

From Monitoring to Forecasting Land Surface Conditions Using a Land Data Assimilation System: Application over the Contiguous United States

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Supplement - microwave Vegetation Optical Depth

Using a similar LDAS-Monde system configuration over CONUS, Albergel et al. 2018 have compared modeled LAI and microwave-derived Vegetation Optical Depth (VOD) from radar backscatter measurements of ASCAT for 2010-2016. They found high correlation values in large parts of the domain, with a median value of 0.57. The northern part of the CONUS domain showed R values greater than 0.7, while smaller R values (and even negative R values) were found in the southern part of the domain. They suggested that over dry soils, sub-surface scattering from the microwave signal may have affected the VOD estimates. They also showed that the same VOD dataset had a higher median R value with the observed CGLS LAI data, that is, 0.88. Consequently it was better correlated with the analysis (median R value of 0.61) than with the model.

Figure S1 demonstrates the correlation of the LAI from the LDAS-Monde OL and SEKF for the first day of forecast (FC1) compared to a recently developed VOD dataset, VODCA (Moesinger et al. 2019).

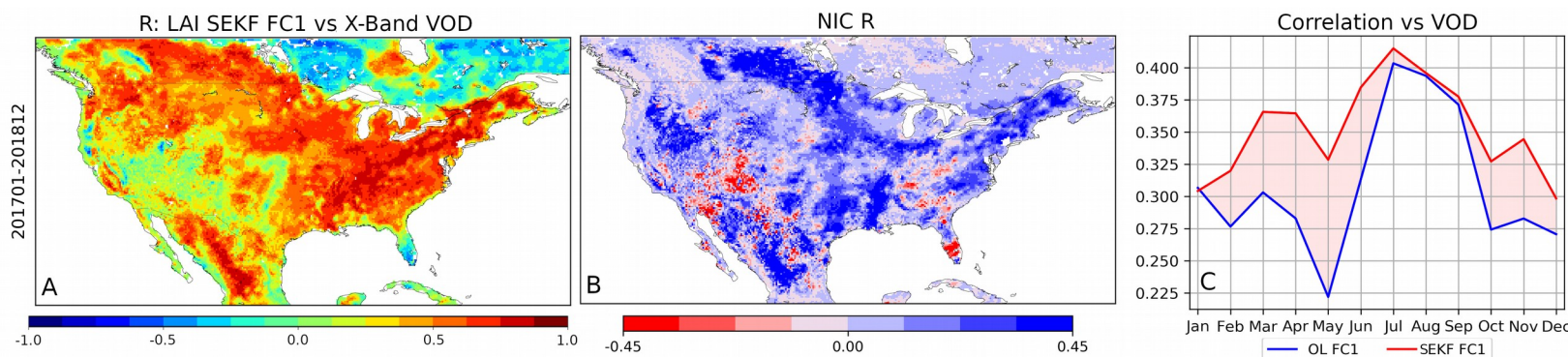


Figure S1 – A) Correlation between LDAS-Monde SEKF LAI at FC1 vs. X-Band VOD from VODCA B) NIC_R illustrating the improvement or degradation in correlation between the VOD dataset and the SEKF and OL LAI C) Average monthly correlation scores between the VOD dataset and the SEKF and OL LAI.

VODCA is a new series of long-term VOD products that combines VOD retrievals derived from multiple sensors (SSM/I, TMI, AMSR-E, WindSat, and AMSR2) using the Land Parameter Retrieval Model (LPRM). VODCA provides VOD products for microwave observations in different spectral bands, Ku, X and C. For this comparison we have retained the VODCA-X band which presented better results than the C-band (the Ku band one was only available up to 2017). The correlation between model EKF LAI and VOD is given in panel A of figure S1, the difference between NIC correlation for (improvement from the SEKF assimilation) is given in panel B, and average monthly correlations for both OL and EKF given in panel C. Strong correlations are seen in the East Coast, and Great Plains, while some Southern and Southwestern regions see very low or negative correlations. As in Albergel et al. 2018, the SEKF gave stronger average correlations than the OL, as shown in most of the domain in panel B and over most months in panel C. This direct correlation of VOD and LAI shows that these values are strongly linked, and provides further justification to assimilate VOD in future studies.

References

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