Short presentation of a project proposal for the 5th call Space in FP7

„Vegetation Fluorescence monitoring from space based platforms

Space and Solar Terrestrial Research Institute- BAS

BULGARIA

COSMOS Matchmaking Event
18th March 2011, Sofia, Bulgaria

FP7 Space
NCP Network

Space-based applications at the service of European Society (GMES)

⤷ ***Support to the coordinated provision of observation data***

⤷ Research and development for In-situ component

Strengthening the foundations of Space science and technology (SSF)

⤷ ***Research to support space transportation and key technologies***

⤷ Key technologies enabling observations in and from space

Short outline / Proposal concept I

➤ Short introduction into the state-of-the-art

The commonly existing methods for remote sensing of the vegetation bio-activity, based on measurement of reflected solar radiation in visible and near infrared spectral ranges, do not yet allow development of technologies for collecting reliable information about the plant bio-status. In these methods, the reflectance signatures are used to discriminate the vegetation from other objects or used as indicators for long-term stress on the vegetation when the chlorophyll content is significantly reduced.

A new concept for vegetation monitoring is in the focus of the remote sensing methodologies in the recent years. These new approaches are based on the well studded during the last several decades relation between the chlorophyll fluorescence intensity and the photosynthesis activity. Extensive experimental and theoretical studies in laboratory and field conditions have demonstrated that the vegetation fluorescence can be successfully used as a highly informative instrument for assessment of the plant vitality.

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Short outline / Proposal concept II

➚ Scientific / technological aims exceeding the state-of-the-art

Considering the increased requirements for precise assessment of the state and the dynamic of the biosphere, and particularly of the vegetation ecosystems,developing of imaging spectrometric systems and complete

methodologies for space born monitoring of the vegetation vitality based on measuring the sun-induced chlorophyll fluorescence using the Fraunhofer lines of the solar spectrum is suggested.

Reflectance and fluorescence (R&F) imaging at different stressors

Heat stress effects

Heat stress impact on poplar leaf. Spectral reflectance Images (750 nm) at 28° C (left) and at 58° C (right). There is no difference between the two images.

Heat stress impact on poplar leaf. Fluorescence Images (FI) at 28° C (left) and at 58° C (right). A 1.7 fold increase in the fluorescence intensity was measured.

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Drought stress effects
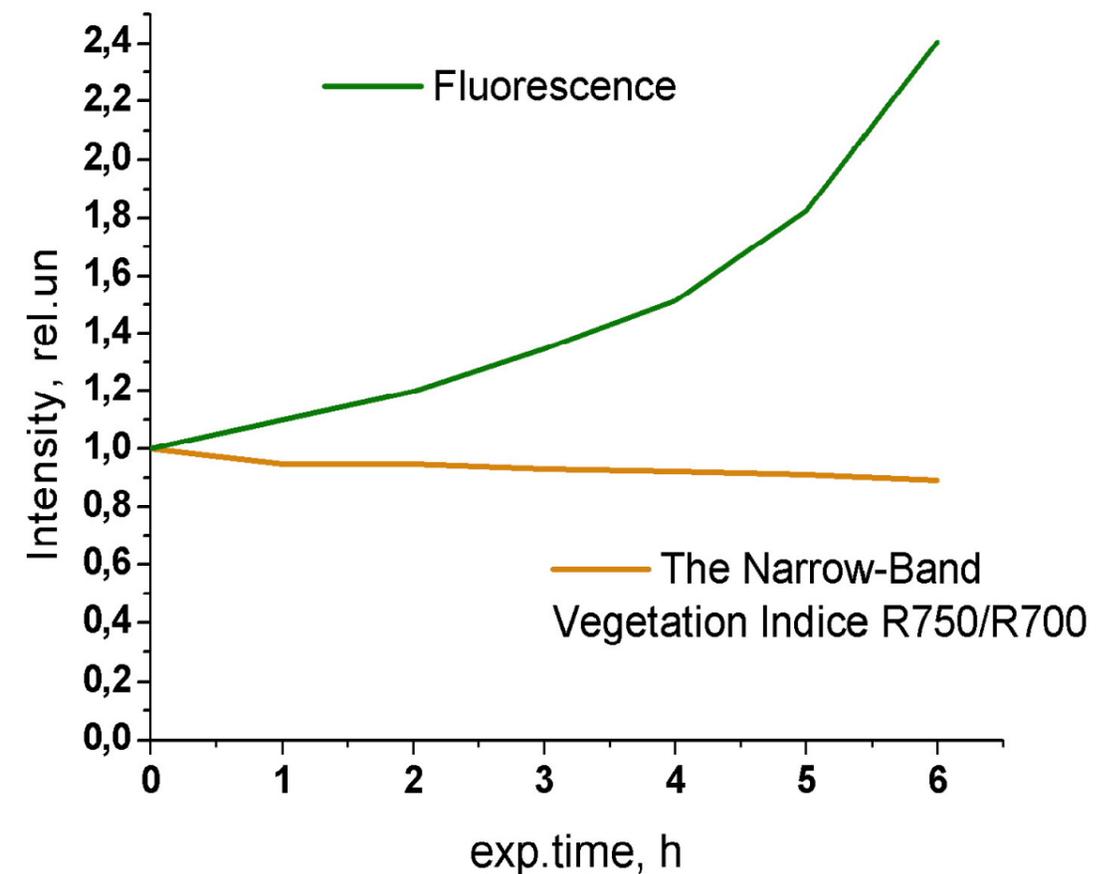
Fluorescence images: in the beginning of the experiment (left), after 4 hours (centre), and after 6 hours (right). The stress impact spreading is directed from the rim to the central part of the leaves.

Comparison of the sensitivity of the fluorescence and spectral imaging for birch samples. The change of the fluorescence intensity is over 2.4 times, while the change of NBVI is about 0.2.

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Short outline / Proposal concept III

- Scientific methodology (TBD)

  - Detailed laboratory and in-situ studies of vegetation fluorescence in reference and different stress induced conditions - under artificial and natural(sun) light conditions

  - R&D on the sensor design, incl. data processing

  - Verification experiments aboard air/space born vehicles

Consortium I

⇗ Coordinator: relevant experience, competencies

remote sensing hardware /sensor R&D and design

⇗ Existing core team and responsibilities

- videometric systems design , hardware system specifications , system level architecture design of the sensor

Consortium II

➚ Wanted partners / competencies
 any related to the topic

Contact and further information (if any)

➔   Address data of the person to contact for more information

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➔   Relevant links / references

www.castra.org, other