cover	CIRA and NESDIS
GMS/GOES/Meteosat WV comp.	NWS/NCEP/AWC
GMS/GOES/Meteosat IR comp.	NWS/NCEP/AWC
GOES VIS/fog product	NWS/NCEP/AWC
GOES sounder channel 8	CIMSS
GOES sounder channel 10	CIMSS
GOES sounder channel 11	CIMSS
GOES sounder channel 12	CIMSS
GOES Pacific NW VIS	WR
GOES Pacific NW IR	WR
QuikSCAT winds	NESDIS
GOES High Density Winds	NESDIS
Polar orbiter Sea Surface Temp	NESDIS

Examples of some of these products are seen in Figures 1-18. Note that in each image there is a hot cursor readout that gives digital values in the units appropriate for each product. Examples of the other products listed in Table 1 will be shown during the presentation and on a webpage (see section 9).

5. EXAMPLES OF IMPACTS AT WR WFOs

The supplemental data sent to WR WFOs has proven to be very useful in forecast operations. The GOES DPI are used extensively during the summer convection season to track moisture and instability. The frequent updates (hourly) compared to RAOB data, allow forecasters to track moisture movement and the development of instability. Figure 19 shows how the GOES TPW gives better spatial coverage of moisture distribution that can help forecasters better predict convection. In this case the forecaster indicated the following in the Area Forecast Discussion:

"12Z KTUS sounding and GOES total precipitable water imagery both indicate lots of moisture to work with across southern Arizona."

The AMSU and SSM/I TPW are used extensively during the winter season to track moisture surges associated with strong storm systems that affect the west coast of the United States. Forecast offices frequently refer to these products in their Area Forecast Discussions and in developing their forecasts. Figure 20 shows how the AMSU TPW shows moisture plumes over the Pacific Ocean.

6. COMBINING SUPPLEMENTAL SATELLITE DATA WITH OTHER AWIPS DATA

A few examples will now be shown to highlight how these satellite products can be combined with other data that are available on AWIPS.

Figure 21 shows how the GOES TPW product can be used with numerical model guidance. In this example, GOES TPW at 12Z on 1 Aug 2001 is plotted with the 0 hour forecast of TPW from the ETA model. It is apparent from this comparison that the general distribution of moisture represented in the ETA matches what the GOES TPW very well. The ETA may be slightly under-predicting the TPW in the lower Colorado River valley area. This also shows that the GOES TPW has a finer spatial resolution than the ETA TPW.

Figure 22 shows how GOES high density winds can be compared to AVN model output. High density winds are available at every mandatory level and can be compared to any model output or conventional data on AWIPS. This is a very useful way for forecasters to evaluate wind fields over the data sparse Pacific Ocean.

7. THE REQUIREMENTS PROCESS

The addition of experimental satellite products on AWIPS can be a great aid in the AWIPS and satellite requirements process. Forecasters have the opportunity to provide feedback to NWSHQ and NESDIS regarding the usefulness of various products. These requirements can then be ranked in order of criticality to the forecast process and the most useful products can be incorporated into baseline AWIPS.

The process of defining and refining the satellite and AWIPS requirements with the aid of these experimental and prototype products in AWIPS is just starting. More details on the status of this process will be provided during the presentation of this paper.

8. SUMMARY

AWIPS is a very useful tool for integrating supplemental satellite data and products with conventional weather data. This integration of data has proven to be very useful to the forecasters at Weather Forecast Offices in the Western Region of the National Weather Service.

The addition of experimental and prototype products on AWIPS also serves well in determining the requirements for operational satellite data on AWIPS.

9. NOTES

Please note, that due to size limitations, that only Figures 1-22 are included in this paper. Other images from Table 1 can be found at the following URL: http://www.wrh.noaa.gov/conf/ams-sat12

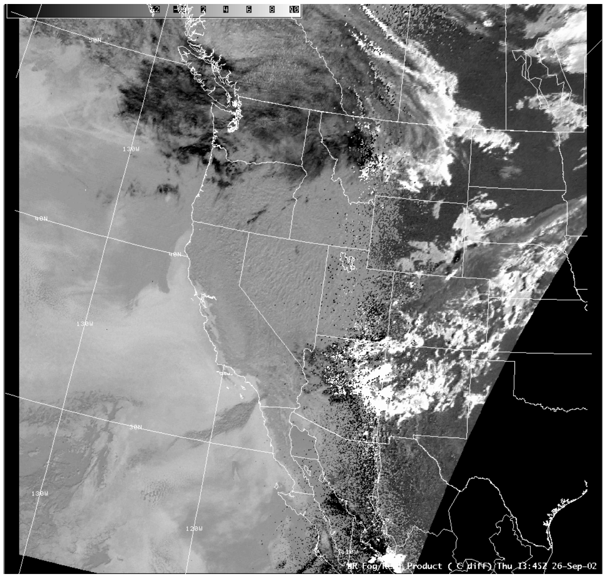

Figure 1. GOES fog/reflectivity product.

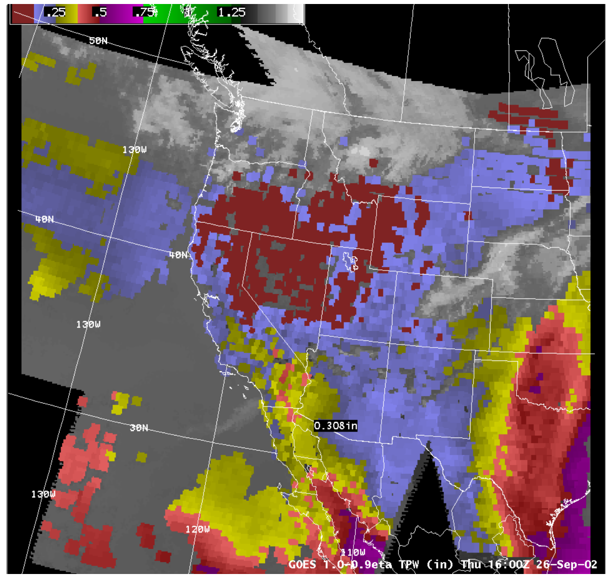

Figure 3. GOES low-level (1.0-0.9 eta) TPW.

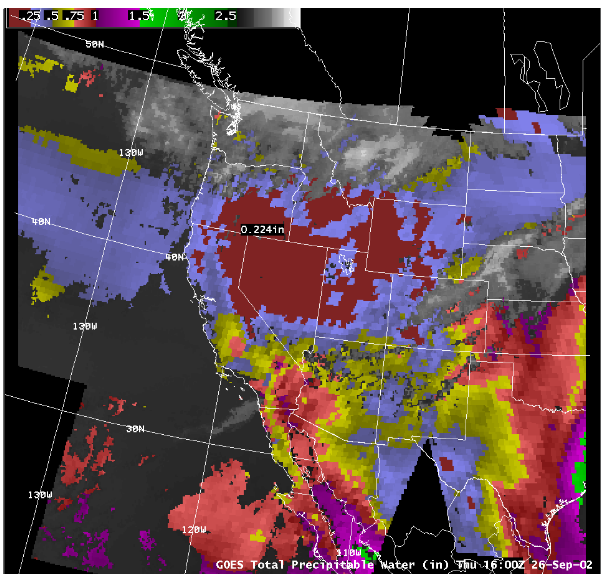

Figure 2. GOES total precipitable water (TPW).

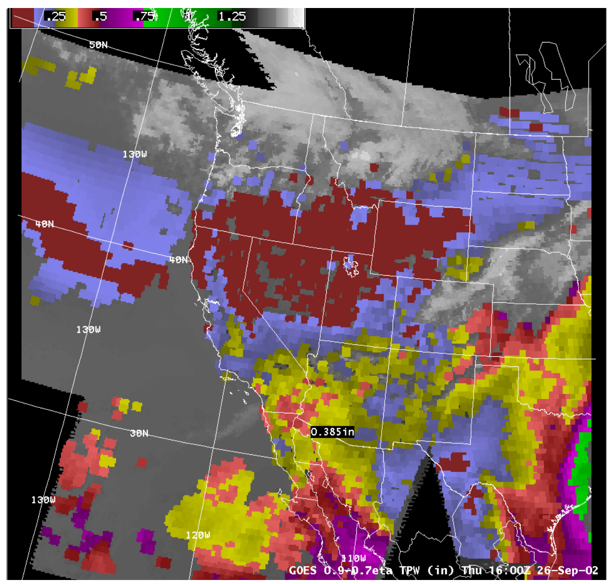

Figure 4. GOES mid-level (0.9-0.7 eta) TPW.

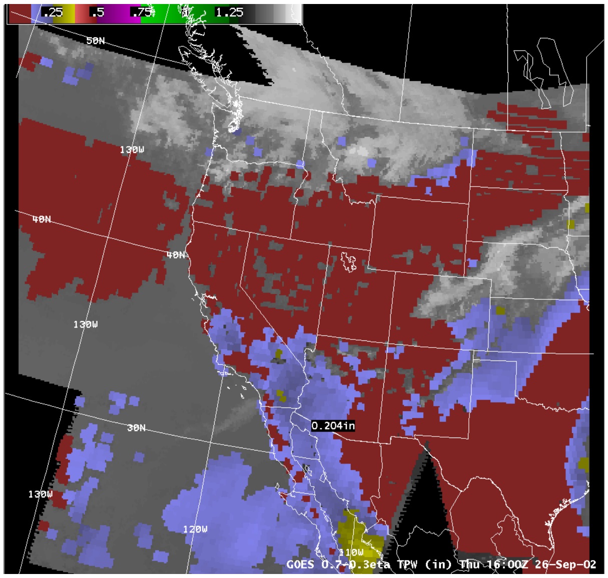

Figure 5. GOES high-level (0.7-0.3 eta) TPW.

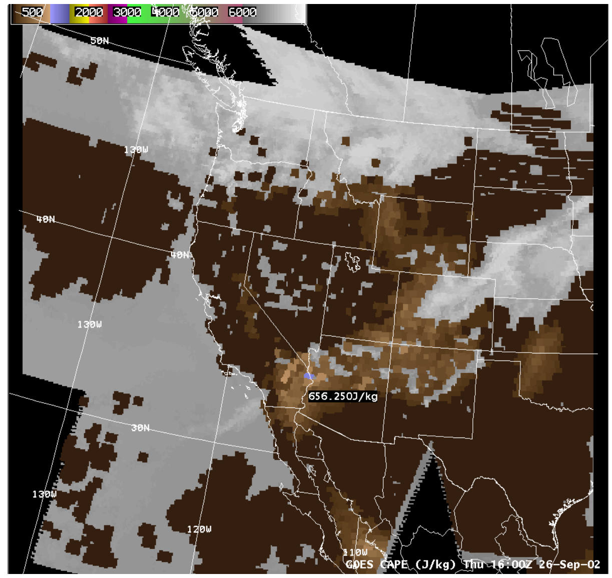

Figure 7. GOES CAPE.

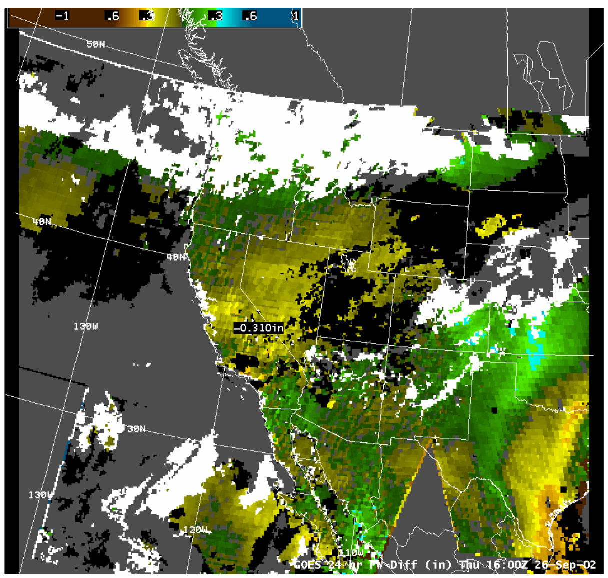

Figure 6. GOES 24 hr TPW difference.

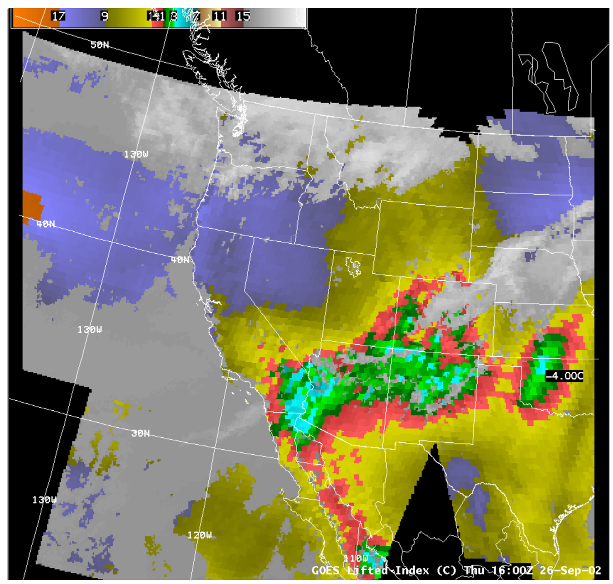

Figure 8. GOES lifted index (LI).

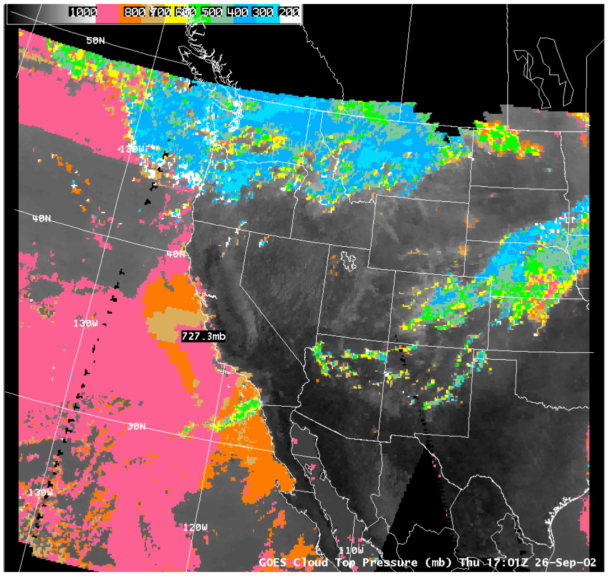

Figure 9. GOES cloud top pressure (CTP).

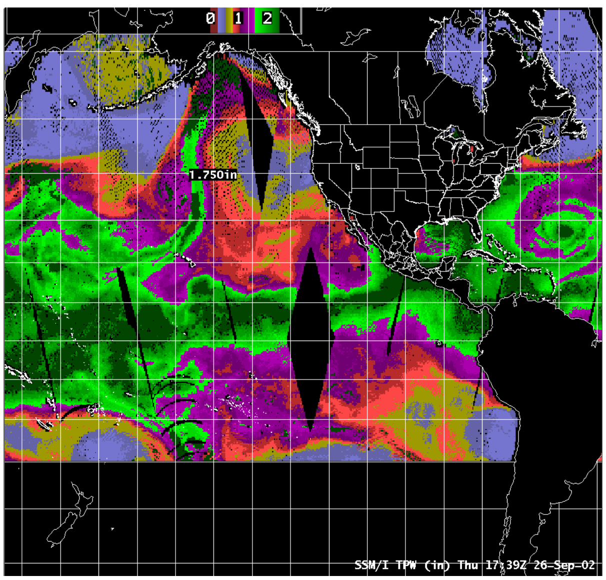

Figure 10. SSM/I TPW.

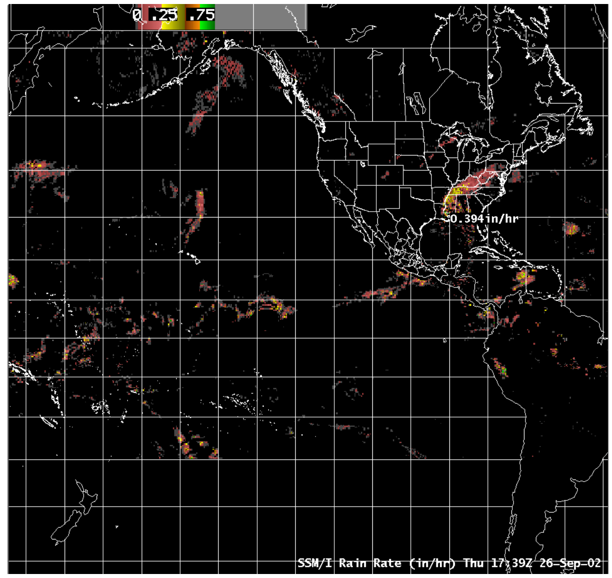

Figure 11. SSM/I rain rate.

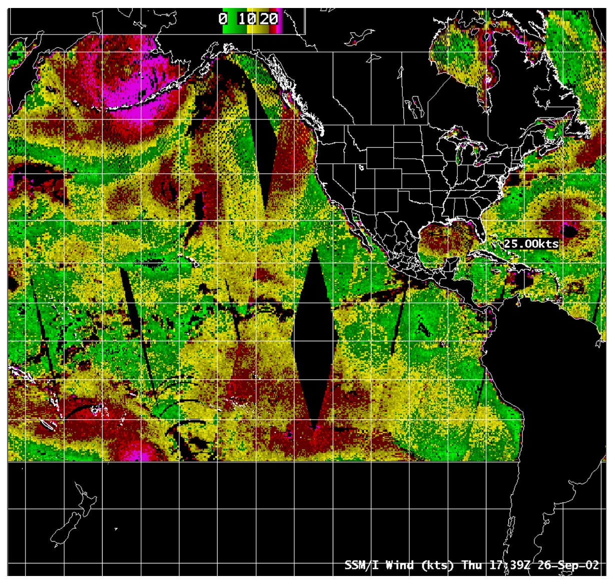

Figure 12. SSM/I TPW.

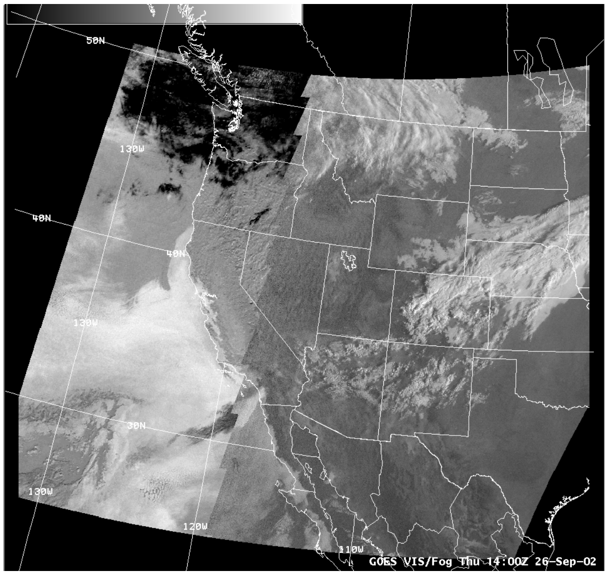

Figure 13. GOES VIS/fog product.

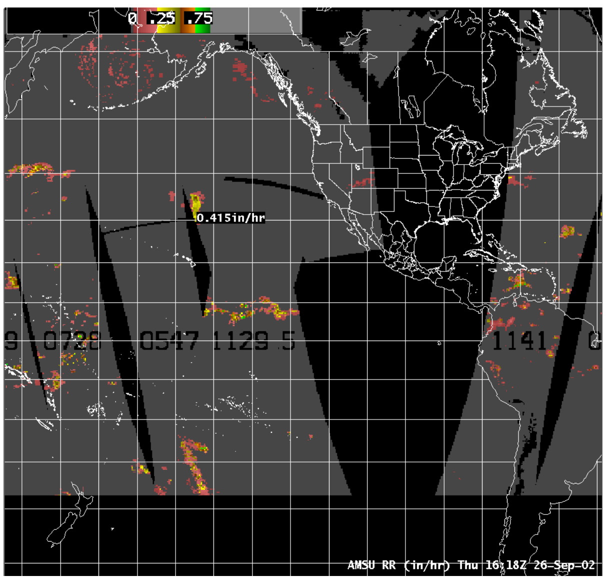

Figure 14. NOAA-15 AMSU rain rate.

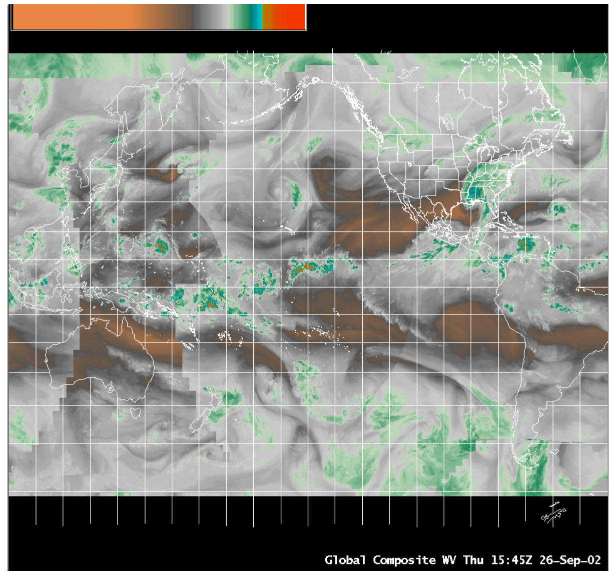

Figure 15. Global composite water vapor (WV).

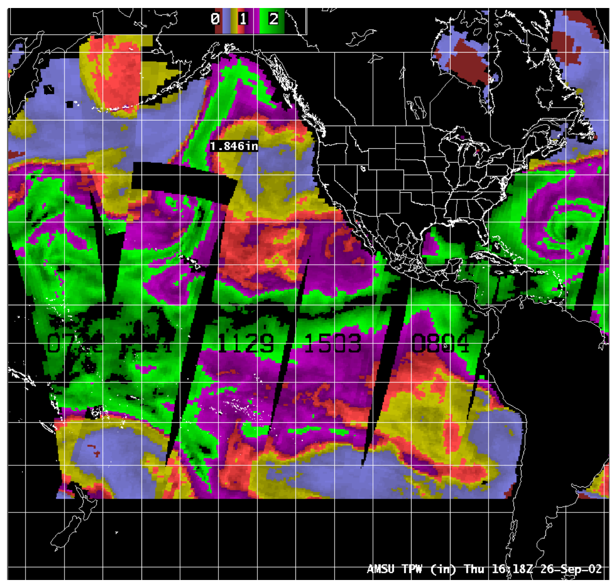

Figure 16. NOAA-15 AMSU TPW.

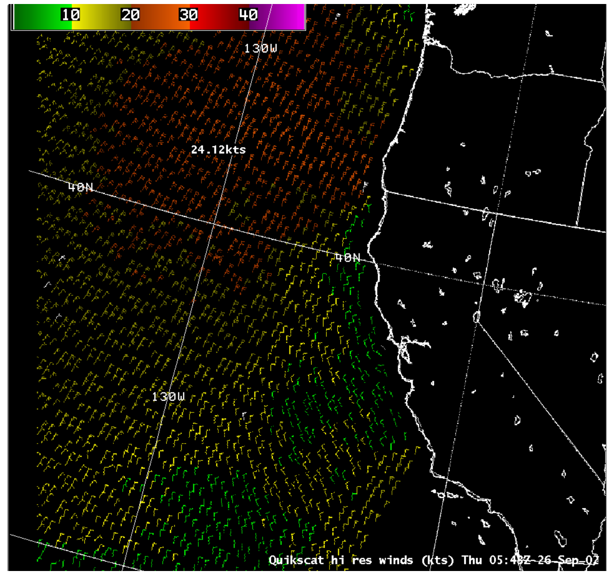

Figure 17. QuikSCAT ocean surface winds.

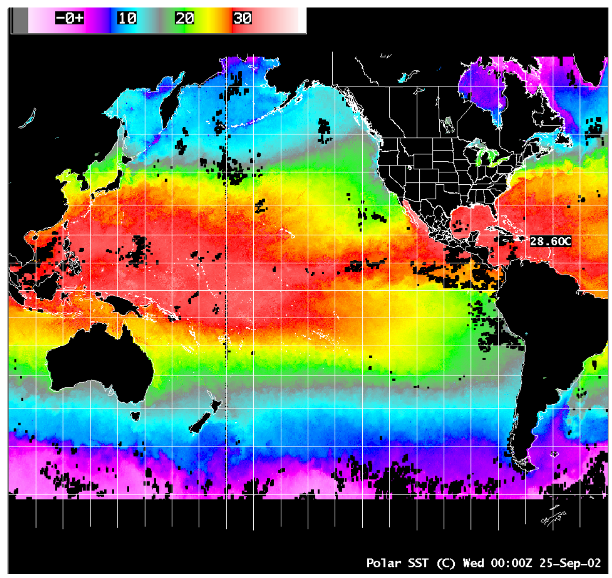

Figure 18. Polar orbiter sea surface temperature (SST).

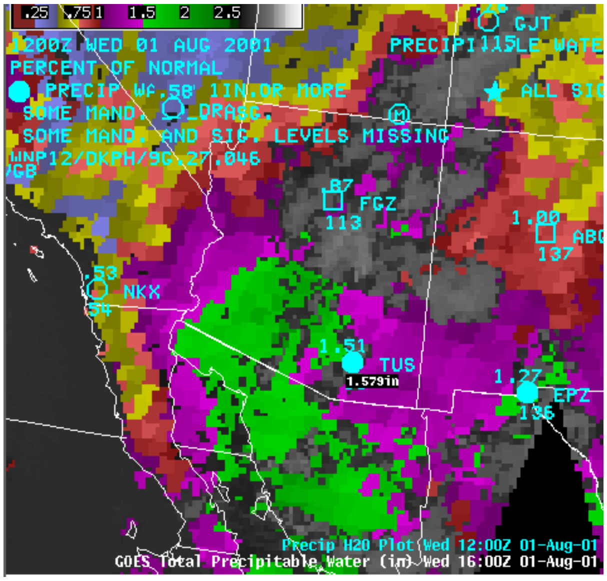

Figure 19. GOES TPW with RAOB PWs overlain.

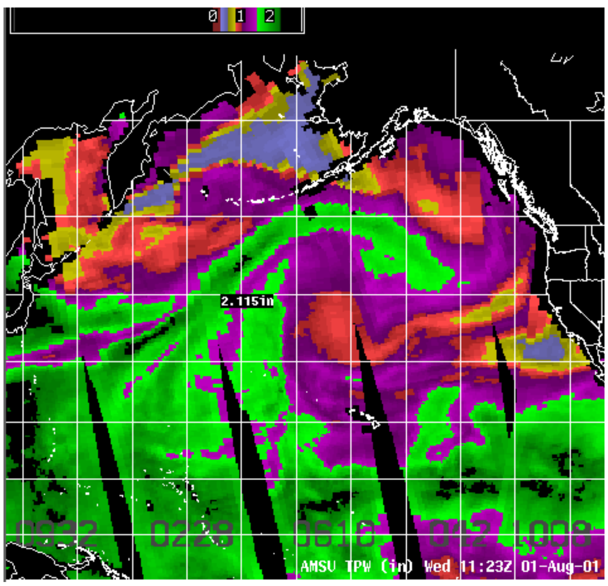

Figure 20. NOAA-15/AMSU TPW showing high PW plume entering the Gulf of Alaska.

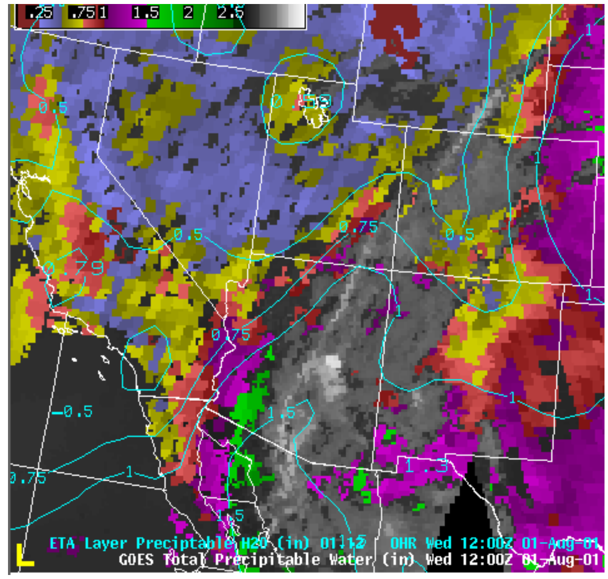

Figure 21. GOES TPW with ETA PW overlain.

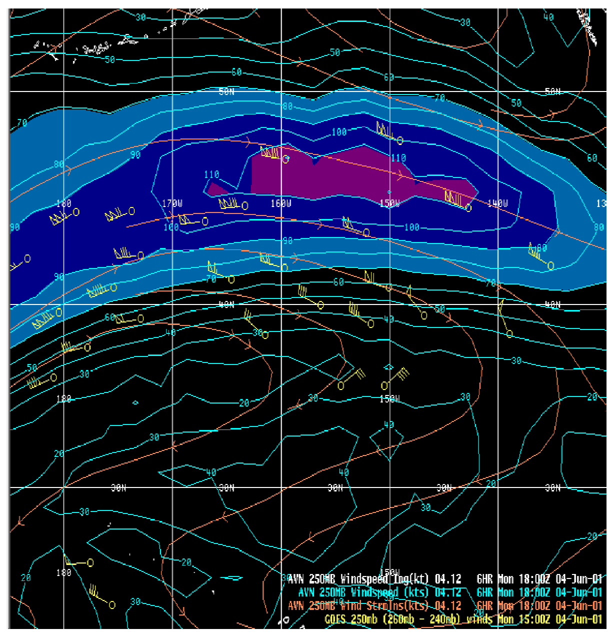

Figure 22. GOES high density winds overlain on AVN analysis, valid at 250mb.