

PRISCAV: lessons learnt from the scientific independent validation of the PRISMA mission

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2nd Workshop on International Cooperation
in Spaceborne Imaging Spectroscopy

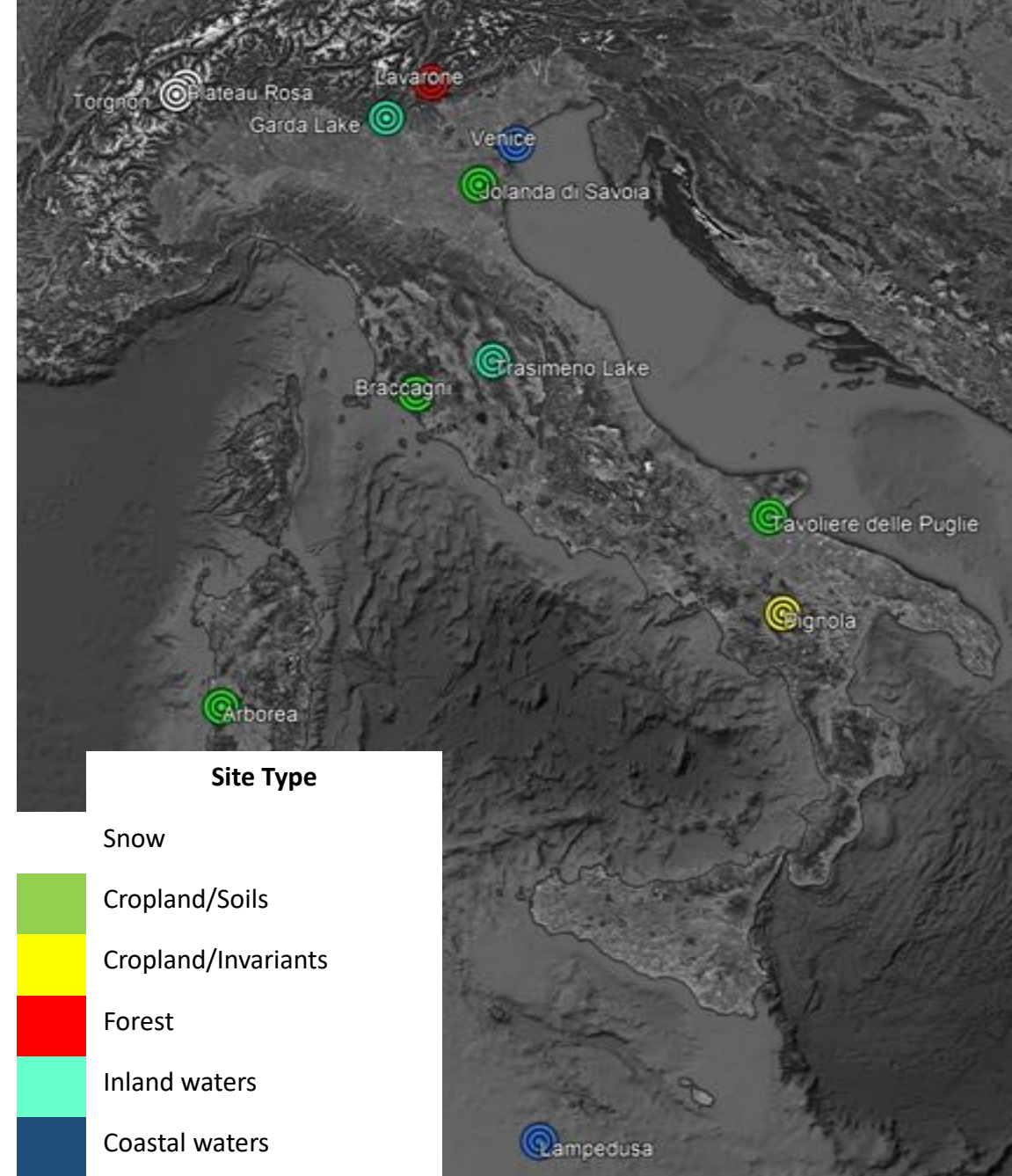
19-21 October 2022 | La Collinetta Eventi, Frascati IT



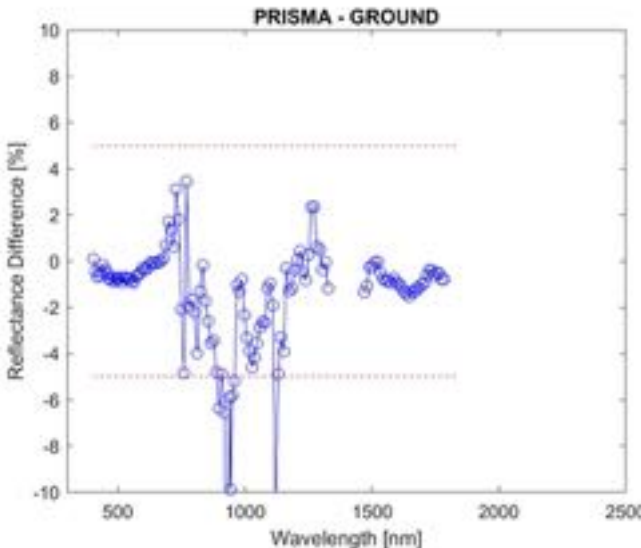
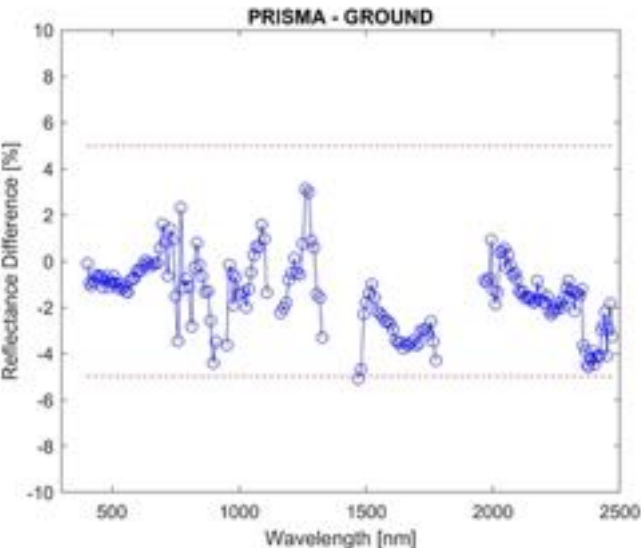
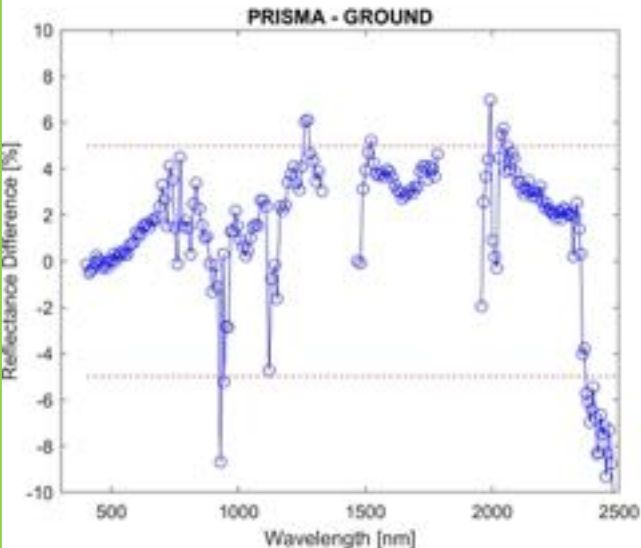
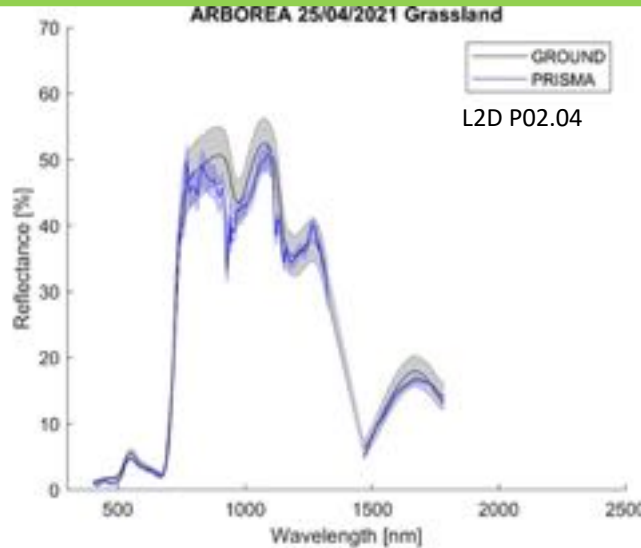
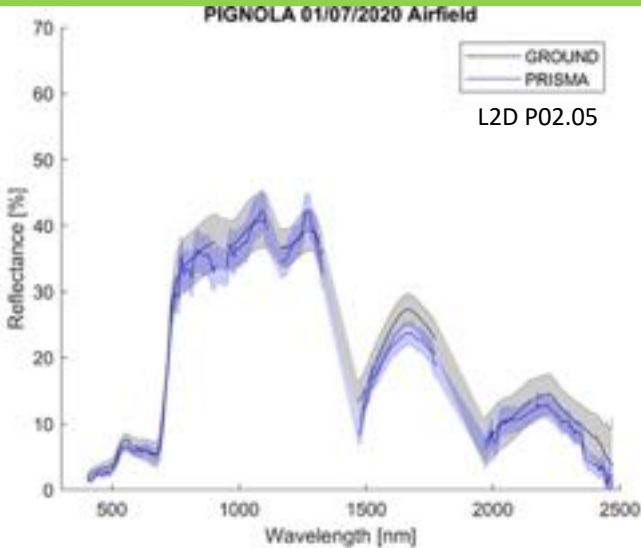
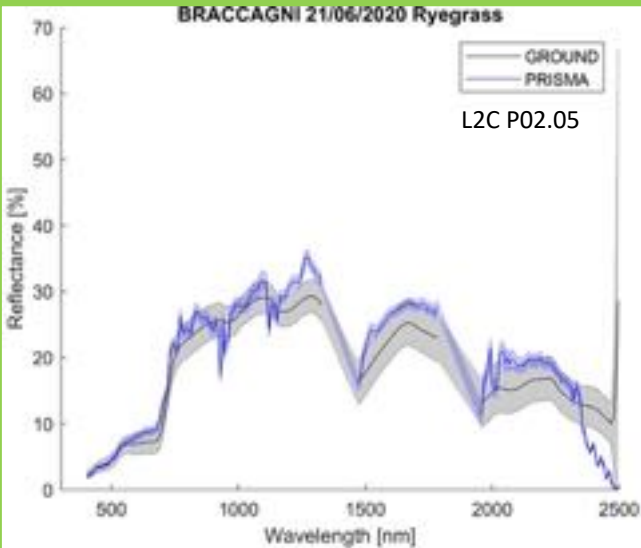
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PRISCAV

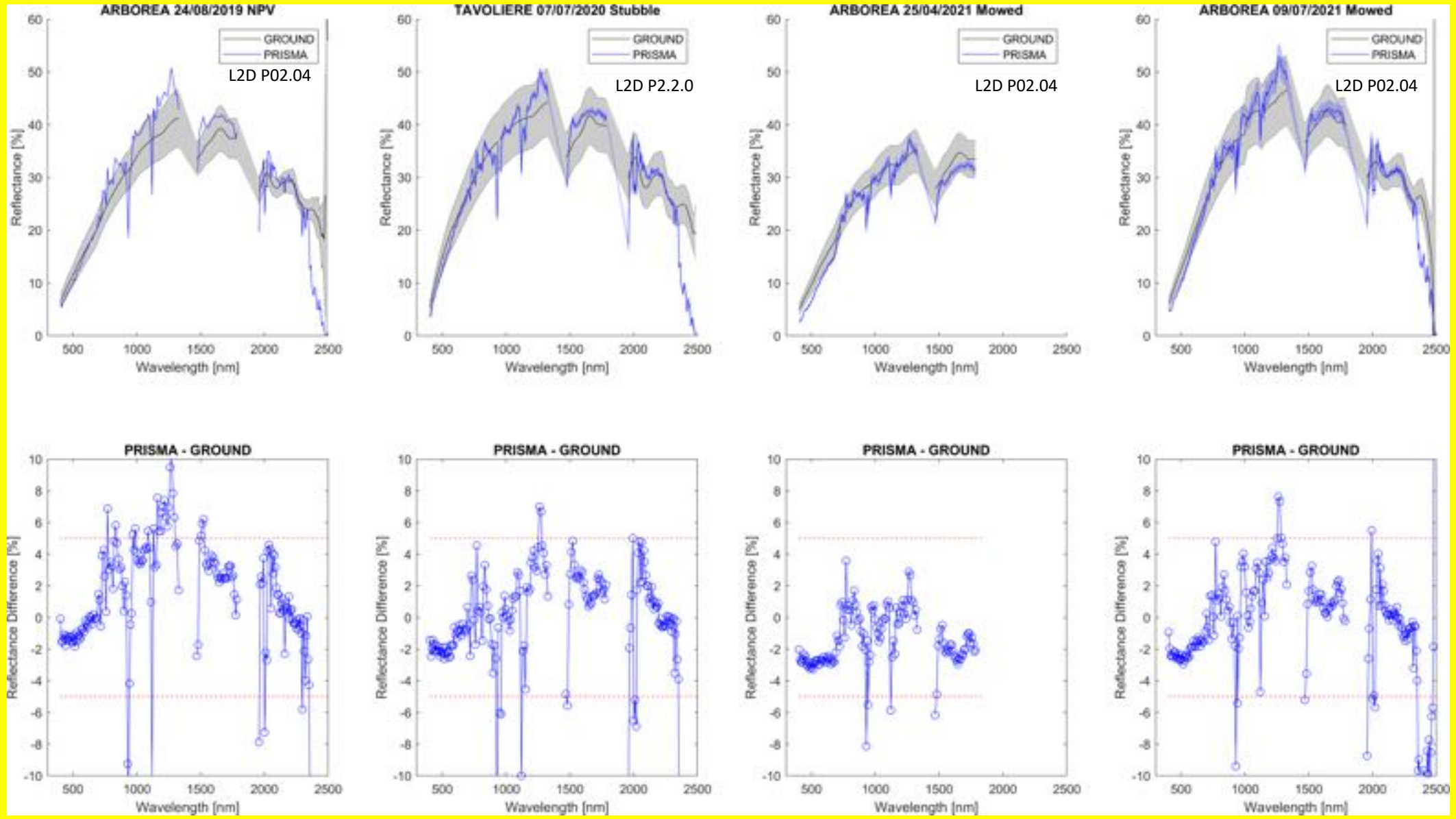
- Project (2019-2023) supporting PRISMA Cal/Val
- 12 fiducial reference sites
- Different surfaces (different land uses and water types)
- Repeated ground truth samplings over multiple Elementary Sampling Units (ESUs)
- Multiscale comparison with hyperspectral flights (> 20 total flights performed over 14 days over multiple land/water types)



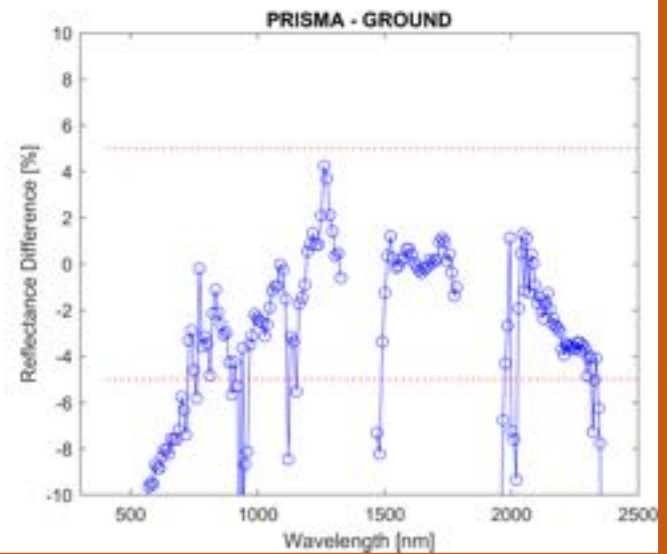
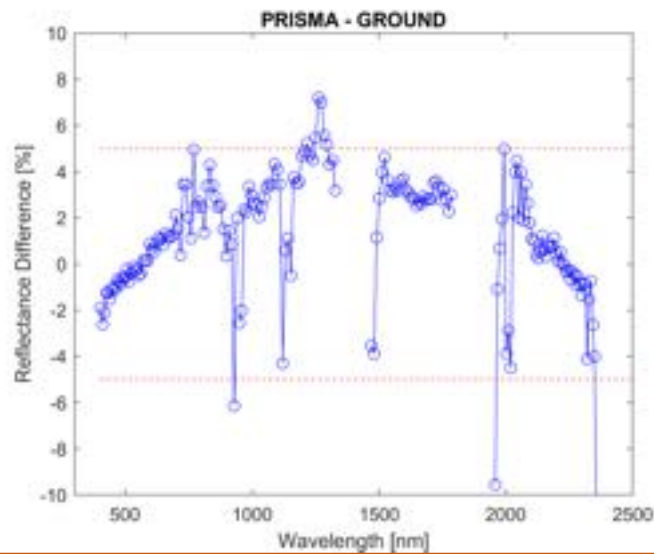
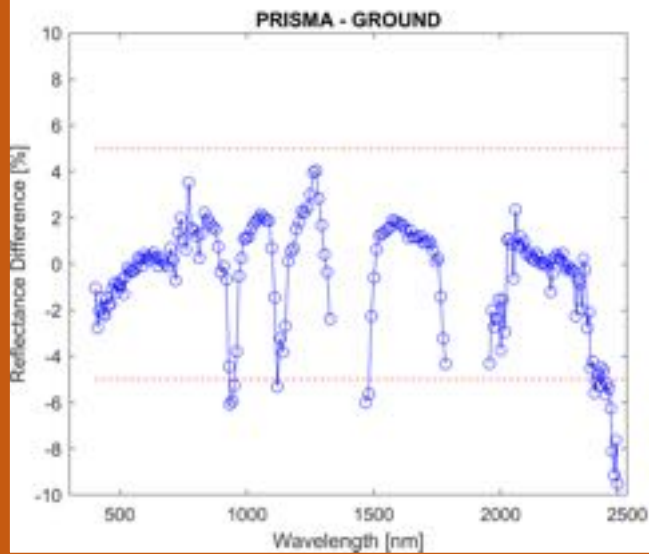
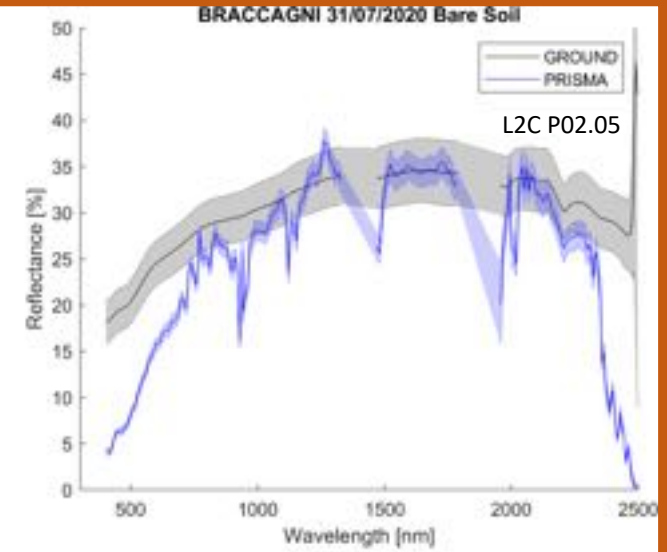
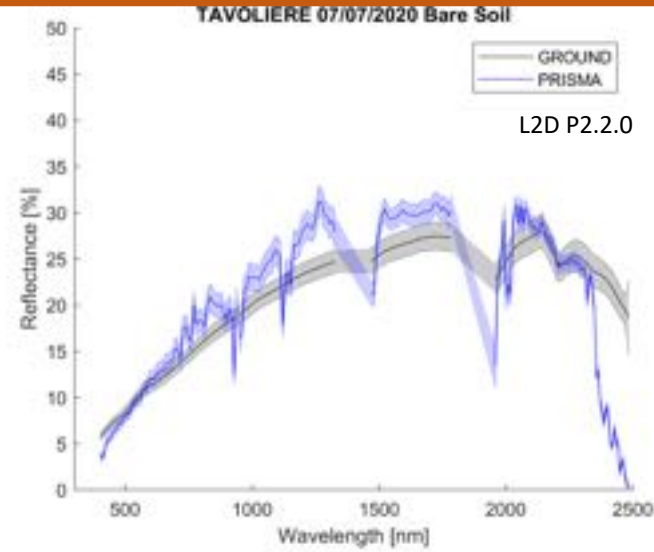
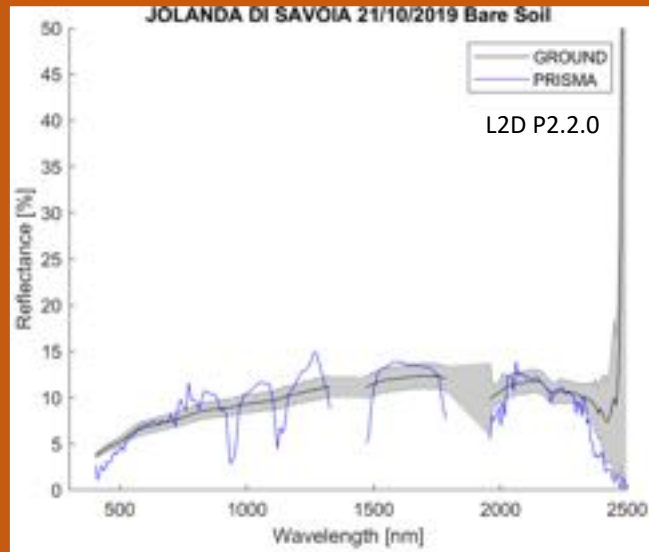
Grasslands



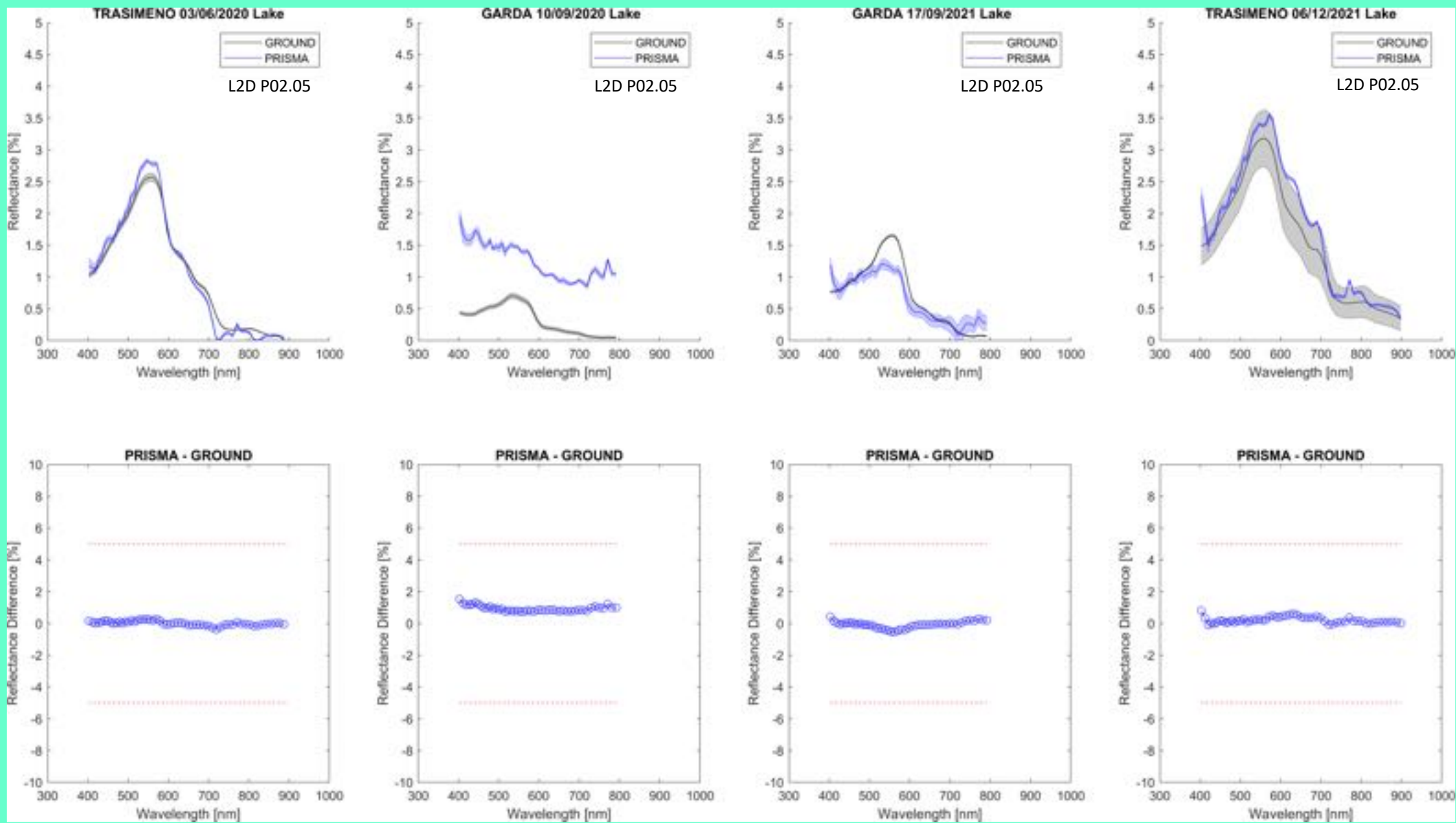
NPVs



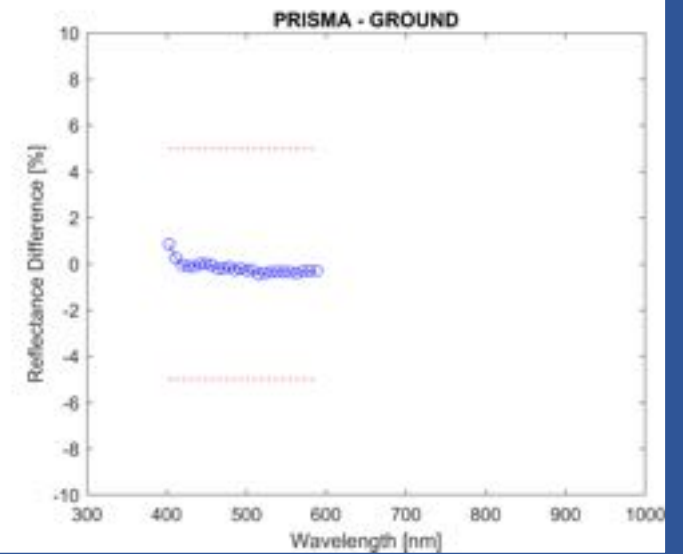
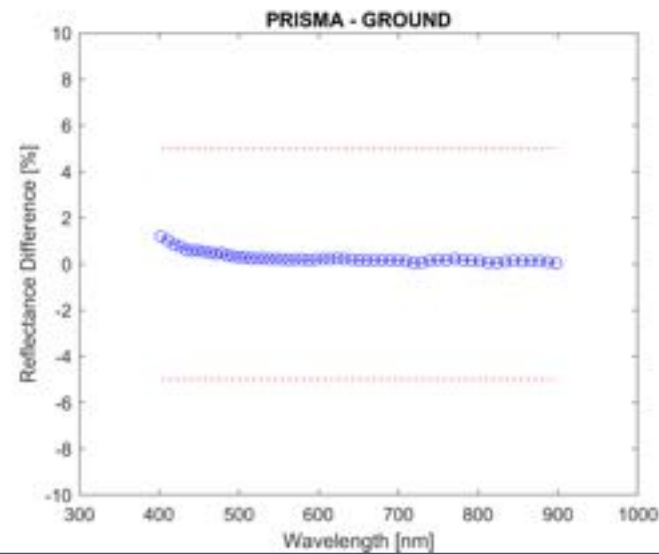
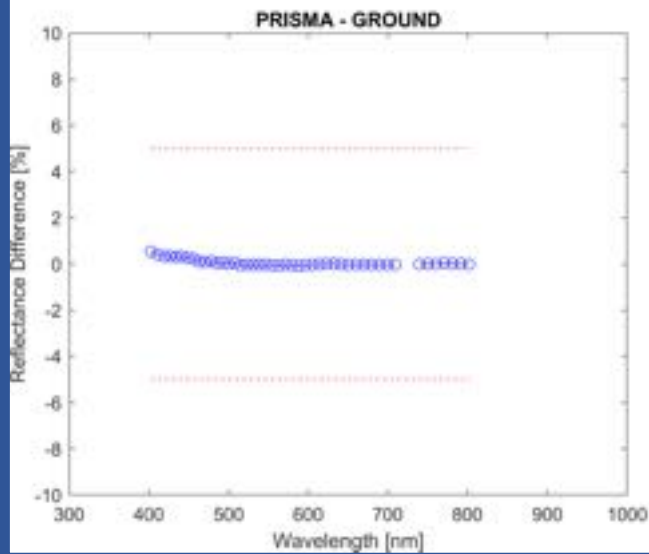
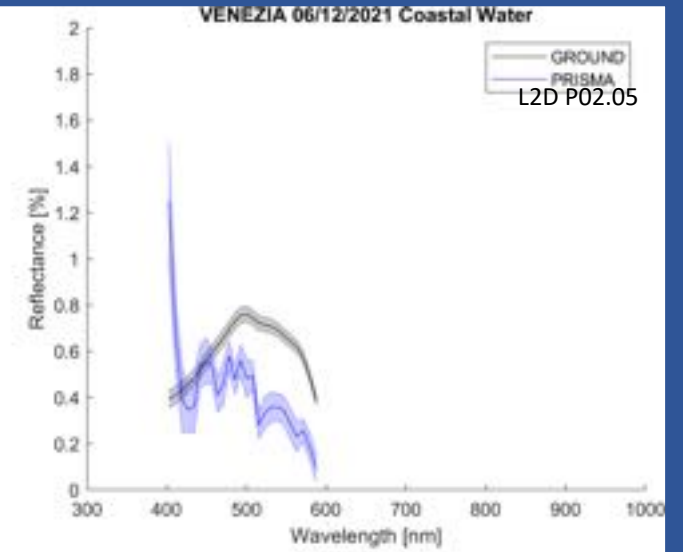
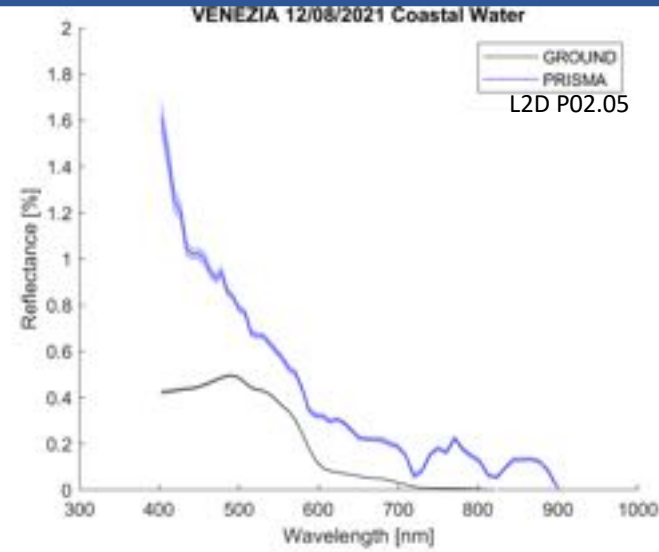
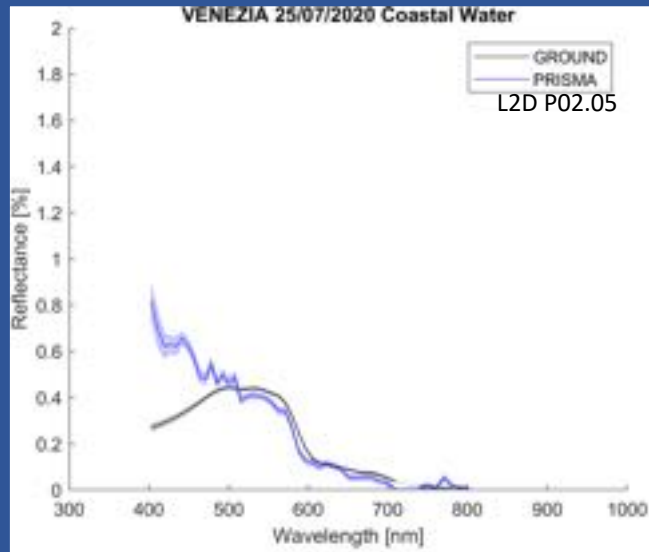
Bare Soils



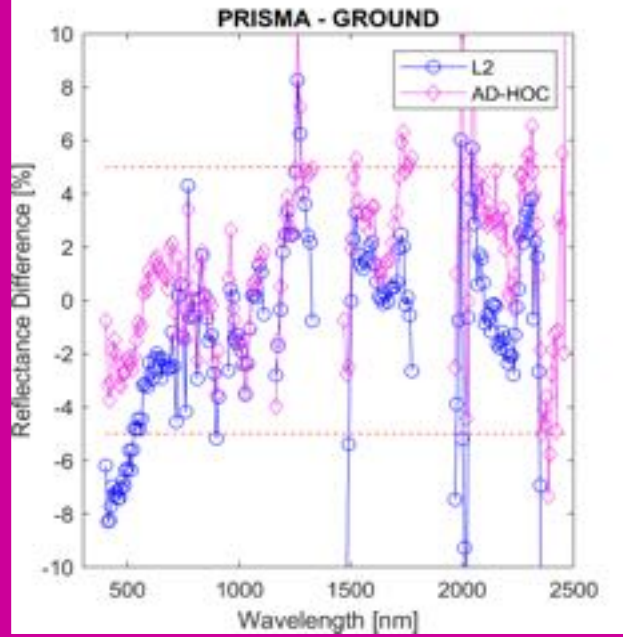
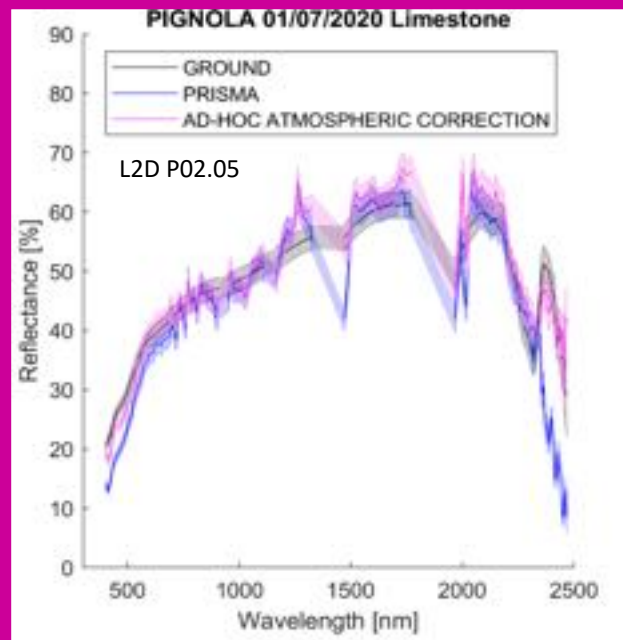
Inland Waters



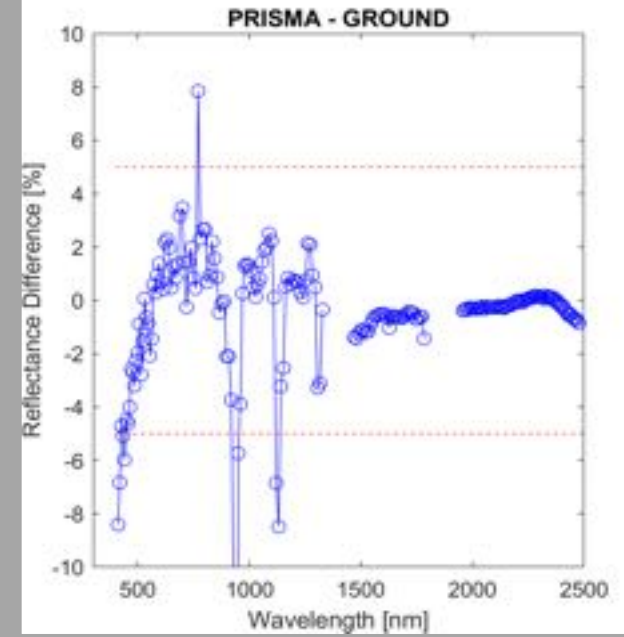
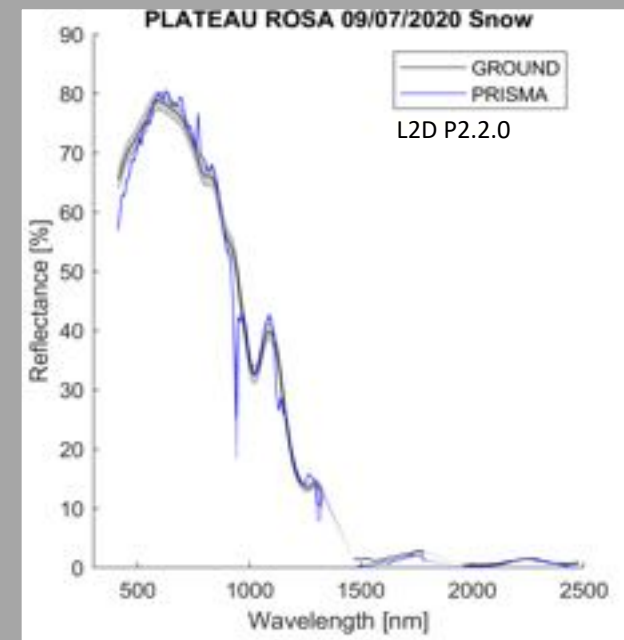
Coastal Waters



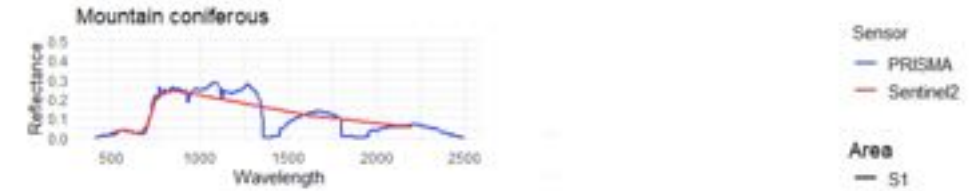
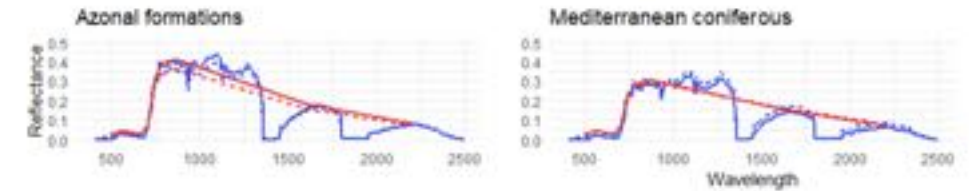
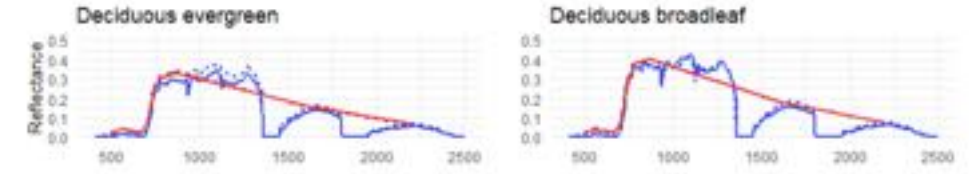
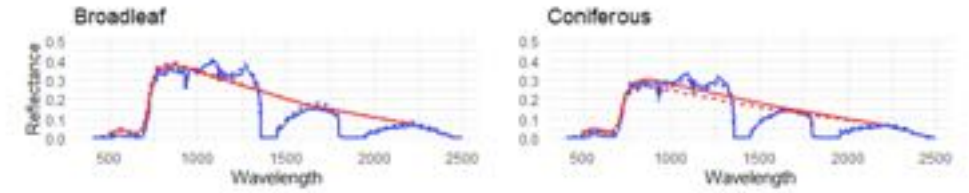
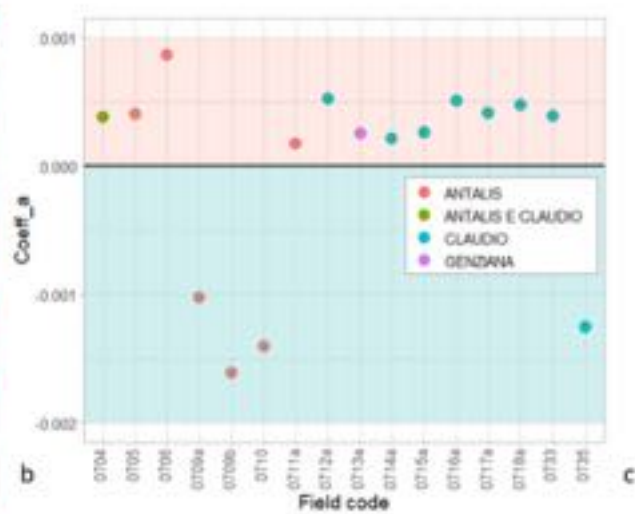
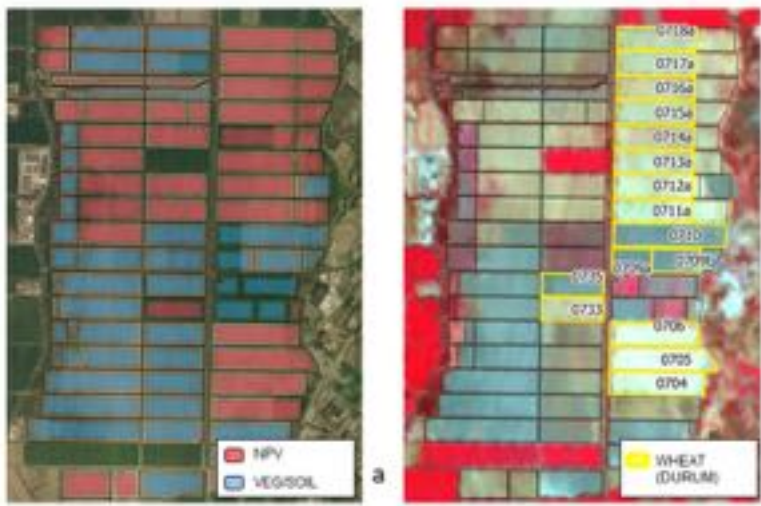
Limestone



Snow

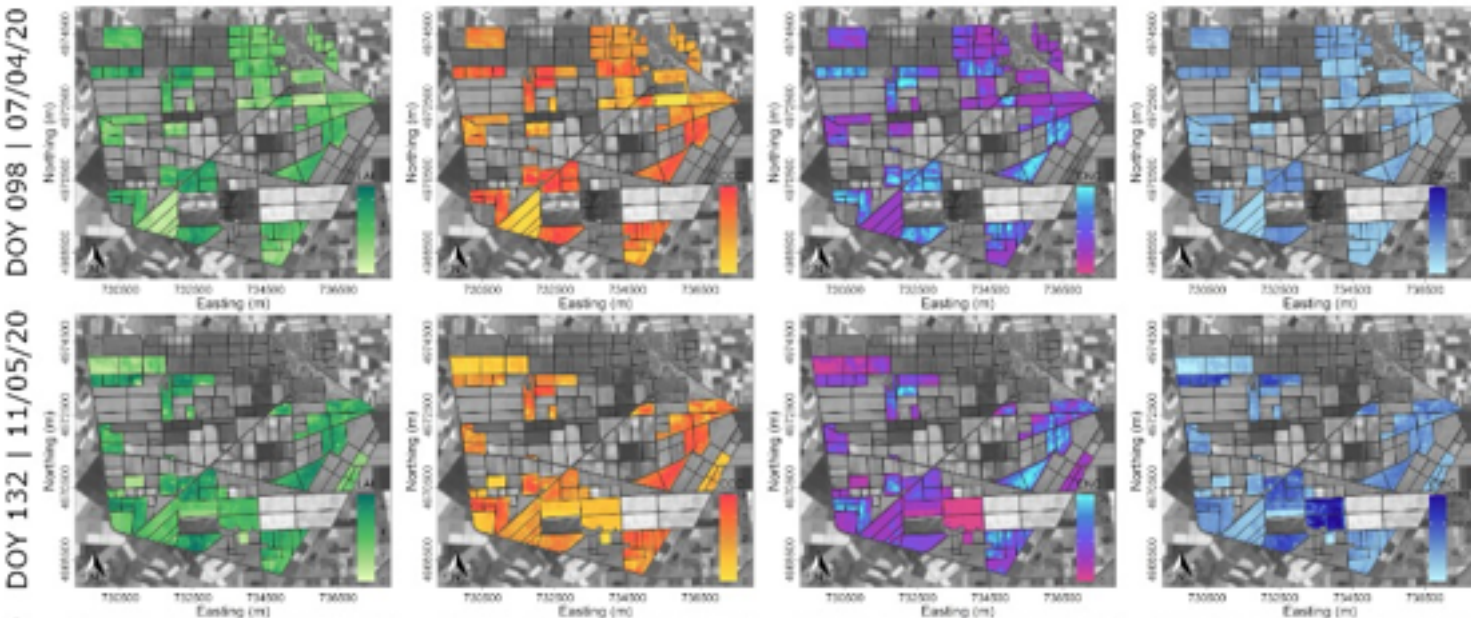


| Land Use | N | Average R2 | Average RMSE [%] | Average VNIR [≤ 1800 nm] Bands > 5% difference [%] | Average SWIR [> 1800 nm] Bands > 5% difference [%] |
|---------------|---|------------|------------------|--|---|
| AlfaAlfa | 5 | 0.84 | 4.41 | 8.95 | 12.05 |
| Bare Soil | 3 | 0.36 | 9.07 | 14.69 | 25 |
| NPV | 4 | 0.80 | 5.55 | 7.34 | 20.17 |
| Grassland | 3 | 0.93 | 3.08 | 3.27 | 8.33 |
| Inland Water | 4 | 0.85 | 0.40 | 0 | 0 |
| Coastal Water | 3 | 0.50 | 0.28 | 0 | 0 |
| Snow | 1 | 0.99 | 2.77 | 7.04 | 0 |
| Limestone | 1 | 0.78 | 8.03 | 16.20 | 28.5 |



(b) Forest type discrimination
Vangi et al. (2021), Sensors, 21, 1182,
doi:10.3390/s21041182

NPV Identification & Monitoring
Pepe et al. (2020), Remote Sensing, 12, 3903; doi:10.3390/rs12233903



Crop traits retrieval

Tagliabue et al. (2022), ISPRS Journal of Photogrammetry and Remote Sensing 187 (2022) 362–377, doi: 10.1016/j.isprsjprs.2022.03.014

Conclusions

1. PRISMA L2 comparison with both ground and airborne truth shows good overall performances of the satellite airborne sensor with most reflectances falling within MRD requirements
2. Most notable exceptions are in the rightmost SWIR edge (>2300 nm) where PRISMA shows a marked drop in performance
3. Sawtooth noise in NIR (800-1300 nm) within acceptable limits and correctable with smoothing algorithms
4. Problematic comparison over water and other surfaces when reflectance is low
5. Complexities of atmospheric correction over specific surfaces. Ad-hoc correction of L1 radiances over a limestone surface shows a good performance of raw sensor data
6. Promising perspective for future hyperspectral products