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Liquid water path retrieval from MSG SEVIRI data using machine learning

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This contribution introduces an approach to determine cloud liquid-water path using a machine learning approach on geostationary satellite imager data.
Variations in cloud properties are one of the most important unknowns of a changing climate.. Changes in liquid-water path (LWP) can promote an enhanced or reduced net downward flux of radiation at the surface, acting to alter the Earth's climate. The change of cloud radiative properties links to the understanding of aerosol and cloud interaction, which is a vibrant area of interest. LWP is indicative of cloud life cycle stages and thus has potential to be used in nowcasting approaches. Therefore, there is a need for better understanding of the diurnal cycle in LWP and statistical modeling of its development are of scientific interest.
Based on Meteosat Second Generation (MSG) Spinning-Enhanced Visible and Infrared Imager (SEVIRI) imagery, we develop a machine learning-based model to estimate LWP. Ground-based supersite (Cloudnet) observations as well as MODIS microphysical products are used as training and evaluation data. Various variables including SEVIRI channels, channel differences and ratios, and solar zenith angles are used as predictors. After performing a suite of tests with several feature selection, the best model is applied to obtain the diurnal cycle of LWP. We examine feature importance to estimate LWP and its spatial and temporal patterns.