

High-resolution orthorectified camera imagery mosaic (DP3.30010.001)

Measurement

Product DP1.30010.001 High-resolution orthorectified camera imagery is the set of individual orthorectified camera images collected over a single site, possibly over several separated flights and days. This product combines all the separate images into a single image called a mosaic and further divides the mosaic into 1 km by 1 km mosaic tiles for ease of use. The mosaic tiles are the actual product.

Collection methodology

NEON AOP instruments, including the medium format digital camera, are flown at 1000 m above ground level at 100 knots in flight lines that have 60% along-track overlap and 37% cross-track overlap. This results in a minimum of eight-centimeter ground pixel resolution. 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

To account for camera specific variables and the orientation of the camera on the plane, a boresight calibration flight is performed twice per year: pre and post season. This process involves correlating ground truth points and tie points within images collected during the boresight flight. These data are used to create a complete camera model consisting of camera, distortion, and alignment models used in the orthorectification process. The camera model accounts for the geometry of components within the camera and for the distortion caused by the camera optics. The alignment model is created to determine the relative position of the camera's sensor in relation to the measurement point for the aircraft's positioning and orientation system. The post-season calibration flight is used to ensure that the camera alignment has not changed.

Data processing and derivation

A mosaic is a collection of orthorectified images that are stitched and blended together to create one seamless image of an entire survey area. NEON has developed an algorithm to perform the following steps. First, orthorectified images are selected for mosaicking based on location and orientation, typically from only North-South survey lines. Next, the zenith angle, or the angle between the orthogonal direction of the pixel

plane and nadir, is found for each pixel and stored in a zenith file. The aggregate of these files determines the coverage area of the mosaic and 1km x 1km tiles are created within this area. Then, all of the overlapping images within a tile are found. Within these images, the pixels that are facing the most upwards, or have the smallest zenith angle, are selected to populate the tile. This process reduces distortion effects caused by the difference in resolution between the digital terrain model and the images, which can cause unnatural features to display such as swirls and outward bending. Placing the tiles next to each other creates the mosaic for the entire area surveyed. Because of the nature of the surveys, images for an entire site may be collected over many days with different lighting conditions. This can cause contrast differences that can sometimes be seen in the mosaic, with darker appearing areas next to lighter appearing areas of the same objects.

Data quality

Orthorectified images have location uncertainties of below 0.5m, or 5 pixels, previously calculated with the L1 product. No numerical error or accuracy information is provided specifically with this product.

Documentation



[NEON Algorithm Theoretical Basis Document \(ATBD\) - AOP Digital Camera Image Orthorectification](#)

NEON.DOC.001211vB | 2.5 MiB | PDF



[NEON Algorithm Theoretical Basis Document \(ATBD\): Camera Mosaic](#)

NEON.DOC.005052vB | 4.9 MiB | PDF

For more information on data product documentation, see:
<https://data.neonscience.org/data-products/DP3.30010.001>

Citation

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