DEVELOPMENT OF LEVEL 2 CALIBRATION AND VALIDATION PLANS FOR GOES-R;
WHAT IS A RIMP?

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Introduction

Calibration and Validation (Cal/Val) plans for Geostationary Operational Environmental Satellite version R (GOES-R) Level 2 (L2) products were documented via Resource, Implementation, and Management Plans (RIMPs) for all of the official L2 products required from the GOES-R Advanced Baseline Imager (ABI). In 2015 the GOES-R ABI was released with RIMPs that covered, for a given L2 product, what was required from that product, how it would be validated, and what tools would be used to do so. Similar to Level 1b products, the intent was to cover the full spectrum of planning required for the Cal/Val of L2 ABI products. Instead of focusing on step-by-step procedures, the RIMPs concentrated on the criteria for each of the validation process (beta, provisional, and Full Validation) and the many elements required to prove when each stage was reached.

Approach

The creation of the L2 RIMPs was a complex and dynamic process. The suite of L2 products required 18 separate L2 RIMPs guided by 6 lead authors who interacted with 12 different science leads from Satellite Applications and Research (STAR) along with GOES-R program personnel. Each L2 RIMP had to accommodate a fixed GOES-R validation schedule and GOES-R requirements. Furthermore, there were conflicting documents on exactly what the standards were for validation, and hundreds of existing Post Launch Product Tests (PLPTs) that also were to be addressed within the RIMPs. The L2 RIMPs were standardized to ensure critical content such as the appropriate criteria for each stage, tools, schedule, processes, and the description of pre-existing Validation Events (VEs) were handled in a consistent manner.

Contents

Each L2 RIMP contained the following required content:

Validation Overview

Schedule of Events

Terms and Responsibilities

Tools

Analysis Methods

Output Artifacts

Pre-Launch

References

Appendices: Validation Events, Validation Reference Data, List of Tools, Acronyms

Cloud and Moisture Imagery

Cloud and Moisture Imagery (CMI) was a special case, and followed the L1b schedule. Anticipation for GOES-R Imagery is high, and numerous pre-launch efforts have focused on being able to exploit this imagery as soon as it becomes available (e.g. Greenwald et al [1]). For CMI, the only Level 2 (L2) product was the Clear Sky Mask (CSM). The CSM was an exceptional challenge since it impacted numerous other L2 products. Such challenges with cloud mask verification have occurred with other programs such as the Suomi National Polar-orbiting Partnership (SNPP) and described in Kopp at al [2]. The Figure above shows the overall L2 validation schedule, and the completion dates for the CSM. The CSM schedule had to account for all downstream dependencies, since all of the L2 products had to meet the schedule reflected in Figure 1. None of the dependent L2 products could finish validation without an acceptable CSM. Therefore the CSM completion date was a key milestone in the overall validation activities. Each dependent product both influenced the CSM completion date, and likewise were written to correspond with the expected availability, and accuracy, of the CSM. Therefore the resulting 18 L2 RIMPs are properly correlated with CSM progress and planning, with margins in case of unforeseen events.

The CSM was the initial product in a sequence of cloud products, and RIMPs were required for each of the cloud products. The sequence of the entire cloud processing chain is shown below. The cloud product RIMPs were broken down based on this chain. Three cloud products cover nine different cloud products, which were grouped together based on their position in the chain and the similarity of the tools employed to prove validation. The exception is cloud phase, whose characteristics and validation techniques are more in line with those used for GOES-R. The associated cloud RIMPs are below the algorithm/product, a simple schematic of the cloud product algorithm chain for GOES-R. The associated cloud RIMPs are below the algorithm/product, and the products were combined consistent with the algorithms that produce them.

Clear Sky Mask (CSM)

![Simple schematic of the cloud product algorithm chain for GOES-R. The associated cloud RIMPs are below the algorithm/product, and the products were combined consistent with the algorithms that produce them.](https://ntrs.nasa.gov/search.jsp?R=20170007319 2019-12-06T20:43:33+00:00Z)

Logistics for the remaining L2 RIMPs

Although each L2 RIMP followed the same format, additional considerations were necessary for Derived Motion Winds (DMW) and Hurricane Intensity Estimation (HIE). In the case of DMW, it contained more than triple the number of PLPTs compared to any other L2 product. This prevalent, and only after exhaustive discussion was a consensus approach agreed to by all parties. The result retained all of the necessary and applicable PLPTs while avoiding an undue lengthy and repetitive RIMP. For HIE the challenge was in describing current quantitative criteria for what is an estimate by design. Nevertheless quantitative values were present in requirement documents and were incorporated into the HIE RIMP to provide an effective standard by which the various stages of validation may be met.

Conclusions

GOES-R, now GOES-16, successfully launched on 19 November 2016. GOES-16 reached its testing position (e.g. GOES-Central) on 5 December and validation procedures have passed the beta stage. The L2 RIMPs successfully guided the validation process through the beta validation time, and they continue to be the foundation from which GOES-16 is accomplishing the L2 validation process.

[1] Greenwald, T.J, Bradley Pierce, T. Selkirk, J. Otkin, M. Rogal, K. B. Bah, A. Lenzen, J. Nelson, J. Li, and H. Sun, (2016), Real-time Simulation of the GOES-R Central) on 5 December and validation procedures have passed the beta stage. The L2 RIMPs successfully guided the validation process through the beta validation time, and they continue to be the foundation from which GOES-16 is accomplishing the L2 validation process.

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