16.019 Improvements to and Update on the Absolute Radiometric Calibration of the DigitalGlobe Constellation

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Reflectance-based (also known as vicarious) calibration is used by DigitalGlobe at Longmont, CO, USA. This approach to on-orbit calibration requires ground-based surface reflectance measurements of specialized calibration targets. Atmospheric characterization is also an important key to obtaining good results. These data are collected at the same time as the overpass of the intended sensor for calibration and then used as inputs to a radiative transfer code that computes predicted at-sensor radiances for comparison to the sensor under test. Several data points are collected throughout a calibration season over well-characterized targets. These data are used in a linear regression to come up with a gain and offset that is an adjustment to the pre-launch absolute calibration factor that is currently reported in the supporting documentation that is shipped with DigitalGlobe imagery.

This paper describes the work done in 2015 to improve the vicarious calibration methodology used by DigitalGlobe to validate the absolute radiometric calibration coefficients of the current DigitalGlobe constellation of sensors including WorldView-3, WorldView-2, GeoEye-1, and WorldView-1. Work done in the 2015 vicarious season included the washing of our two-year old calibration tarps to bring back their uniformity and expected reflectance. Upgrades to the radiative transfer code gained improvements in the water vapor bands; and inclusion of further atmospheric measurements helped to improve results in the visible bands as well in the final results. Coefficients derived during the 2015 vicarious campaign are compared to the 2014-based results. New recommended calibration adjustment coefficients will be presented.