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Assessing gross primary production from solar-induced chlorophyll fluorescence: field results and integration into biogeophysical models

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Light energy absorbed by photosynthetic antenna pigments is only partly used up in photochemical processes, the remainder being dissipated through heat production or chlorophyll fluorescence. The possibility to use remote sensing methods to measure fluorescence emitted by the plants under natural solar illumination (solar-induced fluorescence, SIF) paves the way for the remote assessment of electron transport and photosynthetic processes. Although less straightforward than for near-field pulse-saturated fluorescence, the interpretation of solar-induced fluorescence is advancing, through the development of novel models of variable detail.

The family of Earth Explorer missions is the result of a strategy within the Living Planet Programme of the European Space Agency where missions are designed to address critical and specific issues raised by the scientific community whilst demonstrating breakthrough technology in observing techniques. Following the selection of the first six Explorer missions, currently under development and implementation, the Agency released in March 2005 a new Call for Ideas focused on key processes that are fundamental for improving our understanding of the changing Earth System. The proposals were reviewed by scientific teams and assessed technically and program-

matically, leading to the selection of six candidates in May 2006 to enter dedicated assessment studies. Amongst these missions is the FLuorescence EXplorer – FLEX – a mission dedicated to observing and monitoring SIF globally together with additional complementary information on the vegetation cover and its environmental setting allowing a correct interpretation of the observed SIF signal.

In the framework of the FLEX mission assessment phase dedicated airborne campaigns and study activities were initiated in order to proof the mission concept, to consolidate the mission requirements and to develop the appropriate data processing tools and the necessary methods for assimilating the SIF signal into biogeophysical models with explicit description of vegetation dynamics. An overview of the mission is presented, together with a summary of its main preliminary results.