FIRST APPLICATIONS OF HIGH RESOLUTION BRDF ALGORITHM (HABA) FOR REFLECTANCE NORMALIZATION ON A FUSION DATASET FROM THE SEN2LIKE PROCESSOR

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ABSTRACT: Normalized Bidirectional Adjusted Reflectance (NBAR) is a key parameter for a consistent time series monitoring over surfaces. The Sen2like is a Virtual Constellation (VC) which harmonizes and fuses Landsat & Sentinel 2 dataset giving out a higher spatial and temporal resolution surface reflectance. In this context, the High resolution Adjusted BRDF Algorithm (HABA) provides up to 10m NBAR product retrieved from the disaggregation of the Bidirectional Reflectance Distribution Function (BRDF) parameters based on the VJB method at 1km resolution. HABA downscales this product to Sen2Like resolution inverting BRDF parameters (V & R) using the k-means unsupervised classification for each dataset. The model was evaluated on stable sites, such as Sahara Desert (Libya) and Amazonian Forest (Brazil) by comparing the impact of View Zenith Angle (VZA) and Solar Zenith Angle (SZA) of directional reflectance and two NBAR models in NIR and red spectrum. Also, the Sen2Like performance was assessed on dynamic sites with a mosaic of land covers across the Belgium tiles, calculating the absolute difference per tile in a 5-day window. The results of stable sites show a decline of linear dependency on the Amazon VZA from R^2 0.57 (directional) to 0.37 (HABA) in NIR and R^2 0.04 (directional) to 0.0 (HABA) in red. The Sahara Desert showed a correction of 4% of linear dependency of SZA versus reflectance. Finally, in Belgium, HABA corrected up to 12,74 % the directional. This work contributes to develop a method based on pixel scale for high resolution datasets.

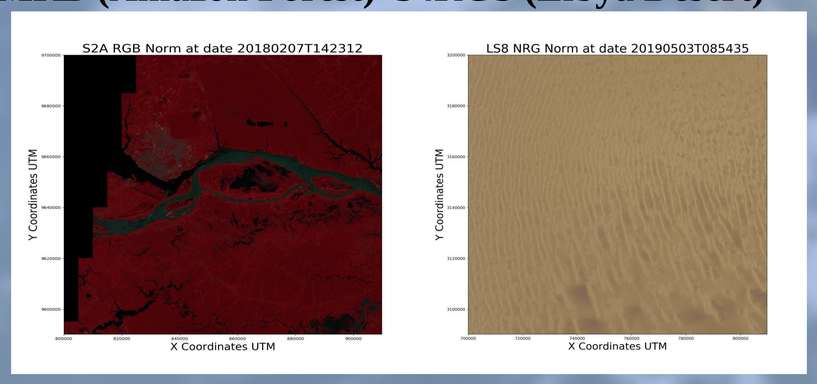
Introduction

- **Sen2Like as new Fusion dataset at 10m for Landsat and Sentinel missions**
- **BRDF is key for consistent reflectance measurements**
- **Directional Reflectance and two BRDF method evaluation over stable and dynamic sites**
- **First Application of High Resolution Adjusted BRDF Algorithm (HABA) at 10m resolution**

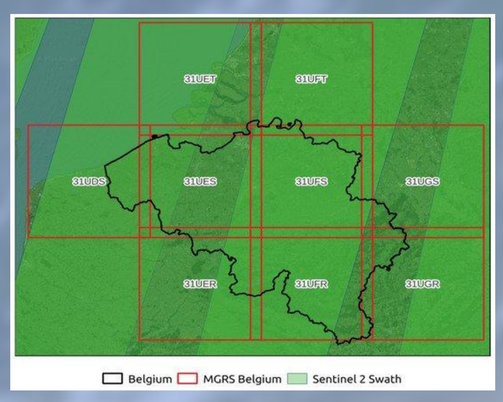
Study Area and Method

- **Test 1: Evaluation normalized and directional reflectance against the corresponding solar and view geometry (SZA & VZA) over two stable sites**

20MRB (Amazon Forest) 34RGS (Libya Desert)

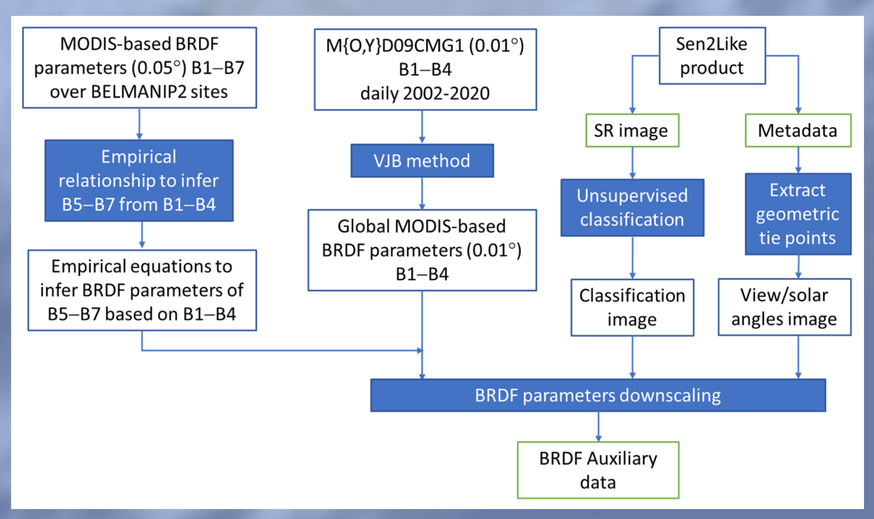


- **Test 2: Evaluate Absolute difference of adjacent Sentinel-2 orbis within a 5-day time window vs VZA variation over multiple tiles in Belgium through 2019.**



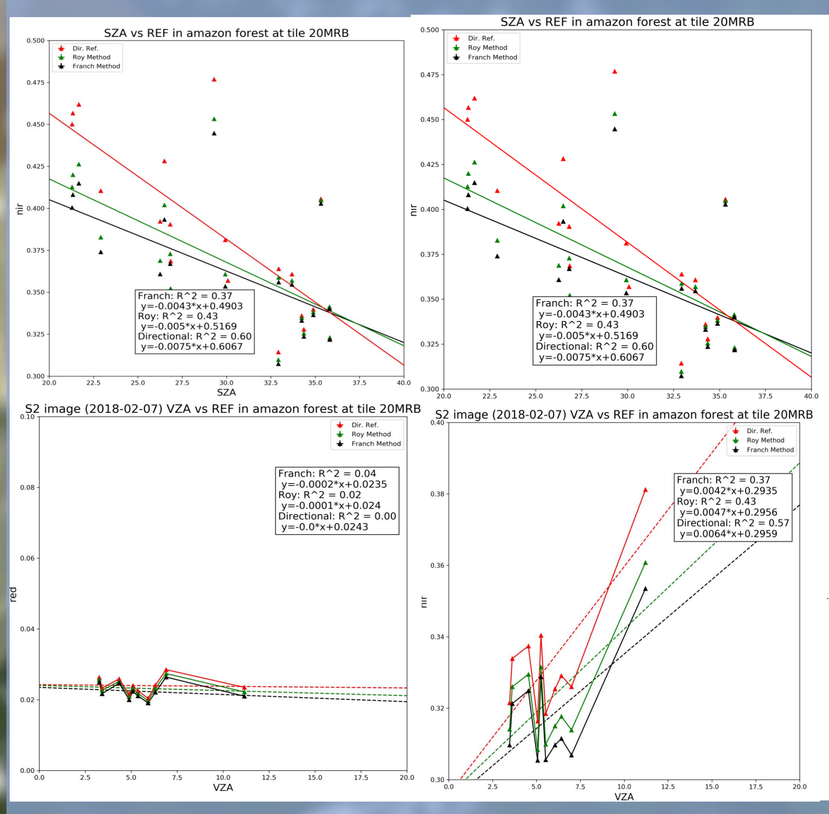
HABA Algorithm:

$$\rho^N(\theta_{mean,lat}, 0, 0) = \rho(\theta, \upsilon, \phi, \Delta) * \frac{1 + V(\Delta)K_{vol}(\theta_{mean,lat}, 0, 0) + R(\Delta)K_{geo}(\theta_{mean,lat}, 0, 0)}{1 + V(\Delta)K_{vol}(\theta, \upsilon, \phi, \Delta) + R(\Delta)K_{geo}(\theta, \upsilon, \phi, \Delta)}$$

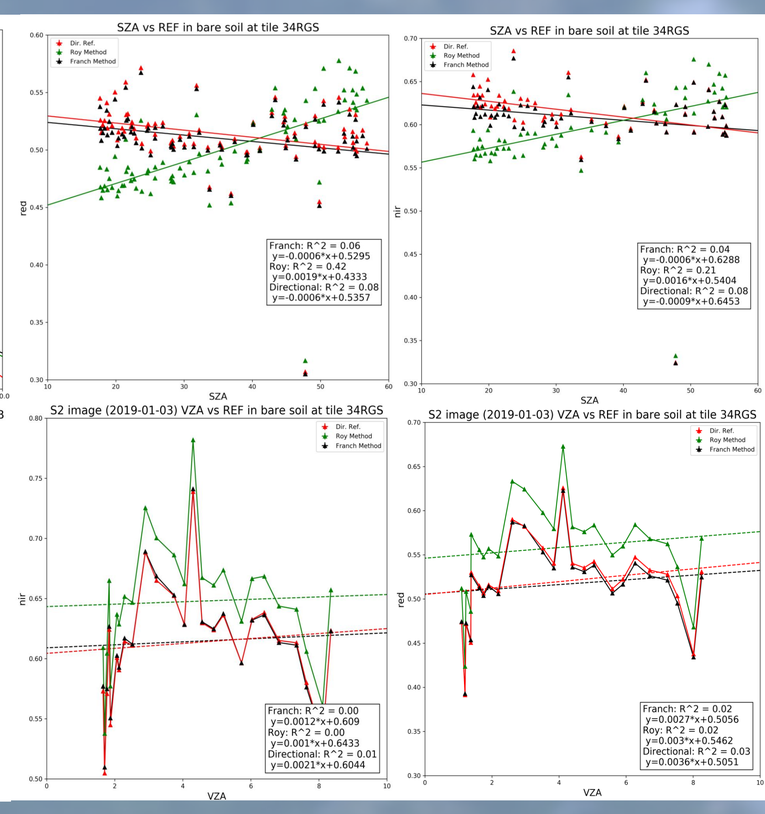


Results

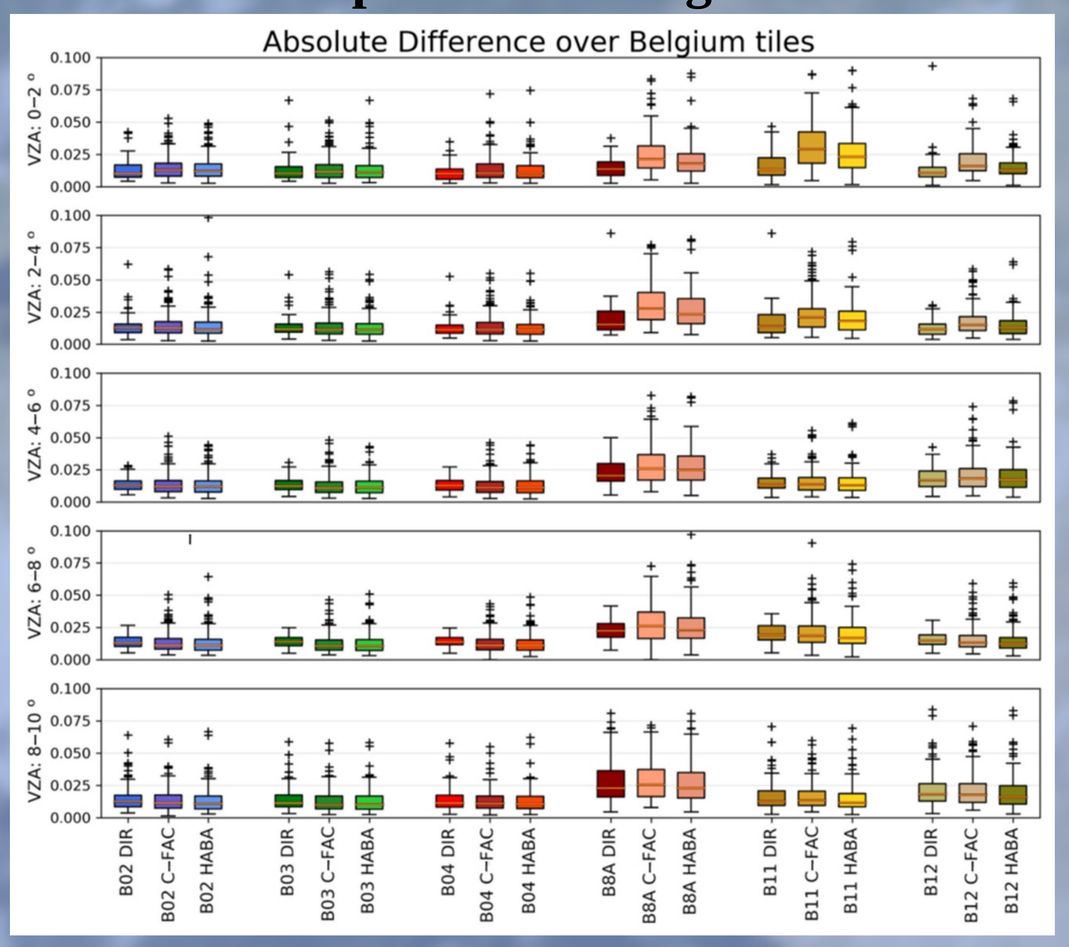
1.A) 20 MRB Forest (Amazon)



1.B) 34 RGS Sahara Desert (Libya)



Comparison on Belgium



Final Remarks

The HABA algorithm shows a reduction of angle effects (SZA & VZA) for reflectance retrieval on stable sites and VZA reduction on mosaic landscape. Next step of algorithm is analyze the performance using multi-temporal unsupervised classification for V & R downscaling, explore the quality assessment of product and explore SAR combination for BRDF correction.