Ongoing Monitoring and Validation of NOAA-Unique CrIS/ATMS Processing System (NUCAPS) Using NPROVS and its Expansion

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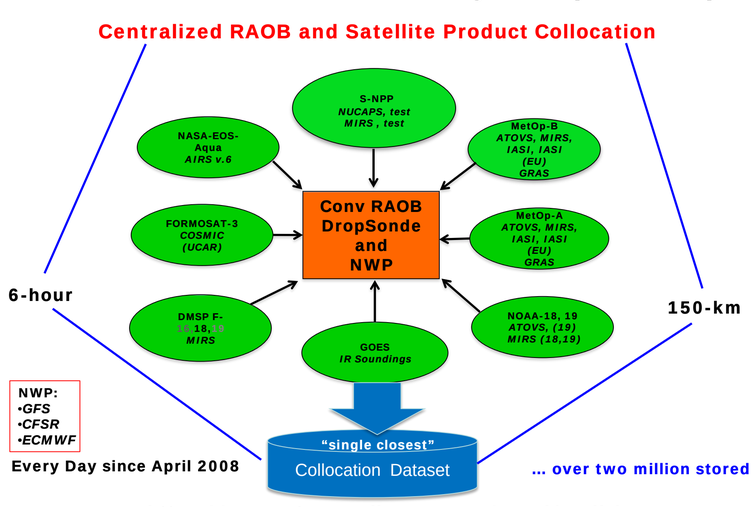
Introduction

The NOAA-Unique CrIS-ATMS Processing System (NUCAPS) was developed by the NOAA/NESDIS Center for Satellite Application and Research (STAR) and has been running operationally at the NOAA/NESDIS Office of Satellite and Product Operation (OSPO) since 2013. In this report, we present the ongoing activity of monitoring and validation of the NUCAPS IR+MW and MW-only temperature and water vapor retrievals using the NOAA Products Validation System (NPROVS) and its expansion (NPROVS+), which are supported by the NOAA Joint Polar Satellite System (JPSS) EDR cal/val program.

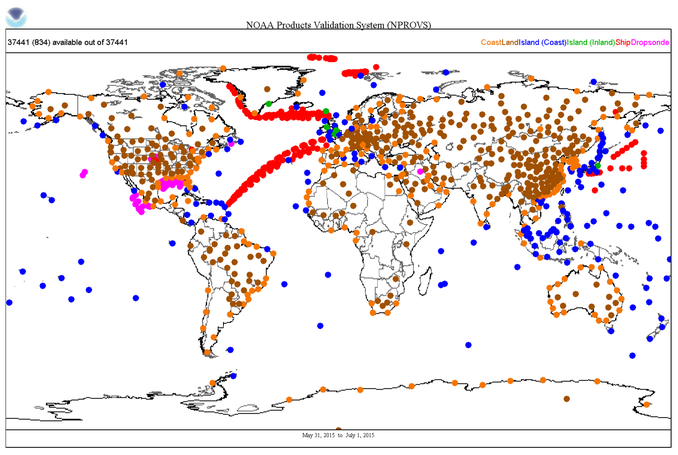
The NUCAPS retrieval characteristics performance is analyzed using multiple reference datasets and compared with legal retrieval products. This validation is conducted in a variety of meteorological conditions and intensive cal/val campaigns and in terms of long-term variability and short-term time-averaging statistics.

NPROVS

NOAA Products Validation System (NPROVS)



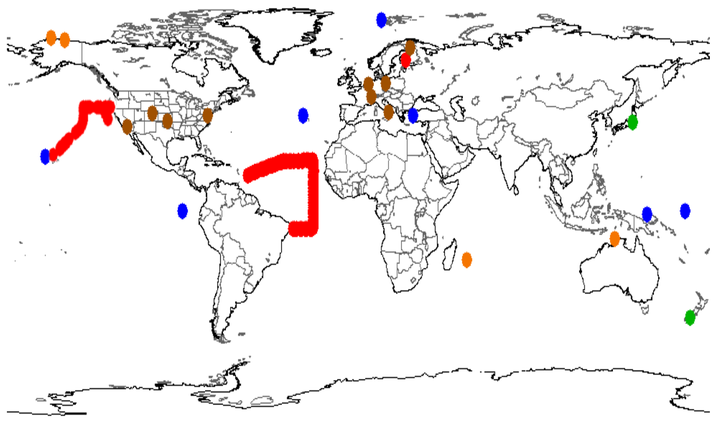
NPROVS provides daily compilation of collocated conventional radiosonde observations (RAOBs) and derived satellite soundings from multiple satellites and product systems. The collocation strategy is consistent for all satellite products, including 6 hr/150 km time/space window, and "single, closest" satellite profile to a given sonde from each satellite product.



Map of sites of global operational radiosonde observations that are used as the anchor to collocate satellite data in NPROVS. Data of June 2015 are shown as an example. Different colors represent different terrain types of RAOBs.

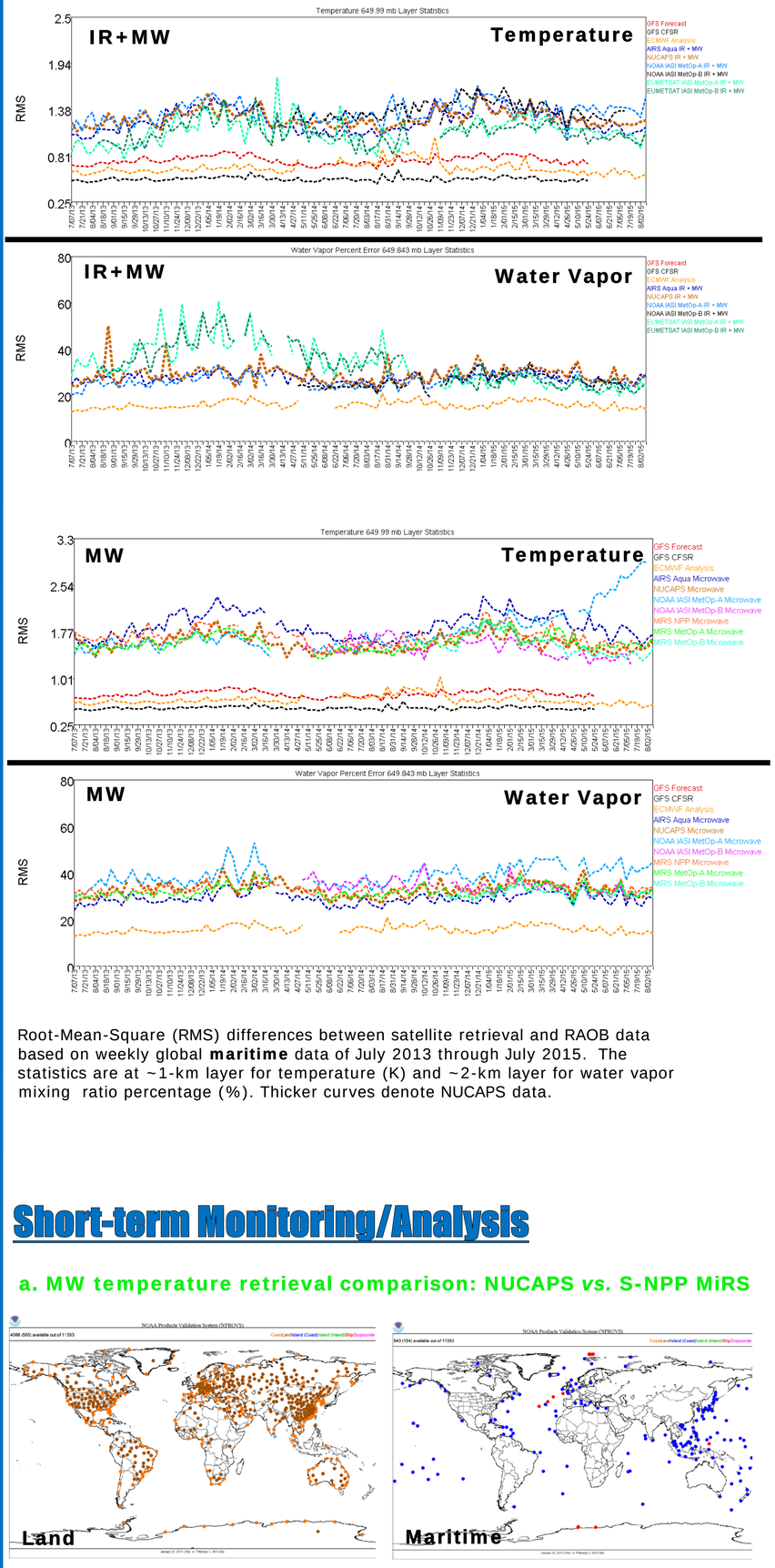
NPROVS +

NPROVS+ leverages from NPROVS by providing daily compilation of collocated Global Reference Upper Air (GRUAN) and Dedicated RAOBs with satellite sounding and sensor data from multiple satellite product/sensor suites. The collocation strategy identifies the "single, closest" satellite profile to a given RAOB but also stores all products and sensor data within 500km of the RAOB, denoted as "granules", for supporting retrieval algorithm development.



GRUAN processed RAOB (Vaisala RS92) are directly accessed from the DWD Lead Center (LC) and retain all qc checks and processing details appended by the LC. JPSS funded dedicated RAOB (also Vaisala RS92) synchronized to satellite overpass are accessed from ARM site holding files. This program also supports dedicated RAOBs launched in NOAA AEROSE and CALWATER/ACAPEX campaigns.

Long-term Monitoring

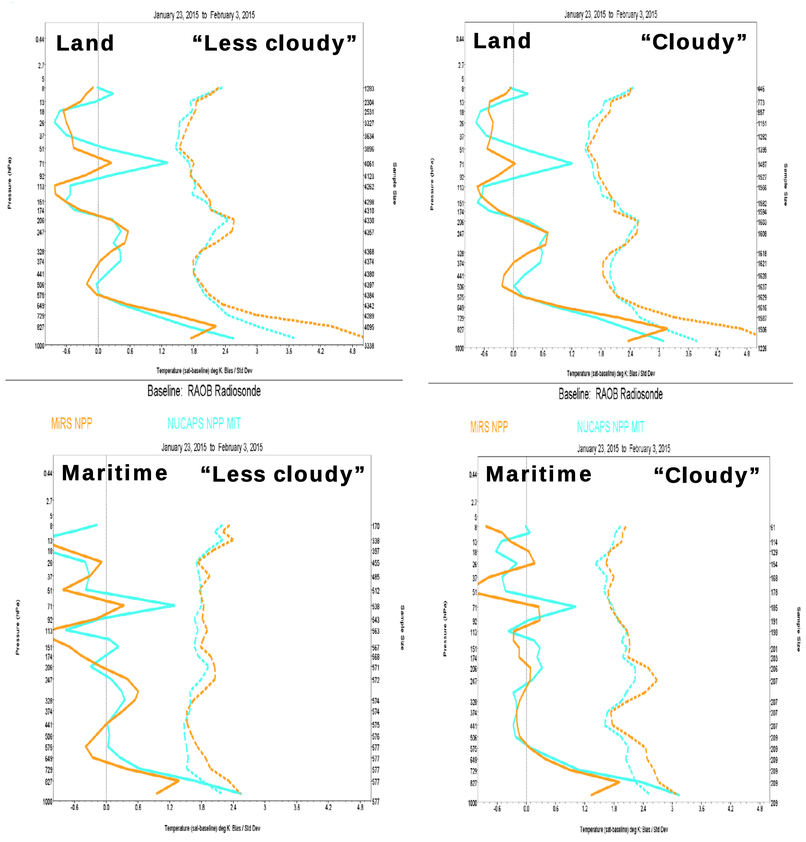


Root-Mean-Square (RMS) differences between satellite retrieval and RAOB data based on weekly global **maritime** data of July 2013 through July 2015. The statistics are at ~1-km layer for temperature (K) and ~2-km layer for water vapor mixing ratio percentage (%). Thicker curves denote NUCAPS data.

Short-term Monitoring/Analysis

a. MW temperature retrieval comparison: NUCAPS *vs.* S-NPP MiRS

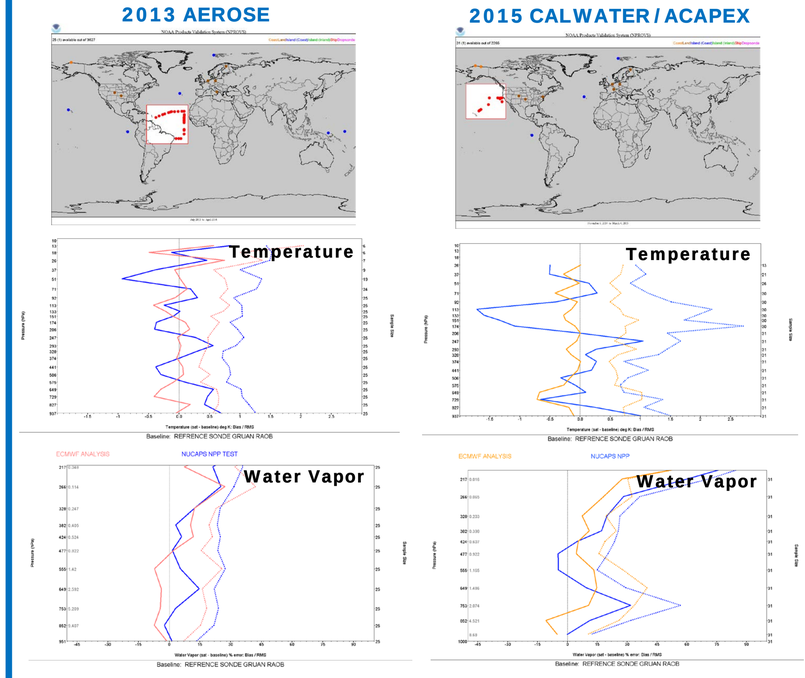
RAOB collocations common to both NUCAPS and S-NPP MiRS retrievals during 01/23 – 02/03 2015. Collocations with 6-hr and 150-km window are used to compute the statistics.



Coarse-layer MW temperature RMS differences from RAOB statistics. "Less cloudy" cases are the ones that pass NUCAPS IR+MW qc, and "Cloudy" cases are the ones that pass NUCAPS MW retrieval qc.

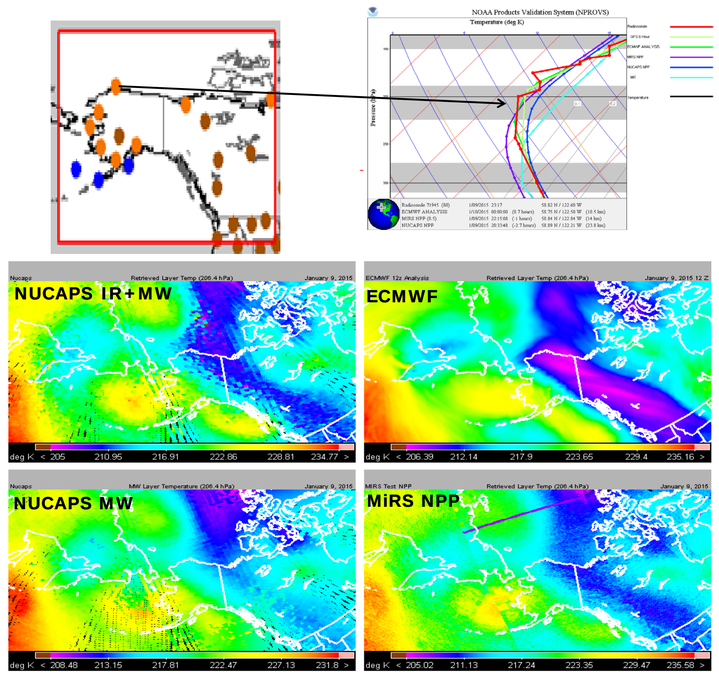
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b. NUCAPS IR+MW in Intensive field cal/val campaigns



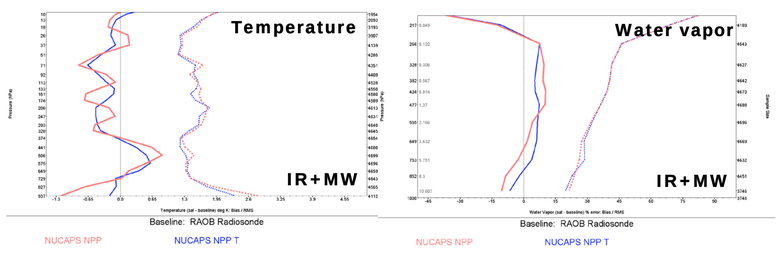
NUCAPS MW retrieval mean bias (solid) and RMS difference (dotted) from RAOBs. Collocations with 3-hr and 100-km of 2013 AEROSE (November 2014 through December 2013) and 2015 CALWATER/ACAPEX (January 2015 through February 10 2015) data are used. The statistics are in coarse layers.

c. AWIPS II Alaska Cold Core Event

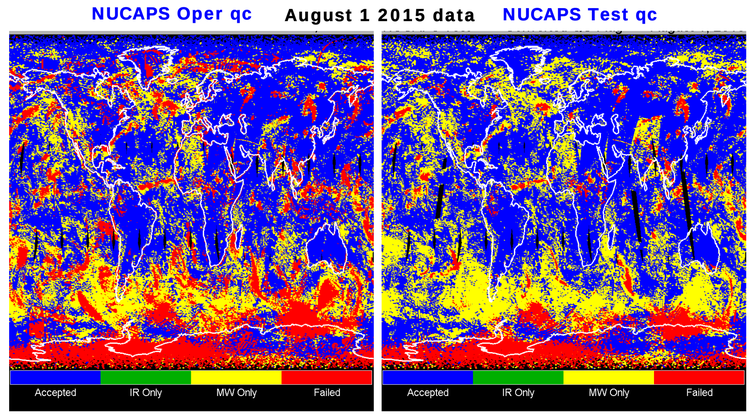


Alaska Cold Core case (with temperature below 201 K at ~10 km altitude) in January 9 2015. ECMWF and satellite retrieval temperatures are at around 206 hpa.

d. NUCAPS oper vs. test version



NUCAPS Oper qc **August 1 2015 data** **NUCAPS Test qc**



NUCAPS production test version is running at STAR. Among the improvements in the test version over the oper include using four days of ECMWF analysis data to generate regression coefficients for creating the IR first-guess and fixing some bugs in the retrieval processing code. The vertical statistics (bias and RMS) are computed using global data of July15-26 2015. The qc maps are for data of August 1 2015.

Summary

This presentation demonstrates the unique capability of NPROVS and its expansion (NPROVS+) in routine monitoring and analysis of NUCAPS and other satellite products characteristics performance and in retrieval algorithm development activities.

STAR Center for Satellite Applications and Research

Poster #, 2015 STAR JPSS Annual Science Team Meeting, 24-28 August 2015, NCWCP, College Park, MD (Corresponding author: Bomin.Sun@noaa.gov)