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Stratospheric temperature is defined as an Essential Climate Variable (ECV), and its importance has been increasingly stressed in the literature; however, so have the uncertainties in the longest, currently available stratospheric temperature datasets from SSUs and radiosondes. Two instruments that offer the potential to provide climate-quality measurements with decreased uncertainties are radio occultation (RO) and hyperspectral infrared (IR) sounders. The high accuracy and stability of RO measurements enable their dry temperature products, which have a high vertical resolution, to also be very stable. Hyperspectral IR sounders, which are calibrated onboard the satellites, measure radiances with high accuracy and high spectral resolution, but are not able to resolve information in the vertical as well as RO. Validation of these temperature products is essential so that claims can be made about their accuracy and how they can be used for not only climate applications but also for others.
The validation of temperature products has been traditionally performed with radiosondes, but this source does not offer the necessary number of samples within the stratosphere and over the globe. This work shows efforts to compare the RO and IR sounder data against each other using a matchup technique to minimize spatiotemporal mismatch errors in order to assess their temperature products in the upper troposphere and lower stratosphere. Comparisons of RO and IR, including between different IR products and different RO products, have been made. As such comparisons do not include an absolute reference (such as RO phase delays or IR radiances), comparisons are also made in radiance space to the coincident IR measurements, which are used as an absolute reference. Synthetic radiances are computed for both the IR and RO temperature products for the 15 micron region using the fast radiative transfer model (RTM), OSS.
Comparisons of products from different missions, processing centers, and retrieval versions have been performed. Conclusions are drawn from a comparison of 6 years of AIRS v6 and UCAR COSMIC v2010 radiances in addition to a three year comparison of three IR temperature retrievals—specifically the EUMETSAT IASI v6, NOAA NUCAPS, and NASA AIRS v6. Highlighted in this work, however, is the assessment of ROMSAF GRAS dry, wet, and background temperatures using both IASI and CrIS radiances over the years 2015 through 2016 on seasonal and zonal scales. Uncertainty estimates of the IR measurements, RO temperatures, and RTM model method are used to draw conclusions.
OSTS session
Regional and Global CAL/VAL for Assembling a Climate Data Record