Consistent datasets across space, time and wavelength within H2020 BACI - Towards a Biosphere Atmosphere Change Index

seit 1558

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http://www.eo.uni-jena.de

Objectives

- Provide a novel framework for optimally **combining EO data** from a range of sources, at a range of scales and wavelengths
- Ingest data **from current and historical optical and microwave EO sensors**
- Describes **surface state with uncertainty that can be ingested directly into the BACI analysis**, without requirement for conversion to higher-level model-derived products (near-real time assessments)
- Operates at high resolutions (example regions), at intermediate resolutions (national) and at moderate resolution (globally)

Data Merging Framework

- Data merging is carried out within **Earth Observation Land Data Assimilation Scheme (EO-LDAS)**
- All observations are represented by a prior **probability density function (PDF)**
- Yields posteriori parameter, which can be approximated as the maximum likelihood estimate of the state variables
- EO-LDAS has **two main components**:

(1) A set of constraints, expressed via the PDF:

- Observational constraint, requiring data (EO or in-situ) and a model translating from state space to observation space
- Dynamic model constraint, conditioning the temporal (and/or spatial) evolution of the state vector
- Physical or empirical bunds and/or distribution constraints to the state vector elements

(2) An assimilation algorithm to achieve optimal estimate of the state vector (via constraints)

- Each constraint has an **associated error model** represented by a covariance at each sample point in time (space)

Preliminary Results

Optical

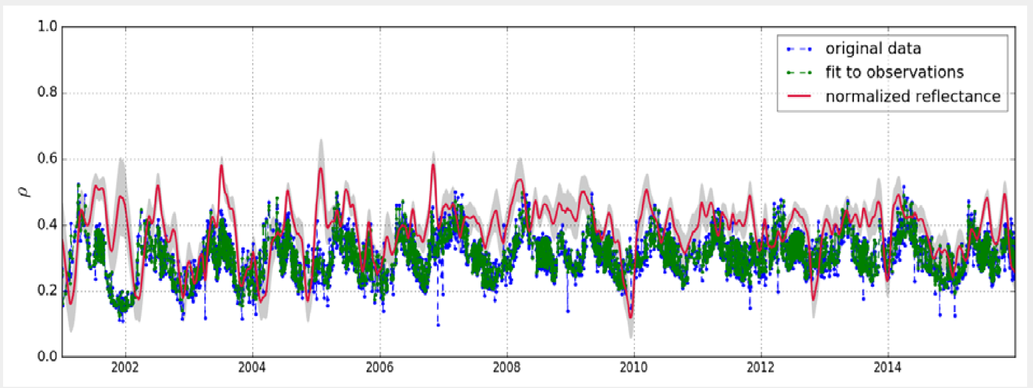
- Time series of **MODIS data (blue)** during 2000-2015
- Temporally **regularized and gap-filled (red)** with associated uncertainties and **EO-LDAS derived fit to observations (green)**

Microwave

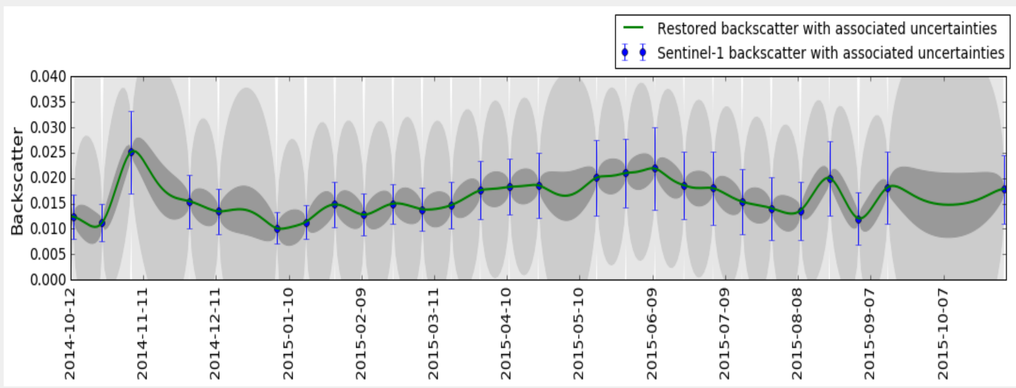
- **Sentinel-1** time series aggregated to 500m MODIS spatial resolution
- **backscatter acquisitions (blue)** are associated with uncertainties, as well as the **restored backscatter (green)**

Viterbo (Italy)

- Shows a strong seasonal cycle
- High differences between MODIS reflectance / fit to observations versus normalized values

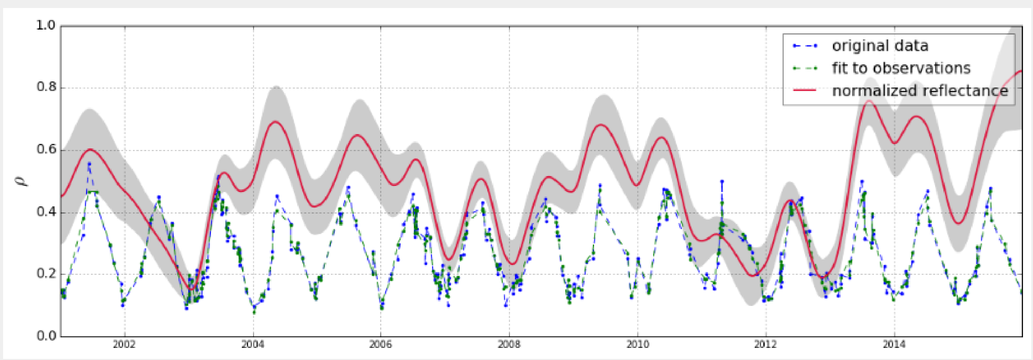


- VH Sentinel-1 backscatter show higher uncertainties in between actual measurements

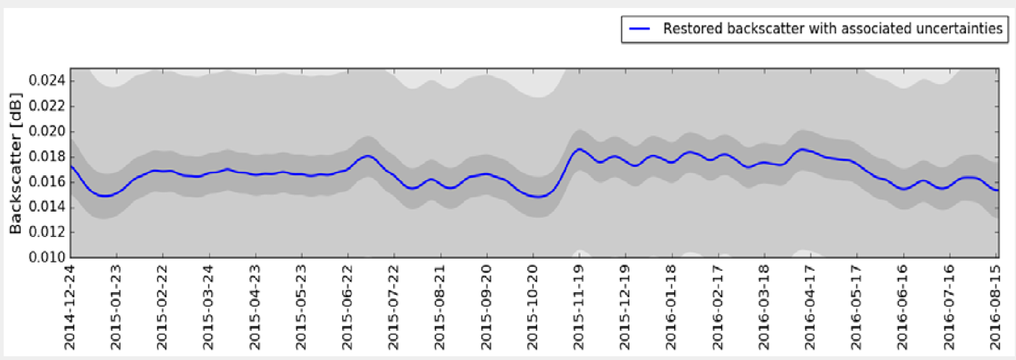


Wytham Woods (UK)

- Seasonal cycle is visible, weaker than Viterbo due to varying canopy types and less observations
- Normalized reflectance has higher values than the input data due to difference in view/sun geometry (especially in winter time)
- Fit-to-observations are very similar to the input reflectance



- Restored Sentinel-1 backscatter (blue) show a reasonable behavior
- Uncertainties are higher in between acquisitions
- Restored intervals between satellite acquisitions are not as trustworthy as actual measurements



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