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 2011. 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)

Centralized RAOB and Satellite Product Collocation

NUCAPS provides daily compilation of colocated 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 source from each satellite product.

NPROVS+ provides daily compilation of colocated 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 source 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.

Short-term Monitoring/Analysis

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

RAOB collocations common to both NUCAPS and S-NPP MiRS retrievals during 02/23–02/28 2015. Collocations with 6-hr and 150-km window are used to compute the statistics.

NUCAPS IR+MW retrieval qc. NUCAPS Test qc August 1 2015 data

Root-Mean-Square (RMS) differences between satellite retrieval and RAOB data based on weekly global statistics of June 2015 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.

Continued

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

2013 AEROSE 2015 CALWATER/ACAPEX

Root-Mean-Square (RMS) differences (dotted) from RAOBs. Collocations with 6-hr and 150-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

NUCAPS IR+MW

Alaska Cold Core case (with temperature below 201 K at ~10 km altitude) in January 8 2015. ECMWF and satellite retrieval temperatures are at around 206 hpa.

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.

Dedicated RAOBs with satellite sounding and sensor data from multiple satellite product/sensor suites. 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 source from each satellite product.

NUCAPS production test version (v1.5) is running at STAR. Among the improvements in the test version over the prior release 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 resolution (18 and 266 hpa) are consistent using global data of July 15–26 2015. The qc maps are for data of August 1 2015.

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

STAR

Center for Satellite Applications and Research