P & M Technologies
Innovations in Plant Science & Technology

FLEX/Sentinel-3 Tandem Mission

FLEX Bridge Study

ABSTRACT

Final Report — January 2016

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Abstract

Within the context of ESA's Earth Explorer 8 Phase A/B1 assessments of the FLuorescence EXplorer (FLEX), the FLEX Bridge Study was conducted to (i) optimise approaches for SIF retrievals and applications in assessment of photosynthesis and stress status in terrestrial vegetation, and (ii) develop a calibration/validation strategy for FLEX mission products.

Capabilities were enhanced for the retrieval and analysis of sun-induced fluorescence from FLEX. These included provision of new simulation datasets, consolidation of algorithms for atmospheric correction of FLEX signals, improvements for SIF retrieval, formalisation of fluorescence-derived indices, and development of biophysical products.

Opportunities and protocols for stress detection were expanded and refined using published and new datasets, testing of stress indicators/indices, and evaluation of strategies to assess non-photochemical quenching and minimise sources of variability and error.

The SCOPE model and A-SCOPE graphic user interface (version 1.61) were improved with new functionality for accommodating plant functional types, and SCOPE now has improved computation speed and greater accuracy of the fluorescence output. A new leaf RT model was introduced to incorporate xanthophyll effects. Several types of applications were investigated.

The FB Study also formulated a comprehensive calibration/validation strategy for FLEX mission products. The strategy covers methods to determine validation error metrics and product accuracies, cal/val for basic fluorescence products, validation of FLEX Level-2/3 products, and definition of common protocols and state-of-the-art instruments for use in the strategy.

This work supports the development of best practices for the retrieval, interpretation, and application of fluorescence measurements from space. These aspects are crucial in order to realise the full potential of space-based SIF technology in helping to meet the land challenges identified in ESA's Living Planet Programme.

Recommendations for future research activities have been made in several areas, including improvements in signal retrieval and analysis, data assimilation, modelling, calibration/validation, and applications.

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