



Fusion of VIIRS and CrIS data to Construct Supplementary Infrared Band Radiances for VIIRS

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Objective: To construct MODIS-like infrared (IR) spectral band radiances for VIIRS from merged CrIS and VIIRS data. MODIS has three channels sensitive to CO₂ in the 4.5 μm CO₂ band, four channels in the broad 15 μm CO₂ band, 2 channels sensitive to H₂O near 6.7 μm, and an ozone channel near 9 μm. VIIRS has none of these IR absorption bands. Our Level-2 product provides these IR channel radiances for both S-NPP and NOAA-20 at VIIRS M-band resolution (750m).

Important Results: Improvement in Cloud Heights (left) and Total Precipitable Water Vapor (right)

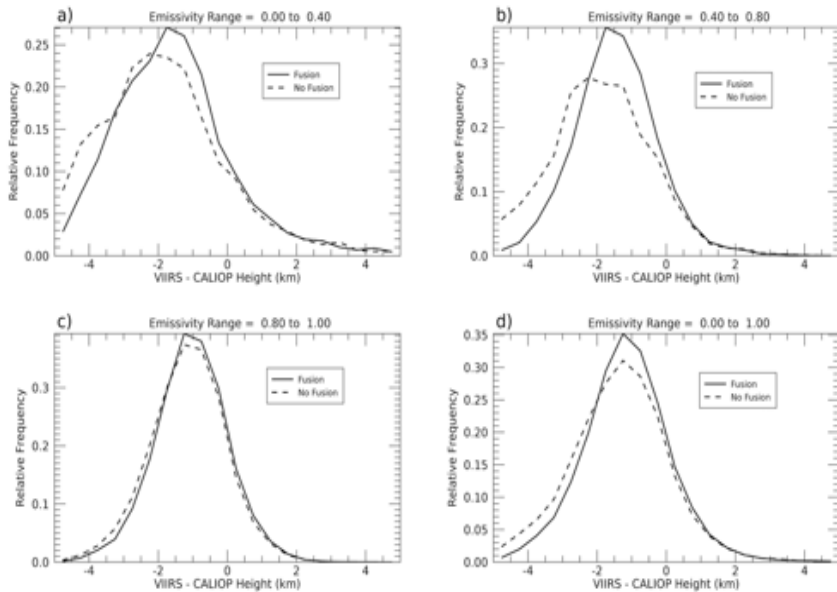


Figure 1: Bias distribution of cloud top height between S-NPP VIIRS and CALIPSO/CALIOP for emissivity range a) 0 to 0.4; b) 0.4 to 0.8; c) 0.8 to 1.0; and d) 0 to 1.0. Solid and dashed lines indicate data with/without fusion channels. Figure taken from Li et al. (2020).

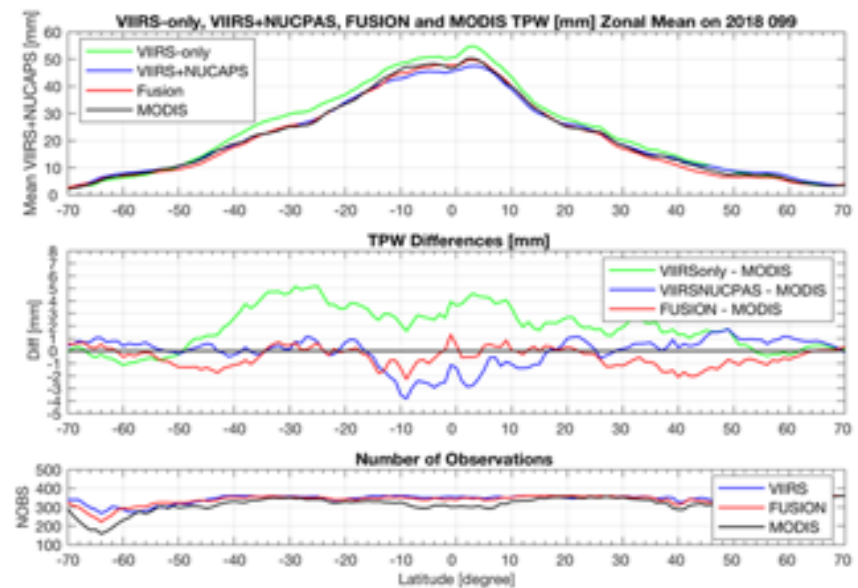


Figure 2. Top: latitudinal distribution of TPW [mm] results for 9 Apr 2018. The middle panel illustrates the corresponding differences while the lowest panel shows the number of observations in each 1° latitude bin.



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Status and Updates:

- V1.01 fusion radiance product available for entire record of both S-NPP and NOAA-20
- Software updated and in review at A-SIPS; next version of fusion radiances will soon be in production. Yield will be improved (currently > 98% for S-NPP; 99.9% for NOAA-20)
- Working with CERES team to implement NOAA-20 fusion product

Needed Products: VIIRS/CrIS L1-b data

Known Issues: H₂O fusion band radiances have slight surface artifacts in very dry regions

Recent Publications:

- Borbas, E. E., E. Weisz, C. Moeller, W. P. Menzel, and B. A. Baum: Improvement in tropospheric moisture retrievals from VIIRS through the use of infrared absorption bands constructed from VIIRS and CrIS data fusion. In review, *Atmos. Meas. Tech. Disc.*, in review, 2020.
- Li, Y., Baum, B. A., Heidinger, A. K., Menzel, W. P., and Weisz, E., 2020: Improvement in cloud retrievals from VIIRS through the use of infrared absorption channels constructed from VIIRS-CrIS data fusion, *Atmos. Meas. Tech.*, **13**, 4035-4059.

- Bryan Baum is the S-NPP science team leader as well as the PI of this effort
- He regularly attends science team meetings from the Sounder, Land, Radiation Budget disciplines
- This team is actively working with the CERES team to implement the NOAA-20 fusion product.
- Note that we are providing the fusion product for NOAA-20 although it was not part of our proposed effort.