ATMOSPHERIC CORRECTION FOR AXELSPACE GRUS DATA

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Axelspace's Earth observation constellation GRUS offers MSI product including one panchromatic band and 5 spectral bands between visible and near-infrared spectral range with a Usable Data Mask (UDM) for each image. All the image data in this product are basically provided in Top of Atmosphere (TOA) reflectance. In order to retrieve Bottom of Atmosphere (BOA) reflectance of GRUS's data for better integration with data acquired in different dates or other sensors, a physical atmospheric correction approach based on the 6SV1 code for performing Radiative Transfer is proposed by Axelspace. A series of multi-parameter lookup tables are generated in order to model the relationship between Bottom of Atmosphere (BOA) and Top of Atmosphere (TOA) reflectance values for a variety of landcover, and viewing angle conditions. The atmospheric data required in the 6SV1 calculations are obtained from MODIS product data, which has global and real time coverage. Performing atmospheric correction with the 6SV1 model and using MODIS data as its input ensures that Axelspace is able to generate a BOA reflectance product rapidly and for a wide variety of landcover conditions.

On the other hand, for the case that GRUS images can have more compatibility with Sentinel-2 open-source images, an empirical atmospheric correction scheme for GRUS TOA reflectance by using Sentinel-2 BOA reflectance product as a reference is studied and evaluated by Taiwan Space Agency (TASA). Based on a linear mapping processing on the unchanged pixels between input GRUS TOA and reference Sentinel-2 BOA reflectance values, another GRUS BOA reflectance is carried out as a harmonized output of Sentinel-2 data. In this empirical approach, a multi-scale Quadtree method is adopted in the linear mapping processing for more adaptive to the local variation of atmosphere. For ensuring the validity of the mapping processing, Pseudo Invariant Features (PIFs) are also extracted by an iterative RANdom SAmple Consensus (RANSAC) approach between input GRUS TOA and reference Sentinel-2 BOA reflectance values.

In this study, different approaches including physical and empirical models for atmospheric correction are proposed for various purposes and applications. Some examples will also be delivered in this study to demonstrate the suitability of each approach.

Keywords: Atmospheric Correction, Axelspace GRUS, Sentinel-2, Bottom of Atmosphere (BOA) reflectance, Top of Atmosphere (TOA) reflectance.