Atmospheric Correction Software for Smallsats

A Service for Smallsat Flocks

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RESOLV was initially developed in NSF SBIR Phases I and II

Example

Uncorrected top of atmosphere

RESOLV corrected

Alexandria, MN; Planet Labs 20210716_PSBSD_SN2233

What is RESOLV?

RESOLV is a…

- software solution to correct smallsat images to surface reflectance.
- comprehensive solution delivering convenience, accuracy and reliability.
- SaaS that first calibrates each smallsat delivered as a software plugin.
- no-delay correction to surface reflectance for each smallsat image.
- program that continues to monitor each smallsat to assure accuracy.
- solution extensively verified to be accurate and reliable.*

*Verification, R&D Basis, and Application are available at https://resolvearth.com/white-papers-and-e-books/application/

Example

Uncorrected top of atmosphere

RESOLV corrected

Burley, Idaho; Satellogic (1m) SAT_0029_183_20240701

Why RESOLV?

Faster: Uses scene statistics – images can be processed/transmitted within minutes of download.

Better: The most accurate and robust atmospheric correction software.*

Cheaper: retrieves more images and obviates the staff attention to maintain the program.*

Practicality: Outsourcing for the RESOLV achieves the best solution available.

Convenience: Calibrates the algorithm for each smallsat and delivers a plugin program that converts TOA data to surface reflectance. We stand by to assure rapid and seamless adoption.

Enhance Image Demand: Users want surface reflectance data – the standard that restores the digital data for automated analysis (including AI) that also clears the view.

Expand the Market: Accurate, no-delay surface reflectance is a game changer for the smallsat industry. With high quality optics and sensors, smallsats can outcompete "bigsats" costing >100x!

The Superior Solution, the Superior Alternative: Work with our team to achieve the most accurate surface reflectance retrieval output in near real-time without the delay of ancillary data.

*Compared to the existing methods for smallsats (radiative transfer, and harmonized datasets)

Example

Uncorrected top of atmosphere

RESOLV corrected

Brookings, SD; Planet Labs 20210716_PS2_SN103c

No-Cost Demo

- We will work with you to specify the images we need from your archives.
- We'll calibrate the software for each smallsat and return a docker version with verification documents to start a one-month evaluation period.
- Add any new smallsat for this service at any time thereafter.

Software Description

- RESOLV is provided for an annual fee per smallsat. For convenience we can prorate this fee.
- Operational RESOLV software consists of two components: Calibration and Correction.
- The Calibration File contains individual coefficients for each member of the smallsat flock.
- The Correction File works for up to 8 bands. We can reconfigure for more and different bands.
- The Correction File calls the coefficients from the Calibration File, corrects each band and outputs an image package containing the corrected data and a grayscale quality raster to support removing uncorrectable clouds and extreme haze from further consideration.

RESOLV is patented in the US and patent pending internationally

Example

Uncorrected top of atmosphere

RESOLV corrected

Brookings, SD; Planet Labs 20210716_PS2_SN103c

The RESOLV Pedigree

- RESOLV is the result of 5 years of research and development partially supported by Phases I and II of the NSF Small Business Innovation Research program.
- RESOLV is a commercial service developed from the “Closed-form Method for Atmospheric Correction” (CMAC) algorithm developed by Advanced Remote Sensing, Inc.
- CMAC was prototyped using Sentinel-2 data, confirmed for correction of Landsat 8/9 and has been successfully applied to numerous images from different smallsats, both nadir and off-nadir views.
- Through extensive comparisons, CMAC/has been verified to convert top-of-atmosphere reflectance to surface reflectance more accurately, for much greater levels of haze than the industry standards and doing so without delay waiting for ancillary data than LaSRC software for Landsat-8/9 and Sen2Cor for Sentinel-2.
- RESOLV overcomes the shortcomings of competing methods without the delay of ancillary data, for much higher levels of atmospheric aerosol, with greater accuracy for the low-end reflectance that is critical for feature extraction and vegetation indices. CMAC output contains a grayscale quality raster for automated removal of clouds and extreme levels of haze that cannot be corrected reliably (e.g., the serious need to avoid providing bad precision ag data to farmers!).
- RESOLV is a simpler and more robust pathway for smallsat atmospheric correction than the NASA-proposed radiative transfer/data harmonization pathway.

Uncorrected top of atmosphere

RESOLV corrected

Sentinel-2, May 3, 2021, view of Playa Chachalacas, Veracruz, MX with smoke from fields burned prior to planting. For reference, the Sentinel-2 software, Sen2Cor cannot correct this image.

RESOLV works well over water but controlled by image geometry ‘s effect upon specular reflectance (look and solar angles, azimuths and elevations). This is the subject of a current program.

The proposed standard to calibrate smallsats for atmospheric correction is Landsat's LaSRC software shown here compared to RESOLV–corrected and uncorrected Landsat 8.

Uncorrected top of atmosphere

RESOLV corrected

LaSRC corrected

Kelowna, British Columbia (Landsat-8)