

UAV based validation of fractional vegetation cover derived from hyperspectral imagery.

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Fractional Vegetation and Soil Cover (fCover) is an important land surface parameter especially, in agricultural systems. It provides quantitative cover of photosynthetically active vegetation (PV), non-photosynthetically active vegetation (NPV), and bare soil (BS) to serve the data needs for soil parameter modeling, soil erosion monitoring and the identification of land degradation. Further, it supports the observation of the impact of climate-friendly tillage practices on carbon stocks in agricultural systems (farming practices). Validating fCover at a large on the other hand is challenging because so far ground data/in-situ measurement availability is very limited and fragmented. Nevertheless, for operational L3 processors, large-scale validation approaches are necessary and required to provide reliable accuracy and uncertainty measures for the land product. The proposed methodology addresses these challenges by utilizing standard UAV RGB imagery within an ensemble framework that leverages the complementary strengths of image segmentation and classification techniques, as well as derived surface information (e.g., Gabor features), to extract fCover components (PV, NPV, BS) from individual RGB images. These UAV derived fCover fractions are aggregated at the field level and used to validate outputs from DLR's semi-operational processor, FRANCA (FRActional Cover Analysis Processor). To assess the strengths and weaknesses of both UAV and hyperspectral based fCover estimates, evaluation metrics and results from both approaches are compared and discussed. The proposed method demonstrates how user friendly and cost-effective UAV data acquisitions can serve as a reliable reference for validating Earth observation-based fractional vegetation cover.