Quality Note – Extending the SPOT/VEGETATION–PROBA-V archive with Sentinel-3 SYN-VGT products

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The Sentinel-3 Ocean and Land Colour Instrument (OLCI), in synergy with the Sea and Land Surface Temperature Radiometer (SLSTR) instrument, is foreseen to provide continuity to the SPOT/VGT capability (Donlon et al., 2012). The ESA Sentinel-3 synergy (SYN_VGT) products replicate the attributes and quality of standard 1 km SPOT/VGT products through innovative spectral remapping and co-location techniques (North and Heckel, 2010). The SYN Level-2 processing aims to combine information from OLCI and SLSTR to provide improved data for land surface analysis. The so-called 'VGT Continuity' processing line outputs SYN Level 2 segments (SY_2_VGP) and daily and 10-daily synthesis products (SY_2_VG1 and SY_2_V10). The details are described in the SYN ATBD (North and Heckel, 2010).

Sentinel-3 SYN_VGT products were released in October 2018 and are now available for download on the ESA Sentinel-3 Pre-Operations Data Hub.

As member of the Sentinel-3 Mission Performance Center (S3-MPC), VITO Remote Sensing evaluates the consistency between PROBA-V and Sentinel-3 Synergy products, in order to assess the possible extension of the SPOT/VGT – PROBA-V time series with Sentinel-3 data.

We have identified a number of issues with SY_2_VGP, SY_2_VG1 and SY_2_V10 products, affecting data quality and consistency with PROBA-V.

1. **Spatial inconsistencies**
   The reference grid of SY_2_VGT products is not aligned to the one from VGT/PROBA-V: there is a shift of ½ pixel in both the X and Y direction.

2. **Inconsistencies in temporal compositing**
   In order to have comparable coverage, S3A and S3B should be combined to perform daily and 10-daily composite products. In addition, the compositing scheme of SY_2_V10 should be revisited to be in line with the VGT/PROBA-V compositing scheme (i.e., 3 composites per month, 1-10, 11-20, 21-end of month).

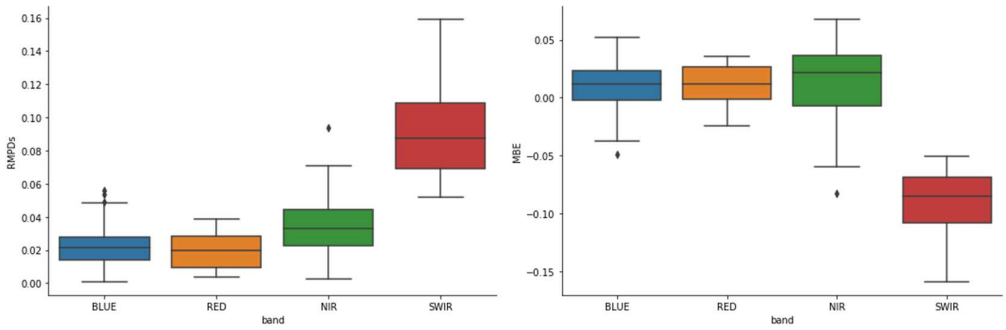
3. **Statistical inconsistencies**
   In first instance, statistical analysis was performed on SY_2_VGP (TOA segments) in comparison to PROBA-V Level2A data. The following results are based on:

   - S3A and S3B data (processing baselines 2.44 (for S3A) and 1.16 (for S3B)
   - PROBA-V Level2A data of all 3 cameras
   - Match-ups with the closest acquisition time within ±1 hour time difference
   - over 6 globally distributed 10° × 10° tiles
   - Time period 1/02/2019 – 31/03/2019

   The number of segments match-ups is 560 (214 for the PROBA-V right camera, 169 for the center camera, and 177 for the left camera).

   As indicated by the figures below, the systematic difference (RMPDs) is around 2% for BLUE and RED, around 3% for NIR, and 9% for SWIR. Mean bias difference (MBE) is around +2% for BLUE, RED, and NIR and around -9% for SWIR. The results for BLUE, RED, and NIR are within the expected range, according to the SYN ATBD (North and Heckel, 2010). The large

inconsistencies for the SWIR band are related to suboptimal radiometric calibration of the SLSTR SWIR channels (Etxaluze and Smith, 2018).



4. **Suboptimal quality of the status map**
   Spatial artefacts were detected in the land mask. The SYN_VGT products show underdetection of clouds and are currently lacking the masking of cloud shadows.

The above mentioned issues were communicated to the S3-MPC and adaptations are considered for the next processing baselines. The analysis will be updated when new data become available.

See also

https://sentinels.copernicus.eu/web/sentinel/missions/sentinel-3/mission-status

https://sentinels.copernicus.eu/web/sentinel/user-guides/sentinel-3-synergy/processing-levels/level-2

https://earth.esa.int/documents/247904/349589/SYN_L2-3_ATBD.pdf

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Henocq, C., North, P., Heckel, A., Ferron, S., Lamquin, N., Dransfeld, S., Bourg, L., TOTE, C., Ramon, D., 2018. OLCI/SLSTR SYN L2 Algorithm and Products Overview, in: IGARSS 2018 - 2018 IEEE International Geoscience and Remote Sensing Symposium. IEEE, pp. 8723–8726. https://doi.org/10.1109/IGARSS.2018.8517420

Sentinel-3 Pre-Operations Data Hub https://scihub.copernicus.eu/s3/#/home

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