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Development of comprehensive uncertainty estimates for satellite-derived climate data records

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Climate data records (CDRs) constructed from measurements made using satellite sensors are critical to understanding the recent evolution of the climate system. The methods used for CDR construction are often complex, because data from different instruments flying in different orbits must be adjusted to remove both the effects of different and changing local measurement times and errors in instrument calibration before the data can be combined together. Calibration errors are often characterized by comparing data from different satellites, leading to a complex interplay between the different types of adjustments. To address this complexity, we use a Monte-Carlo approach to make comprehensive error estimates of the uncertainty CDRs derived from microwave sounders and imagers. These estimates can be used to characterize uncertainty on all relevant spatial and temporal scales. We have completed uncertainty estimates for atmospheric temperature from the MSU/AMSU series of sounders, and made progress in estimating the uncertainty for variables retrieved from microwave imagers, such as oceanic measurements of total column water vapor and surface wind speed. These estimates can and should be used in activities such as the detection of anthropogenic climate change, and intercomparison of CDRs constructed using different approaches or instrument systems.