J2 VIIRS Data Analysis Working Group (DAWG) Release of J2 VIIRS RSR Version 2

The Version 2 (V2) release of JPSS-2 (J2) VIIRS Relative Spectral Response (RSR) updates and replaces the August 2018 Version 1 (V1) release by the DAWG. The V2 release is based upon updated RSR produced by the DAWG by adding into the analysis the August 2016 spectral measurements of VisNIR (M1-M7, DNBLGS, DNBMGS, I1, I2) and SWIR (M8-M10, I3) bands made at the Raytheon El Segundo, CA facility using the GSFC GLAMR system. The GLAMR measurements complement the summer/fall 2017 SpMA based FP-15 and FP-16 spectral measurements used to develop the V1 release. V2 also updates the band M13 RSR by correcting the influence of CO2 attenuation on the RSR measurements. For bands that were not updated from V1 (M11, M12, M14-M16, I3-I5), the V1 RSR are repeated in V2 so that the V2 release includes the full complement of VIIRS RSR. As with the V1 release, the V2 release consists of the band average RSR (over all detectors and subsamples) that support SDR/L1B LUTs plus supporting detector level RSRs. The V2 release has been designated as the J2 VIIRS "at-launch" version of the RSR.

The DAWG V2 release consists of one file per band containing 16 detector RSR per "M" band or "DNB" band and 64 detector RSR per "I" band (32 detectors x 2 subsamples), plus a band average RSR for each band plus an extra file for band average "M16" (average of M16A and M16B) for a total of 49 files. The files are contained in a tar file named "J2_VIIRS_RSR_DAWG_Release_V2_Jul2019.tar", e.g. :

J2_VIIRS_RSR_M1_Detector_Fused_V2F.txt	(Band M1 detector RSR V2)
J2_VIIRS_RSR_M1_BA_Fused_V2F.txt	(Band M1 band average RSR V2)
J2_VIIRS_RSR_I1_Detector_Fused_V2F.txt	(Band I1 detector RSR V2)
J2_VIIRS_RSR_I1_BA_Fused_V2F.txt	(Band I1 band average RSR V2)
J2_VIIRS_RSR_DNBLGS_Detector_Fused_V2FS.txt	(Band DNBLGS detector RSR V2)
J2_VIIRS_RSR_DNBLGS_BA_Fused_V2FS.txt	(Band DNBLGS band average RSR V2)
J2_VIIRS_RSR_M13_Detector_V2F.txt	(Band M13 detector RSR V2)
J2_VIIRS_RSR_M13_BA_V2F.txt	(Band M13 band average RSR V2)
J2_VIIRS_RSR_M15_Detector_V2F.txt	(Band M15 V1 detector RSR included in V2)
J2_VIIRS_RSR_M15_BA_V2F.txt	(Band M15 V1 band average RSR included in V2)

Etc.

The band average RSR are the "final" (designated by "F" in file name) RSR product used to populate LUTS supporting the VIIRS SDR and L1B products.

All files are ascii text. Detector files contain 9 columns including band name, detector number, subsample number, wavelength, response, SNR, SNR threshold, quality flag, and a test data set identifier (aka UAID). Band average RSR files contain band name, wavelength, and response. Band average RSR are generated by averaging the high quality detector RSR at the native spectral sampling. See comments below for insight on the data quality determination. At wavelengths where the data quality is low, the band average response is set to 1E-10.

General comments on the DAWG V2 RSR Product

1. The RSR are stitched IB+OOB RSR with all RSR normalized at the peak response to 1.0.
2. Detector and band average RSR are provided at the native spectral sampling of the test data collection (i.e no resampling) with exception of M9 band average RSR. See Band-Specific comment #6 .
3. Detector numbering is given in sensor order, i.e. leading detector in along track direction is detector 1.
4. A band average SNR metric is used to stratify high quality (i.e. light-driven) response from low quality (i.e. noise-driven). A quality flag (0=High; 1 = Low) is provided at each wavelength in the detector RSR files. The quality flag information supported data quality filtering in the band average RSRs. For a few wavelengths the SNR threshold test was waived and the wavelength was accepted as high quality

response (i.e. quality flag value set to zero) or assigned low quality (i.e. flag set to one). The DAWG recommends that low quality response be treated as noise.

5. For informational purposes, the low quality (i.e. noise floor) response including negative response is retained in the detector level RSR but is set to 1E-10 in the band average RSR. The retained noise floor response in the detector level RSR is not corrected for the Relative Spectral Output (RSO) signal level, leaving the noise floor unmodified.
6. SpMA-based response has not been corrected for a minor SpMA spectral smile influence. No such effect exists in GLAMR-based response.
7. Spectral patterns indicating fluorescence in the source light (occurring inside integrating sphere) were observed in the GLAMR-based RSR of VisNIR bands. Those wavelengths at which fluorescence was suspected were removed from the analysis, effectively treating them as low quality.

Band-specific comments from the DAWG review

1. M13 RSR (and the RSO characterization) are corrected for ambient CO2 absorption influence.
2. M9 inband detector RSR are influenced by ambient water vapor absorption. Using a forward model with measured atmospheric water vapor status, wavelengths at which the water vapor influence exceeded 1% were removed from the analysis and interpolated using corrected wavelengths at which the influence was less than 1%.
3. RSR are provided for the mid-gain (DNBMGS) and low-gain (DNBLGS) stages. These stages were both measured using the GLAMR system. Meaningful differences exist between the DNBLGS and DNBMGS RSR due to the presence of a neutral density filter containing minor spectral shape over the DNBLGS detectors. The DAWG recommends that the DNBHGS RSR, which isn't measured in the prelaunch test program, be represented by the DNBMGS RSR, which should be a close match.
4. The V2 DNBLGS and DNBMGS RSR were sampled ("S" in filename) to limit the number of elements to less than 1000 to meet constraints in the format of the SDR/L1B RSR LUT.
5. Separate I band detector RSR are provided for subsample 0 and 1. They agree closely as expected. The band average RSR for all I bands is based on an average of all detectors and subsamples.
6. RSR are provided for M16A, M16B and an average of M16A and M16B referred to as M16. Minor shape differences exist between M16A and M16B. VIIRS on-orbit M16 SDR radiances consist of a time delay integration of M16A and M16B observations.

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