Vegetation and drought: towards improved data-driven estimates of ecosystem carbon fluxes under moisture stress (Vad3e mecum)

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Data-driven modeling of carbon fluxes





Droughts are misrepresented in current data-driven simulations



- Observations (eddy covariance)
- Predictions based on daily meteorology and seasonality of greenness
- Predictions based on daily and halfhourly meteorology and seasonality of greenness

Simulating drought effects on the C balance is a scientific challenge



- \cdot seasonal and exceptional droughts influence the carbon balance $% \left({\left[{n_{\mathrm{s}} \right]} \right)$ both locally and globally
- stress from both water deficits in the soil and high atmospheric demand
- morphological and physiological reactions
- effects are specific to plant type, ecosystem, climate, timing in the growing season,...

Vad3e mecum: selection of predictor variables is crucial





The approach in Vad3e mecum



Challenge & objective:

combination of EO data streams with very heterogeneous acquisition properties



MW-based (active & passive): ESA CCI soil moisture, SMOS Support from Wouter Dorigo

their collocation with





MODIS vegetation index preprocessing





Original data gapfilled data









Residual cloud contamination in Seviri LST



· eesa





Further objectives



- develop methods for the combination of the different EO data streams in machine-learning algorithms
- analyse the improvement by individual and synergistic effects of newly included EO data streams for carbon flux predictions under drought
- generate improved gridded data products for net and gross carbon fluxes for Europe and the globe
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- benchmark the novel products against independent and previous estimates of biogenic carbon exchange, and assess and synthesize carbon cycle response to recent droughts in Europe Thanks for your interest!

Correction for effects of VZA and observation time in MODIS LST



AT-Neu morning nadir 8 geometrical correction [K] VZA=40 6 4 2 0 -2 2012 2016 2020 2000 2004 2008

Geometrical correction of MODIS TERRA daytime LST: to nadir and to 40° viewing angle after Ermida et al. 2018



Temporal correction of MODIS TERRA daytime LST: to 11am local time and to shortly before solar noon (dynamic)

Correction for effects of VZA and observation time in MODIS LST





Total difference between MODIS Terra daytime LST as observed and the LST after the corrections for angularity and observation time have been applied