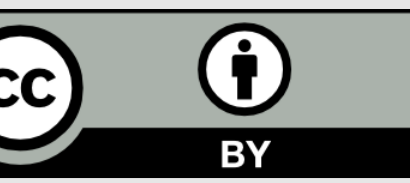


# How valuable are citizen science data for a space-borne crop growth monitoring? – The reliability of self-appraisals



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## Motivation

### Aim:

Physically based satellite-aided retrieval of biophysical state variables with Earth Observation Land Data Assimilation System (EO-LDAS)

### Problem:

Superposition of different parameter influences on the spectrum  
→ Lack of knowledge

### Solution:

Including prior information  
→ Integrating information from other sources:  
(1) measurement stations/networks  
(2) citizen science (CS) data

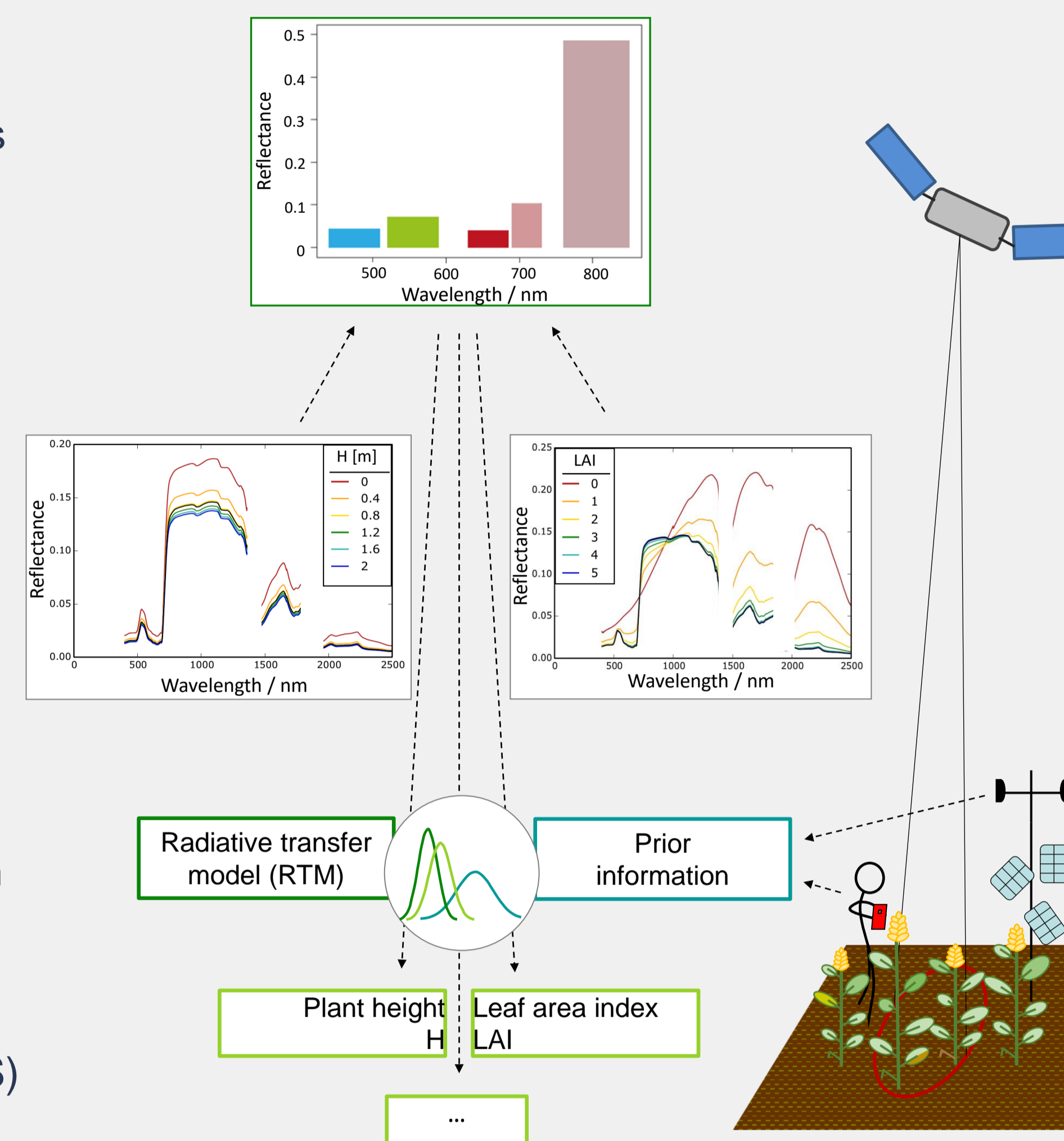
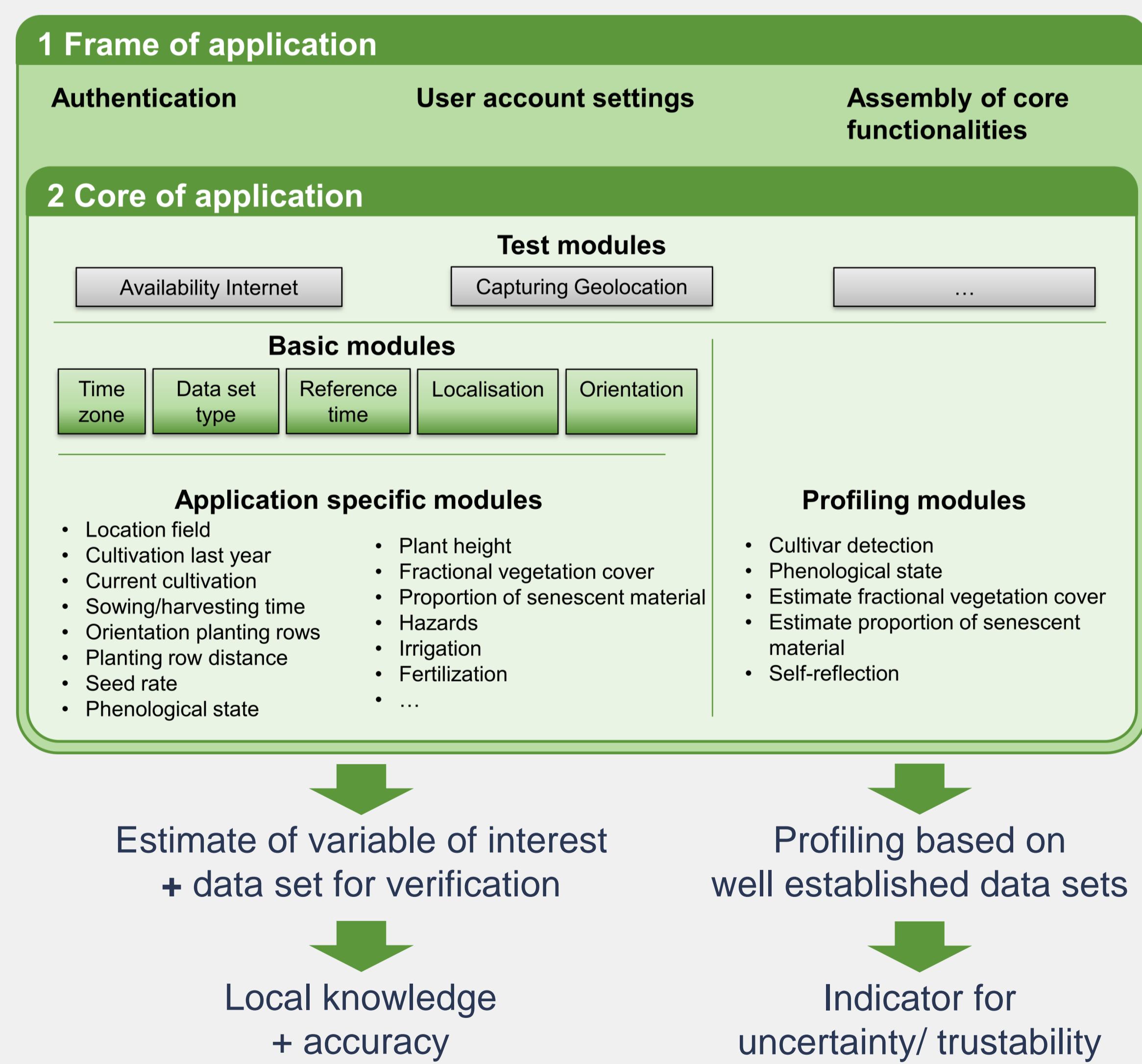


Figure 1 Satellite-aided retrieval of biophysical crop parameters (Lewis et al. 2012, Combal et al. 2002, Enting 2002)

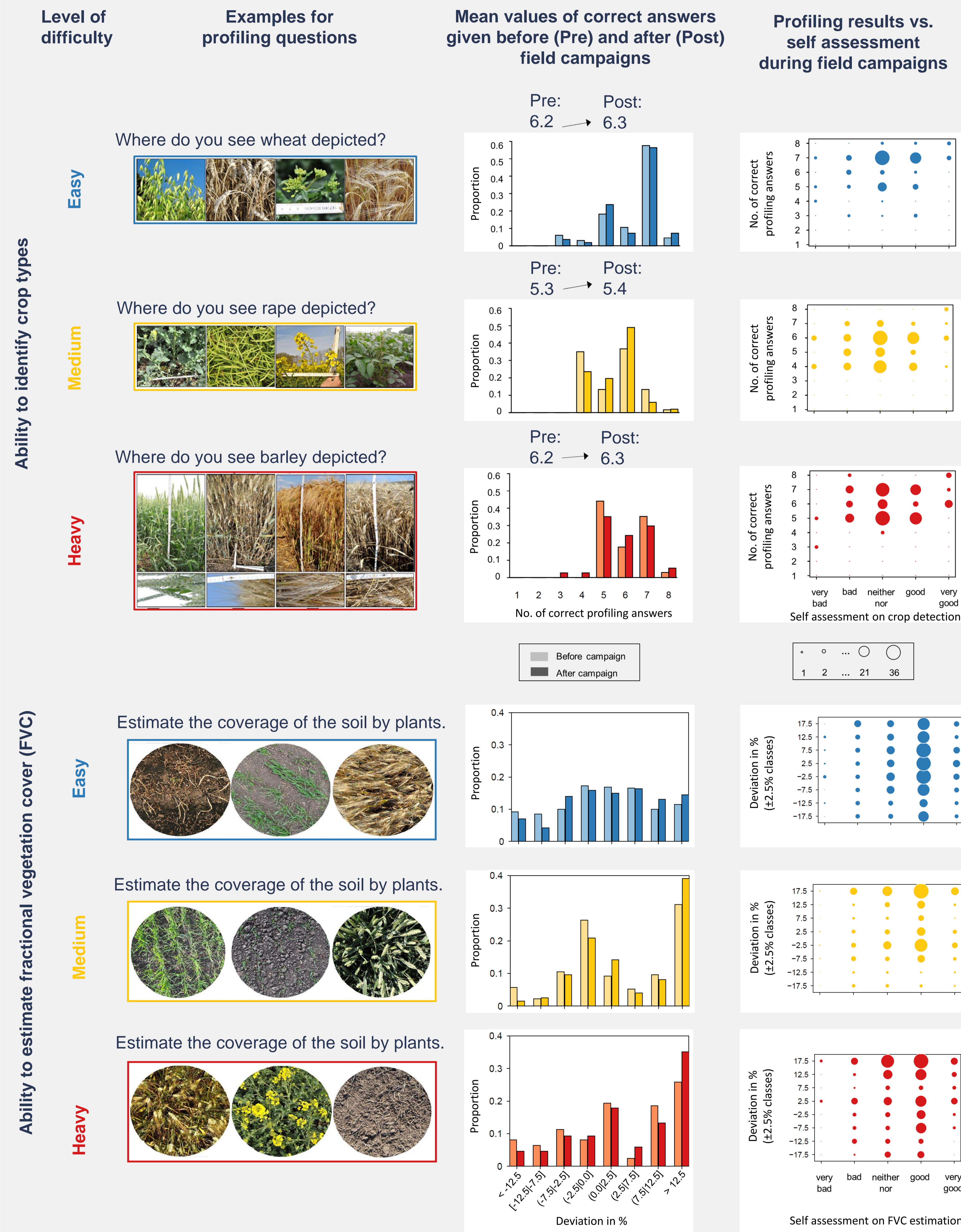
## Citizen Science (CS) Data Capturing Concept

Structure of the application „FieldMApp“ that was set up and implemented for mobile devices (operated with iOS or Android) to collect local knowledge about the management and development of crops:



## Trustability Assessment

Trustability assessment based on data collected on DEMMIN test site (Northeast Germany) in 2018 and 2019.



## Summary

Aim of the project is to quantify the impact on the quality of the biophysical parameter retrieval when citizen science data are assimilated into the prior information that is fed in the physically-based satellite-aided retrieval model Earth Observation Land Data Assimilation Scheme (EO-LDAS).

Preliminary results on the trustworthiness of the collected citizen science data regarding the classification of crop types indicate that:

- Approximately 75 % of crop types were identified correctly by 77 citizens/students.
- No significant increase in the accuracy of answers could be registered 2 to 5 days after first profiling of the citizens/students.
- Self-assessment seems to be no suitable indicator to transfer uncertainties determined by profiling from investigated parameters to parameters that are not directly investigable by profiling or measurement.

The integration of citizen science data (CS-data) in EO-LDAS presumes an investigation of the uncertainties of all other data sources regarding their spatial and temporal dynamic.

## Outlook

Based on data assimilation information from different sources will be combined under consideration of its uncertainty.

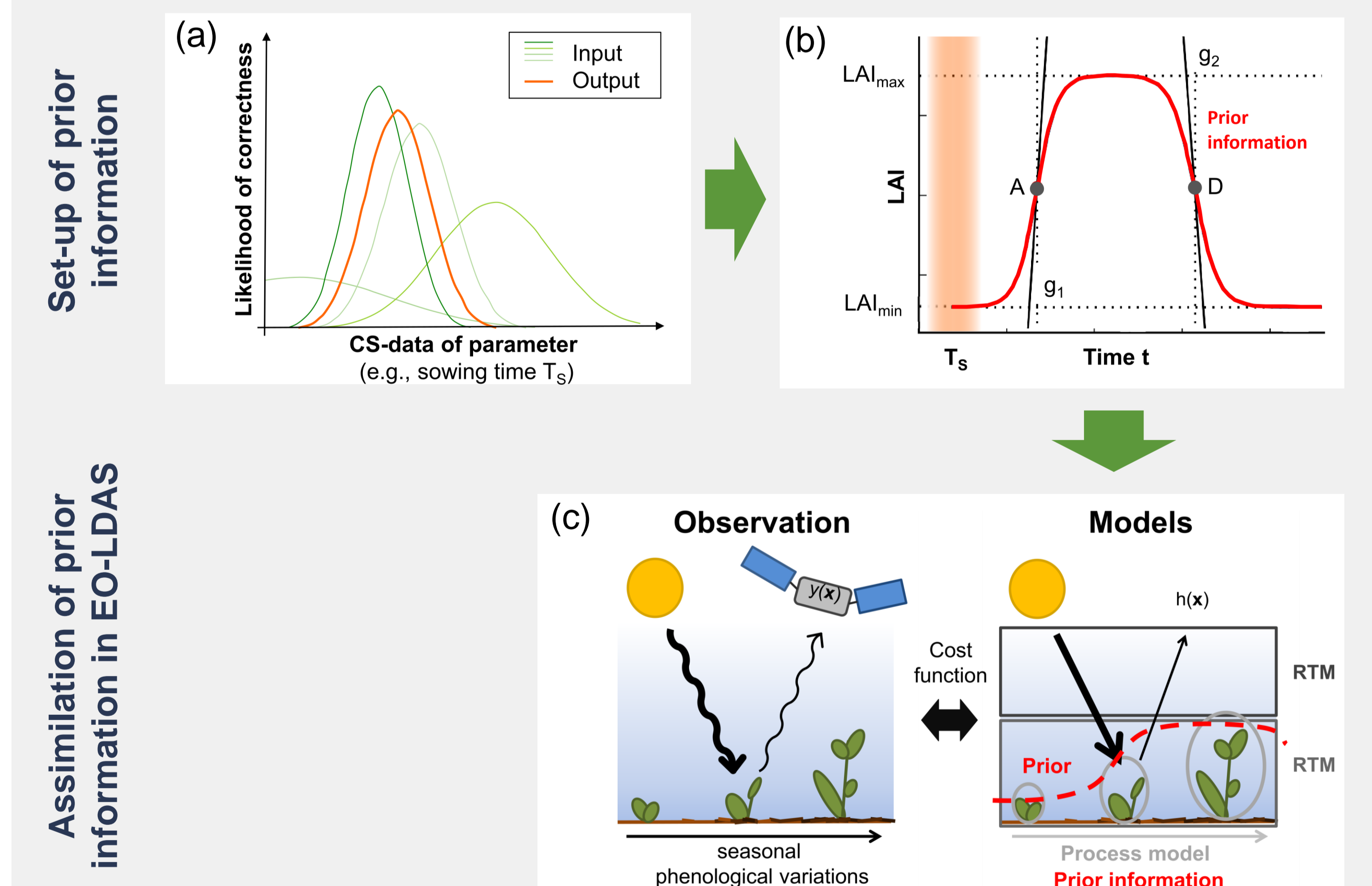


Figure 2 Set-up of prior information by (a) merging available citizen science data (CS-data) and (b) incorporating it in a phenological development model. The resulting prior information is (c) assimilated in the Earth Observation Land Data Assimilation Scheme (EO-LDAS; scheme after Lewis et al. 2012).

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## References

Combal, B., F. Baret, M. Weiss, A. Trubuil, D. Macé, A. Pragnère, R. Myneni, Y. Knyazikhin & L. Wang (2002): Retrieval of canopy biophysical variables from bidirectional reflectance. Using prior information to solve the ill-posed inverse problem. — Remote Sensing of Environment 84, 1-15.

Enting, I.G. (2002): Inverse problems in atmospheric transport. Cambridge: University Press.

Lewis, P., J. Gómez-Dans, T. Kaminski, J. Settle, T. Quaié, N. Gobron, J. Styles & M. Berger (2012): An Earth Observation Land Data Assimilation System (EO-LDAS). — remote Sensing of Environment 120, 219-235.

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