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REMOTE SENSING OF VEGETATION DYNAMICS IN WEST AFRICA: IMPROVED SATELLITE TIME SERIES FOR PHENOLOGICAL ANALYSES

K. Knauer [a,] *, U. Gessner [a], S. Dech [a], C. Kuenzer [a]

[a] German Aerospace Center (DLR), Earth Observation Center, German Remote Sensing Data Center, Oberpfaffenhofen, 82234 Weßling, Germany

* Kim.Knauer@dlr.de

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ABSTRACT:

Vegetation dynamics and the livelihoods of millions of people in West Africa are closely interlinked with each other. The high annual variability of the phenological cycle considerably affects the agricultural population with late rainfalls and droughts, often resulting in serious food crises. On the other hand, the rapidly growing population has a high need for space due to expanding cities and a low agricultural efficiency. The mapping and monitoring of seasonal and long-term changes in West Africa's vegetation is essential to understand the implications for nature and population. At the moment, there are several remotely sensed time series of vegetation parameters available, but for an application in cloud-prone areas like West Africa, time series of sensors with sun-synchronous orbits (e.g. MODIS) are highly affected by data gaps. In contrast, geostationary satellite sensors such as MSG SEVIRI, which has a fixed position over Africa, can overcome this problem but have the issue of a rather coarse spatial resolution. In this work, a data fusion of MODIS and SEVIRI time series is conducted in order to facilitate a consistent analysis of vegetation dynamics in West Africa. For this purpose, the established fusion algorithm ESTARFM is applied and modified in order to fill the cloud-induced gaps in the MODIS (MCD43A4, Col.6) dataset with SEVIRI data. In a first step, nadir BRDF-adjusted SEVIRI reflectances were derived from BRDF model parameters and adapted to the MODIS pre-processing. The fusion is then applied to generate a consistent daily dataset at MODIS spatial resolution for West Africa. Based on this improved time series, the land surface phenology of West African vegetation is investigated. Different parameters for the monitoring of seasonal and long-term changes of vegetation are derived from the time series and tested for their suitability.

* Corresponding author. This is useful to know for communication with the appropriate person in cases with more than one author.