Spectrometer orthorectified surface directional reflectance - mosaic (DP3.30006.001)

Measurement

The solar energy reflected off of the earth's surface in the 0.4 to 2.5 micron wavelength range and modeled using ATCOR to best account for the many influencing factors such as reflectance angle/wavelength, solar angle, and scattering, absorbing, & re-radiating effects of atmospheric conditions. Surface reflectance data values range from 0 to 1 and are scaled by 10,000 and orthorectified to a UTM projection with 1 m pixels.

Collection methodology

NEON AOP instruments, including the NEON Imaging Spectrometer (NIS), are flown at 1000 m above ground level at 100 knots in flight lines that have 37% overlap. This results in NIS collections at 1 m spatial resolution and 5 nm spectral resolution in over 420 bands from 380 to 2500 nm. All AOP L3 data products are distributed in 1 km by 1km tiles. NEON sites are flown once per year with a target of 90% of maximum greenness or higher and at a minimum of 3 of every 4 years. Flight coverage is a minimum of 10 km by 10 km and covers both NEON tower and observational sampling sites. Aquatic sites, as well as the terrestrial sites in Hawaii and Puerto Rico, are flown in the same fashion, but at reduced frequency.

For information about disturbances, land management activities, and other incidents that may impact data at NEON sites, see the Site management and event reporting (DP1.10111.001) data product.

Maintenance and calibration

Calibration activities are conducted on the NIS every winter between flight seasons in the NEON AOP lab where it measures known radiance sources in a controlled environment. Calibration/validation flights are flown at the beginning and end of every flight season for positional and timing accuracy as well as measuring radiance and reflectance over well-characterized, homogenous targets. In each domain collected, an in-situ calibration is conducted where the NIS records radiance from a known portable mercury lamp positioned directly under the sensor. Finally, at the start and end of each flight line flown, a set of on-board calibrations are made. These calibration activities allow any variances in the spectral response of the focal plane to be characterized, recorded, and tracked.

Data processing and derivation

Each NIS flight line is processed from raw L0 DN to L1 radiance using the lab and onboard calibration information. Each radiance flight line is then orthorectified using a digital surface model from the co-collected lidar data. The orthorectified radiance flight lines are then processed to directional surface reflectance using the atmospheric correction and modeling package ATCOR and distributed including all 426

bands in HDF5 format for each individual flight line. The flightline HDF5 files at a given site are then merged and distributed in 1 km by 1 km tiles where pixels are selected from flightlines with the highest quality cloud conditions at collect and closest proximity to nadir.

Data quality

Downloaded data include a quality report for each flight flown over a site, as well as the site as a whole, describing cloud conditions, positioning errors, parameters used for atmospheric corrections, and other data quality considerations made during flight collection and processing of data. Flightlines are each assigned color-coded quality flags indicating cloud cover (green <10%, yellow 10%-50%, red >50%). Pixels missing data are coded -9999.

Standard calculations

For wrapper functions to download data from the API, and functions to merge tabular data files across sites and months, see the neonUtilities R package.

Data should be divided by the scale factor (10,000) stored in the Scale_Factor attribute of the dataset in the HDF 5 file. This will put the data in a range of 0 (0%) to 1 (100%).

Documentation

NEON Imaging Spectrometer Radiance to Reflectance Algorithm Theoretical Basis Document
`NEON.DOC.001288vB | 1.2 MiB | PDF`

NEON Algorithm Theoretical Basis Document (ATBD): Spectrometer Mosaic
`NEON.DOC.004365vB | 1.9 MiB | PDF`

For more information on data product documentation, see:
https://data.neonscience.org/data-products/DP3.30006.001

Citation

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