

EGU21-14263

<https://doi.org/10.5194/egusphere-egu21-14263>

EGU General Assembly 2021

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Generalization of Vegetation Indices for Monitoring the Terrestrial Biosphere

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Vegetation indices are the most widely used tool in remote sensing and multispectral imaging applications. This paper introduces a nonlinear generalization of the broad family of vegetation indices based on spectral band differences and ratios. The presented indices exploit all higher-order relations of the involved spectral channels, are easy to derive and use, and give some insight on problem complexity. The framework is illustrated to generalize the widely adopted Normalized Difference Vegetation Index (NDVI). Its nonlinear generalization named, kernel NDVI (kNDVI), largely improves performance over NDVI and the recent NIRv in monitoring key vegetation parameters, showing much higher correlation with independent products, such as the MODIS leaf area index (LAI), flux tower gross primary productivity (GPP), and GOME-2 sun-induced fluorescence. The family of indices constitutes a valuable choice for many applications that require spatially explicit and time-resolved analysis of Earth observation data.

Reference: "**A Unified Vegetation Index for Quantifying the Terrestrial Biosphere**", Gustau Camps-Valls, Manuel Campos-Taberner, Álvaro Moreno-Martínez, Sophia Walther, Grégory Duveiller, Alessandro Cescatti, Miguel Mahecha, Jordi Muñoz-Marí, Francisco Javier García-Haro, Luis Guanter, John Gamon, Martin Jung, Markus Reichstein, Steven W. Running. *Science Advances*, in press, 2021