## NEAR REAL-TIME DISTURBANCE DETECTION APPROACH FOR IN-SITU AND EARTH OBSERVATION SENSOR DATA

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## 1. ABSTRACT

Monitoring disturbances is critical for addressing its impact on ecosystems dynamics such as for example, carbon storage and fluxes at a global scale and productivity of agriculture fields at a local scale. In-situ sensors and satellite remote sensing enables cost-effective and accurate monitoring at frequent time steps over large areas. Several methods are available to detect disturbances within time series data. However, methods to detect changes in near real-time need to be further improved. There is a critical need for methods that enable rapid and automated analysis of in-situ sensors and satellite image time series to detect disturbances in near real-time (e.g. within a high precision agriculture context).

Here, we demonstrate an approach to detect disturbances in near real-time. The method detects disturbances in near real-time by comparing newly acquired data with a modelled stable period based on historic in-situ or satellite time series data. The method allows the automated differentiation between normal and abnormal change in near real-time and is based on the Break For Additive Seasonal Trend (BFAST) concept [1, 2, 3]. Demonstration is done by 1) analysis of 16-day MODIS satellite image time series (MOD13Q1) for areas in the Brazilian Amazon region for which optimised deforestation systems (e.g. PRODESDETER, IMAZON) are available, and 2) analysis of in-situ sensor data for a potato field experiment in the Netherlands.

Preliminary results illustrate that abrupt changes are successfully detected while being robust for high noise levels. The method is publicly available within as the *bfastmonitor* function within the BFAST package for R (http://bfast.r-forge.r-project.org/). The proposed method is an automated and robust change detection approach that can be applied on different types of data (e.g. in-situ sensor data, or earth observation data like Landsat data and future sensors like the Sentinel constellation that provide higher spatial resolution at regular time steps) since it is fast and does not require time series gap filling. The method can be integrated within current operational early warning systems and has the potential to detect a wide variety of disturbances (e.g. deforestation, flood damage, pests and diseases).

## 2. REFERENCES

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