THE USE OF NOAA PRODUCTS VALIDATION SYSTEM IN SUPPORT OF SATELLITE DERIVED PRODUCT SYSTEMS

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1. INTRODUCTION

The NOAA PROducts Validation System (NPROVS) operated by the Center for SaTellite Applications and Research (STAR) compiles datasets of collocated ground truth and satellite orbital observation in conjunction with real-time operational satellite processing. These datasets are routinely used at STAR to inter-compare derived weather products from multiple satellites and scientific algorithms and for the a-priori tuning of selected algorithms. The combined NPROVS and Environmental Data and Graphics Evaluation (EDGE) analytical interface provides a thorough and flexible utility for quantifying and characterizing differences among the various satellite and ground truth platforms contained and for troubleshooting orbital products [1] [2].

The following paper presents a series of results comparing various satellite derived products systems including from conventional ATOVS, advanced hyper-spectral and COSMIC GPSRO observations using a variety of collocation sampling strategies. Results are also presented on the use of collocations as a source of a-priori tuning of derived products and special case studies from troubleshooting. The report concludes with latest status and plans including the integration of NPROVS into the NOAA Integrated Program Office (IPO) Government Resource for Algorithm Verification, Independent Testing and Evaluation (GRAVITE) in support of CrIS/ATMS level-2 products for NPOESS.

2. SYSTEM OVERVIEW

NPROVS has been continuously operated and expanded at STAR since April 2007 and now includes over 20 operational and experimental processing systems from eight different satellites. These include hyper-spectral products from Atmospheric InfraRed Sounder (AIRS) and Infrared Atmospheric Sounding Interferometer (IASI), and Global Positioning System Radio Occultation (GPSRO) soundings from Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC). Figure 1 shows the configuration of satellites, processing systems and ground-truth platforms currently comprising NPROVS.

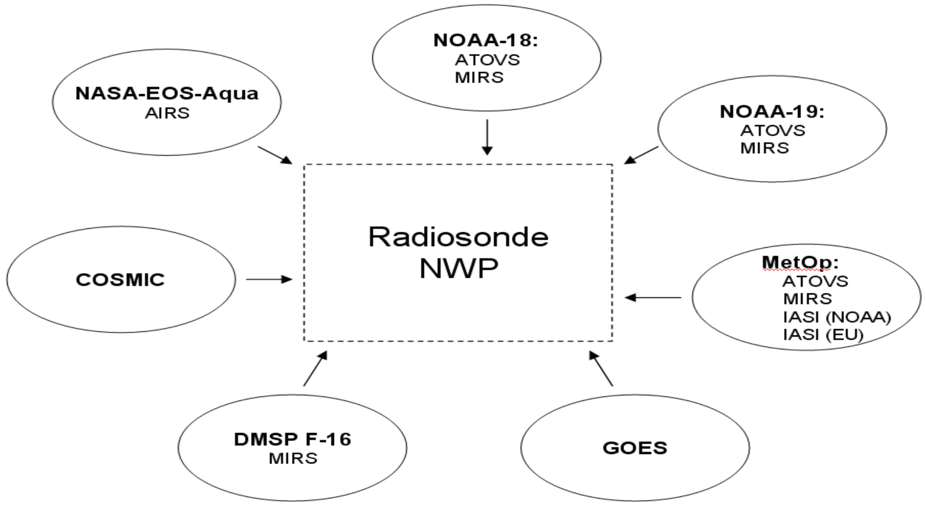

Figure 1: NPROVS schematic diagram of satellites, processing systems and ground truth platforms currently processed within NPROVS

3. RESULTS

Figure 2 shows examples of routine weekly satellite-minus-radiosonde vertical statistics (left) and long term trend analysis (right) for atmospheric temperature from the various systems. Relative performance characteristics for each system are readily denoted but a direct association with accuracy is more ambiguous. Temperature and H20 vapor results for various system combinations and sampling strategies are presented.

The collocation datasets can also be used as a source of a-priori tuning of derived products systems [3] as shown in Figures 3 and 4.

The left panel of Figure 3 shows an example of regressed satellite H20 vapor at 700mb (left) based on collocated radiosonde and microwave measurements (MetOp) for use as the background (first guess) for deriving soundings; the right side panel shows concurrent NWP 3-hour forecast H20 vapor for comparison.

Figure 4 shows examples of regressed Radiative Transfer (RT) model bias adjustments for Advanced Microwave Sounding Unit (AMSU) channel 6 (left) and Microwave Humidity Sounder (MHS) channel 4 (right) sensitive mid-troposphere, temperature and H20 vapor, respectively. As seen, the global patterns for each channel are different.

Selected tuning results for ATOVS satellites and sensors are presented.

Special case-study results from orbital products troubleshooting are also presented.

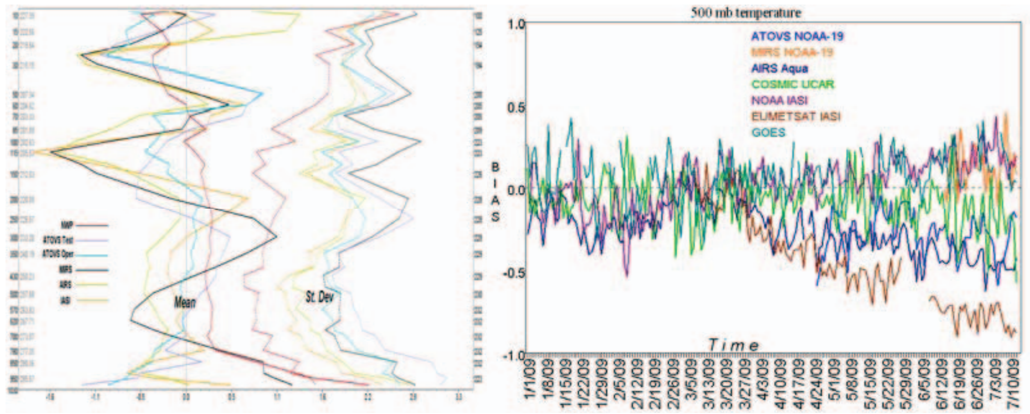

Figure 2: Examples of weekly satellite-minus-radiosonde vertical statistics (left) for Mean and Standard Deviation and long term trend analysis for mean 500mb temperature (right) for selected systems.

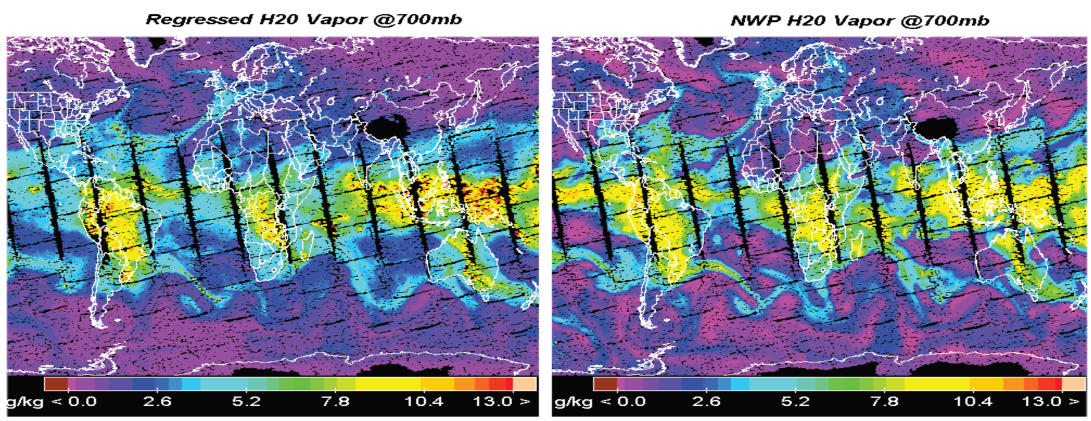

Figure 3: Regressed first guess and concurrent NWP 3-hour forecast H20 vapor for ATOVS MetOp ascending node orbital observations

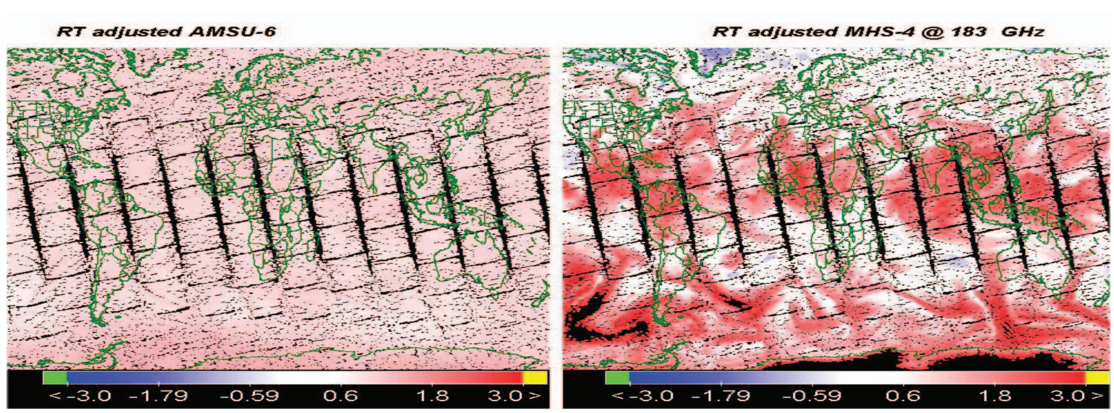

Figure 4: Regressed RT model bias adjustments for AMSU channel 6 and MHS channel 4 from MetOp ascending node observations.

4. PLANS

STAR will maintain the routine processing and archive of NPROVS datasets. NPROVS and the associated EDGE analytical interface are now in the process of integration into IPO GRAVITE in support of NPOESS EDR product development with associated presentations planned at the proposed "NPOESS User's Workshop" at this conference. Growing user applications, including support for evolving GCOS Reference Upper Air Network (GRUAN), and the retrospective compilation of an historical collocation dataset/base linking the TOVS and NPOESS eras conclude this presentation.

5. SUMMARY

The following report summarizes status and results from NPROVS. Results include inter-comparison of multiple satellite derived product platforms including hyper-spectral AIRS, IASI and COSMIC. Approaches and results are presented on the use of NPROVS collocation datasets to tune derived satellite product algorithms. Status and plans including the integration of NPROVS into IPO-GRAVITE conclude this paper.

5. REFERENCES

[1] Pettey, M., B. Sun and A. Reale, "The NOAA PROduct (integrated) Validation System (NPROVS) and Environmental Data Graphical Evaluation (EDGE) Interface Part-2: System," *25th Conference on International Interactive Information and Processing Systems (IIPS) for Meteorology, Oceanography and Hydrology,* 89th AMS Annual Meeting, Phoenix, AZ, 11-15 Jan., 2009.

[2] Sun, B., A. Reale and D. Hunt, "The Use of Radiosonde-COSMIC Collocations to Identify Radiosonde Type Characteristics and Quantify the Impacts of Collocation Mismatch on Validation," *13th Conference on Integrated Observing and Assimilation Systems for Atmosphere, Oceans, and Land Surface (IOAS-AOLS),* 89th AMS Annual Meeting, Phoenix, AZ, 11-15 Jan., 2009.

[3] Reale, A., F. Tilley, M. Ferguson and A. Allegrino, "NOAA Operational Sounding Products for ATOVS," *IJRS,* **29,** (16), 4615-4651, 2008.