

Assessing the impact of non-linear responses of field spectroradiometers on the estimation of biophysical parameters and light use efficiency

Javier Pacheco-Labrador ^{a)}, Tommaso Julitta ^{b)}, Micol Rossini ^{b)}, M. Pilar Martín ^{a)} and Alasdair MacArthur ^{c)}

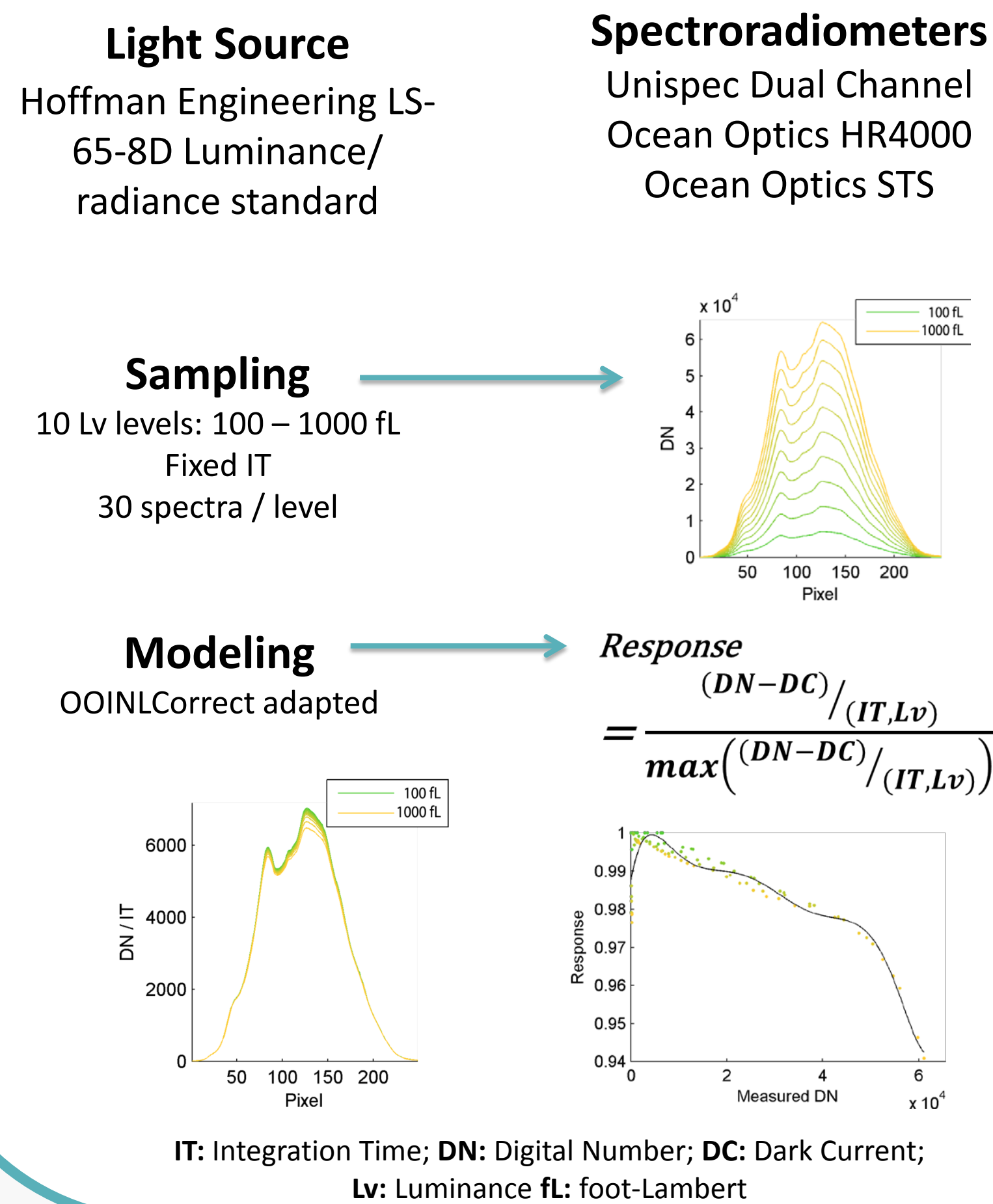
^{a)} Environmental Remote Sensing and Spectroscopy Laboratory (SpeLab), IEGD-CCHS-CSIC. Albasanz, 26-28, 28037, Madrid, Spain.

^{b)} Remote Sensing of Environmental Dynamics Laboratory, University of Milano Bicocca, Piazza della Scienza, 1, 20126, Milan, Italy.

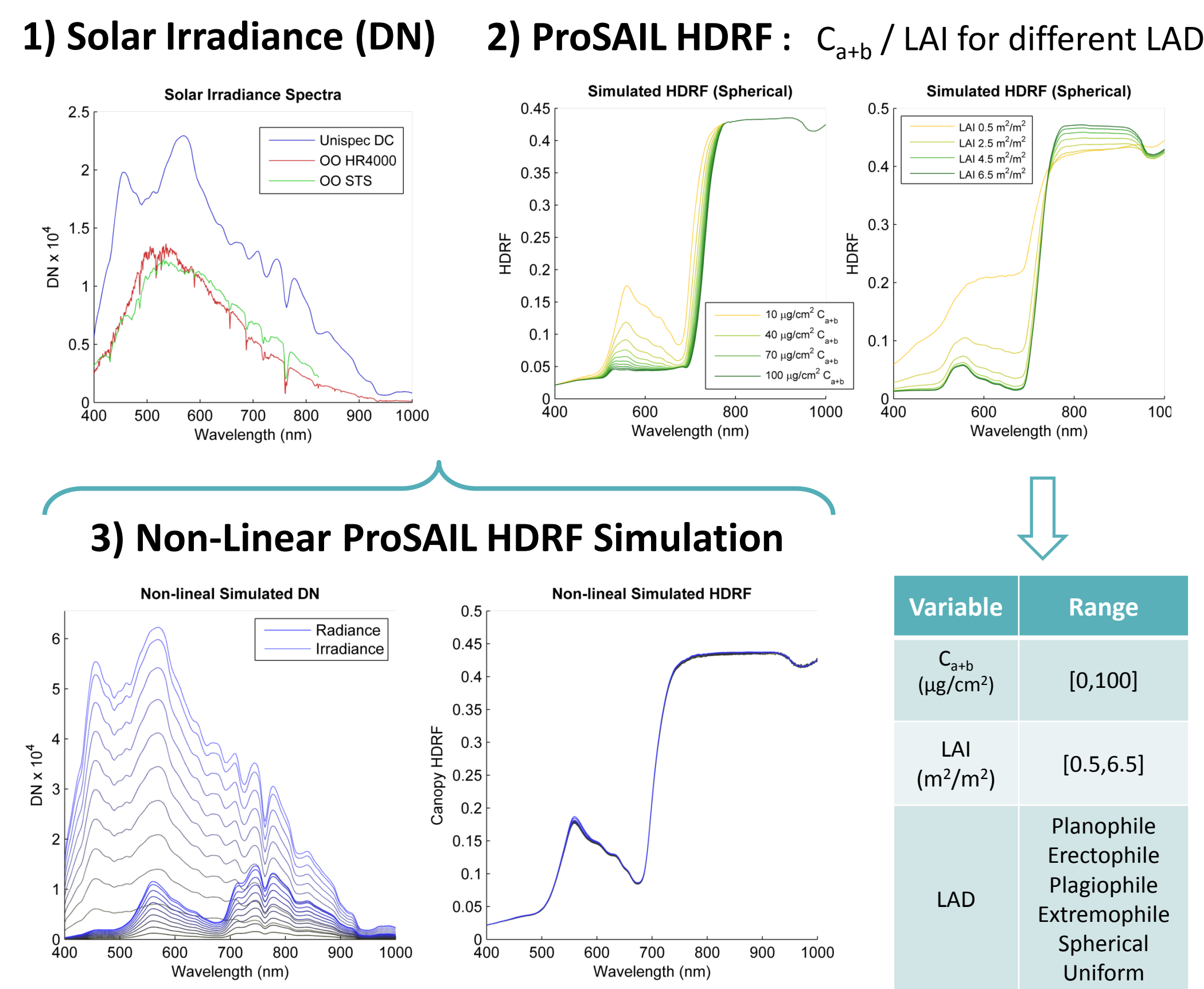
^{c)} NERC Field Spectroscopy Facility, University of Edinburgh, Grant Institute, King's Buildings, West Mains Rd, Edinburgh EH9 3JW, United Kingdom.

1. Methodology

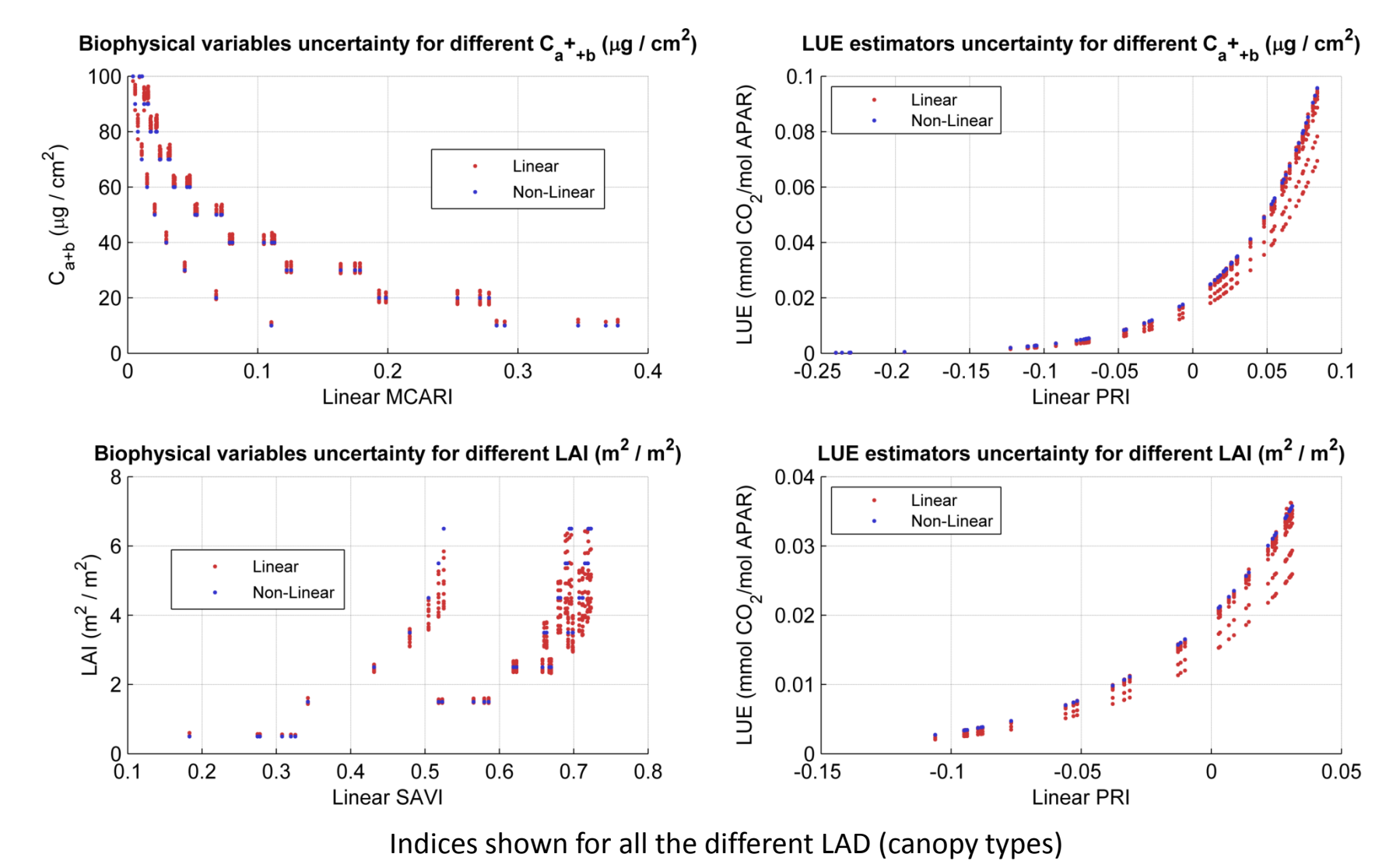
1) Non-linearity calibration (Ocean Optics method)



2) Non-linear reflectances simulation from solar irradiance, ProSAIL HDRF and Non-linearity model inversion

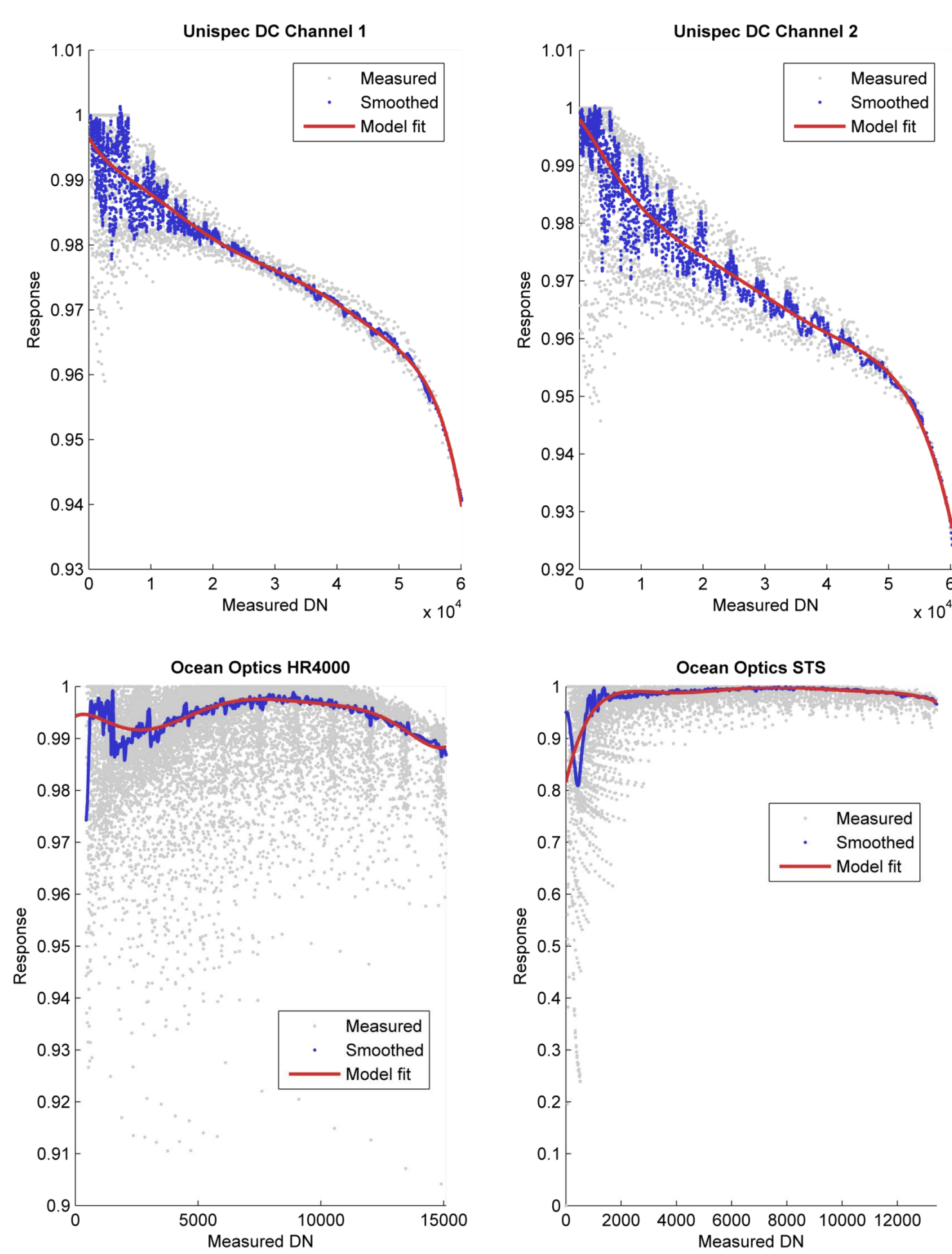


3) Assessing impact on estimation of biophysical parameters and LUE through spectral indices

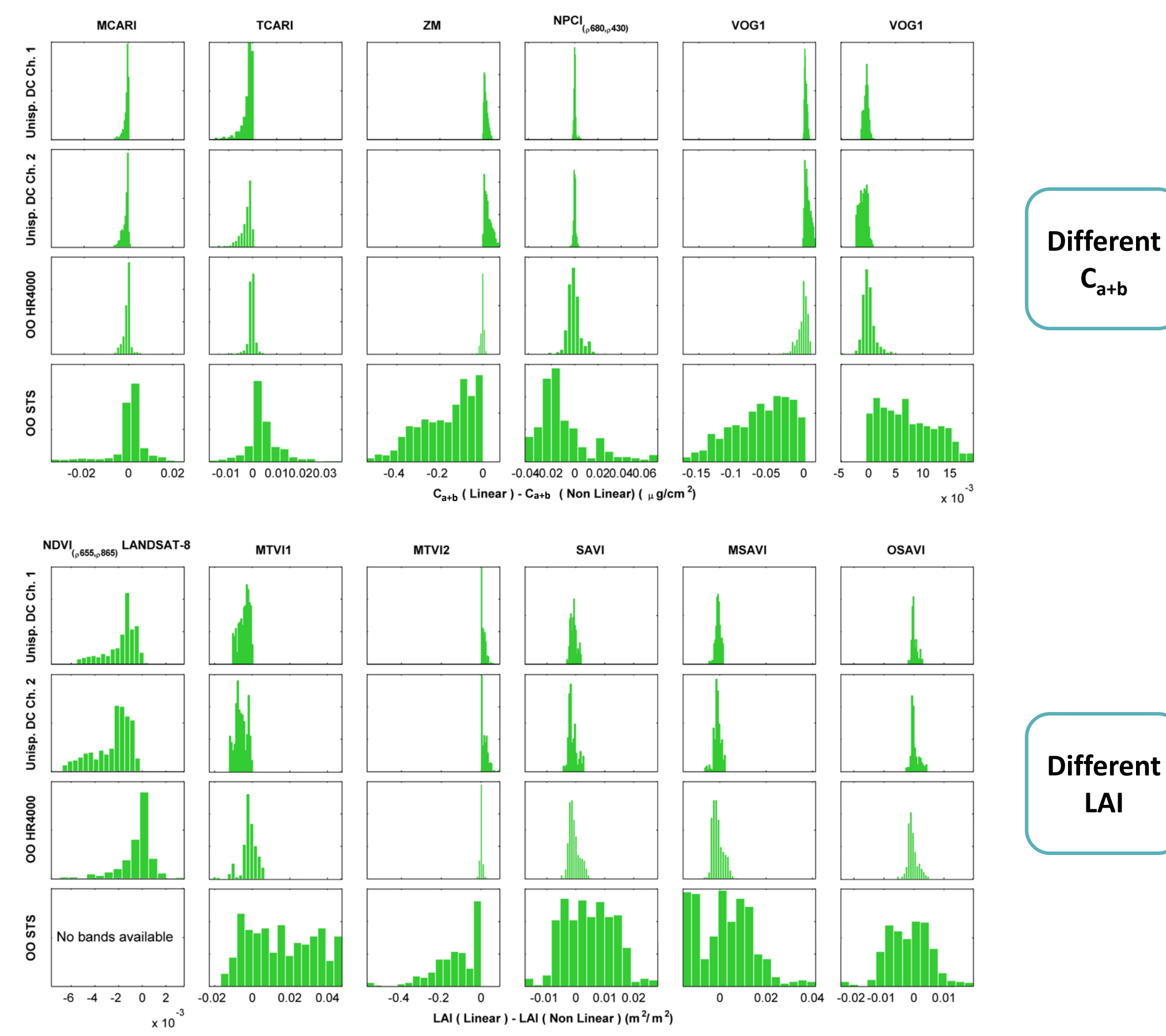


2. Results

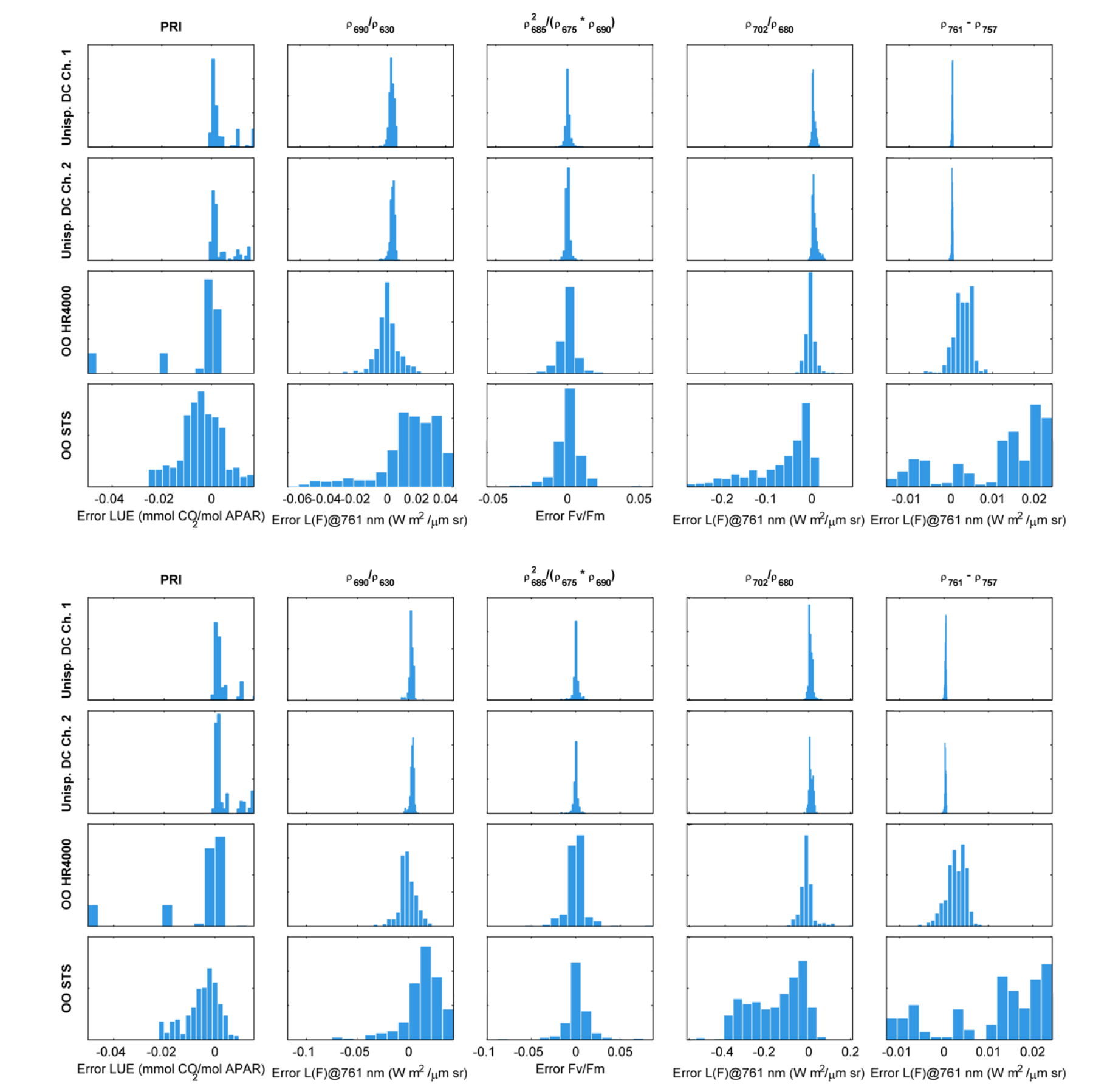
1) Non-linearity Models



2) Assessing impact on estimation of biophysical parameters



3) Assessing impact on LUE estimators through spectral indices



3. Conclusions

- Radiative Transfer Model are a suitable tool to estimate instrumental uncertainties in the estimation of biophysical parameters and LUE estimators using SVIs
- Non-linearity effects depend on:
 - Spectral irradiance
 - Spectral reflectance
 - Sensor's Quantum efficiency
 - Estimator – Estimate relationship
 } Wavelength dependencies
- Non-linearity impacts are usually low, but these are more usually biases rather than noise in the estimations
- Non-linearity can be more relevant in the estimation of LUE, since both variables are related with the irradiance levels

Acknowledgements

We would like to acknowledge the contributions of all the colleagues that took part in the intercomparison experiments, and advice provided by Chris MacLellan, at the NERC FSF in Edinburgh.

Tommaso Julitta's Short Term Scientific Mission was funded by the Cost Action ES0903 – Eurospec.

Javier Pacheco-Labrador's stay was partially funded by the Biospec project "Linking spectral information at different spatial scales with biophysical parameters of Mediterranean vegetation in the context of Global Change" (<http://www.lineas.cchs.csic.es/biospec>) (CGL2008-02301/CLI, Ministry of Science and Innovation).

