16.026 Uncertainty Analysis for the Radiometric Calibration Test Site (RadCaTS) at Railroad Valley, Nevada

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The Radiometric Calibration Test Site (RadCaTS) at Railroad Valley, Nevada is used to perform the calibration and validation of Earth-observing sensors in the 400 nm to 2500 nm spectral range. It was developed by the University of Arizona in response to a need to collect data for the ever-increasing number of on-orbit sensors without the cost-restrictive requirement of ground-based personnel. It is currently being used to provide absolute radiometric calibration and surface reflectance validation data to such sensors as Landsat 8 OLI, Terra and Aqua MODIS, SNPP VIIRS, WorldView, RapidEye, and Sentinel-2A MSI. RadCaTS is also currently one of four sites that are taking part in the prototyping phase of the CEOS WGCV Radiometric Calibration Network (RadCalNet) along with sites at La Crau (France), Baotou (China), and Gobabeb (Namibia). A well-documented and traceable uncertainty budget will be a key element to the future success of RadCalNet. This is critical because each site uses different instrumentation and processing techniques to determine the inputs they will provide to RadCalNet for calculation of top-of-atmosphere (TOA) reflectance to be used for comparison with Earth-observation sensors. In order to ensure that the sites provide results that are on the same radiometric scale, an end-to-end uncertainty budget is required. This work describes the uncertainty budget that has been derived for RadCaTS at Railroad Valley, though the approach to deriving the uncertainties has general application across other sites and vicarious methods. The analysis includes many factors such as the instrumentation used to make surface reflectance and atmospheric measurements, the exoatmospheric solar irradiance model, spatial sampling of the site, and the MODTRAN radiative transfer code. The overall uncertainty of RadCaTS is determined using a combination of analytical and Monte Carlo approaches. The results provide a detailed uncertainty budget for the TOA spectral radiance that is derived from ground-based measurements.