



Monitoring of **water table** dynamics in peatlands with **OPTRAM**: Towards globally applicable algorithms in **Google Earth Engine** using Landsat and Sentinel-2

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Problem and our solution

- > Water table depth in peatlands is a crucial parameter that is **difficult to derive with RS** data at high spatial and temporal resolutions.
- > Optical TRapezoid Model (**OPTRAM**) is an optical remote sensing based approach for soil moisture estimation.
- > **OPTRAM** reflects vegetation water status → root-zone soil moisture → **water table depth**.

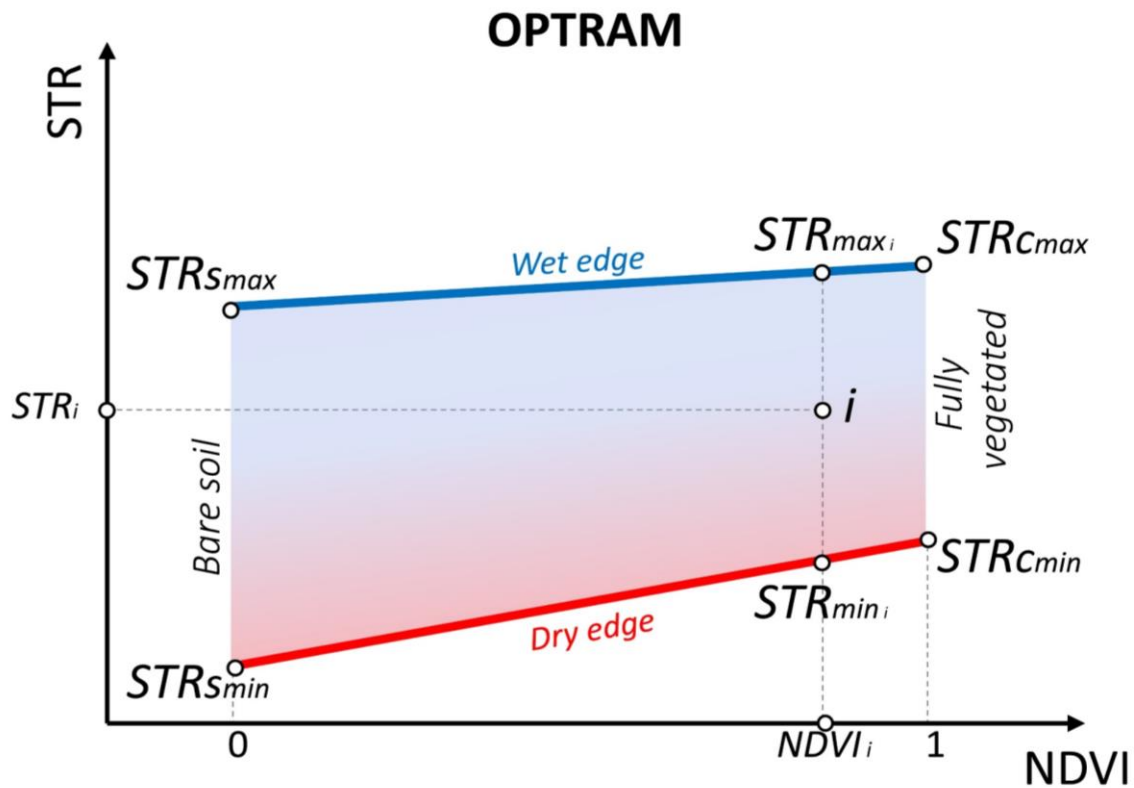


Fig. 1. The concept of OPTRAM

- normalized difference vegetation index (NDVI)
- short-wave infrared transformed reflectance (STR)



Objectives and data

Objectives:

- > to test OPTRAM over northern peatlands with long-term in-situ water table records (Landsat data);
- > to develop an automated algorithm for OPTRAM calculation in Google Earth Engine (**GEE**) (Sentinel-2 data).

In-situ data:

- > water table time series data from 5 peatlands in Estonia (EE_LIN), Canada (CA_MER), Sweden (SE_DEG), the USA (US_LOS) and Finland (FI_LOM).

Remotely sensed data:

- > Landsat-5, 7, 8;
- > Sentinel-2.

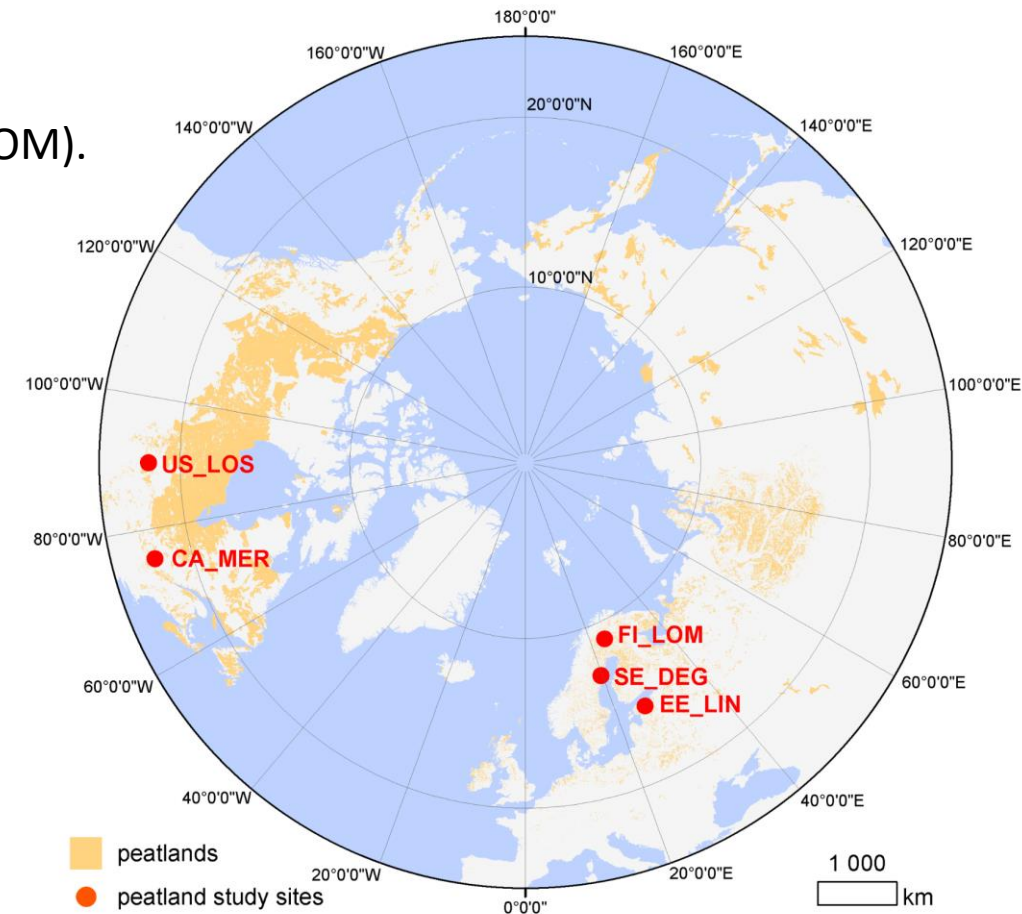


Fig. 2. Studied peatlands



Results: OPTRAM based on Landsat vs. long-term water table depth records

OPTRAM is applicable for monitoring water table dynamics in both bogs and fens (temporal correlation coefficients $R = 0.56$ – 0.74 , an average of 0.7)

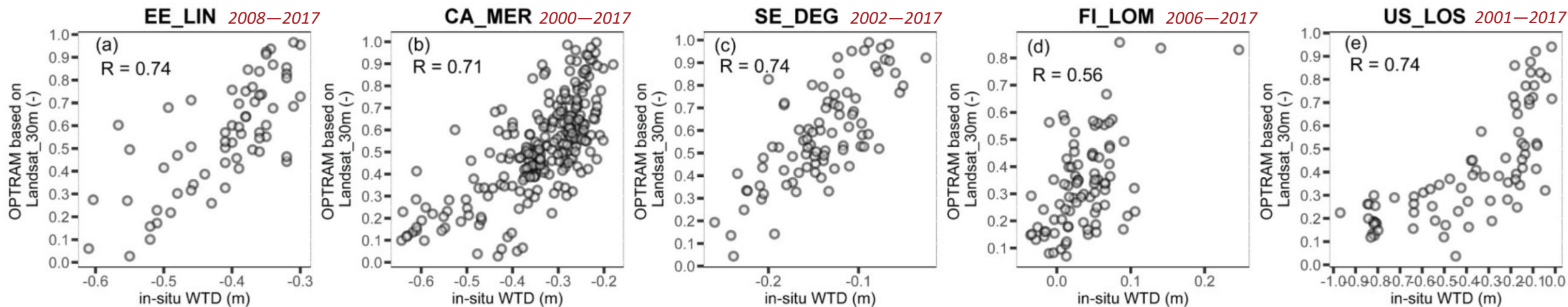


Fig.3. Scatterplots of in-situ water table depth (WTD) and OPTRAM based on Landsat pixel with the highest temporal correlation (R)

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Article

Satellite Determination of Peatland Water Table Temporal Dynamics by Localizing Representative Pixels of A SWIR-Based Moisture Index

Iuliia Burdun ^{1,*}, Michel Bechtold ^{2,3}, Valentina Sagris ¹, Annalea Lohila ^{4,5}, Elyn Humphreys ⁶, Ankur R. Desai ⁷, Mats B. Nilsson ⁸, Gabrielle De Lannoy ² and Ülo Mander ¹

Results: automated GEE algorithm for OPTRAM based on Sentinel-2

- > Preliminary results of an automated OPTRAM approach (GEE) performs similar to a site-specific manual calibration.

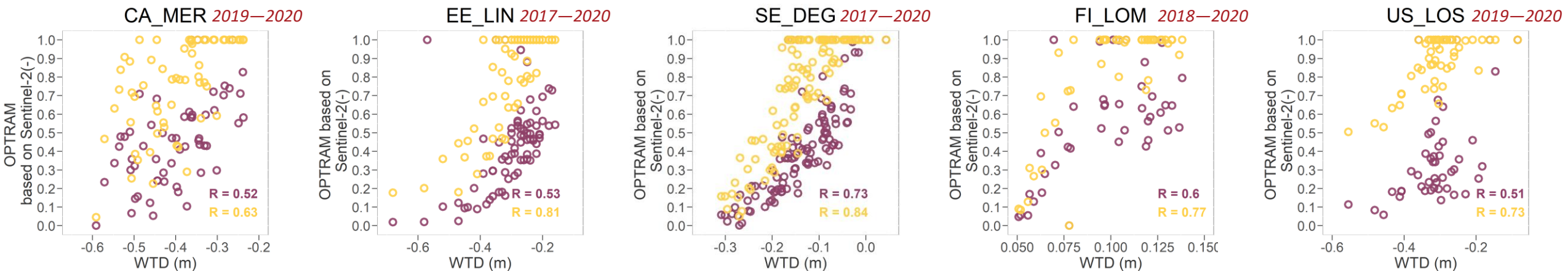


Fig.4. Water table depth (WTD) vs. OPTRAM Sentinel with site-specific manual calibration and in GEE

- > The automated OPTRAM approach needs to be improved to enable global RS-based water table depth monitoring.

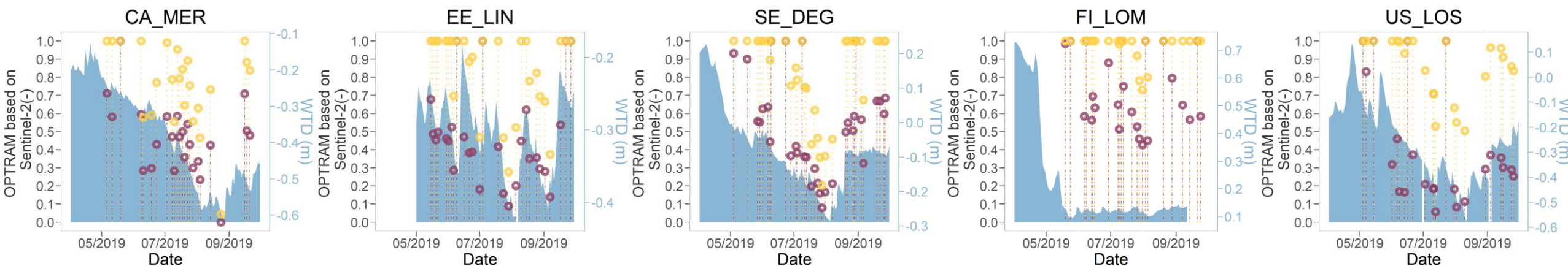
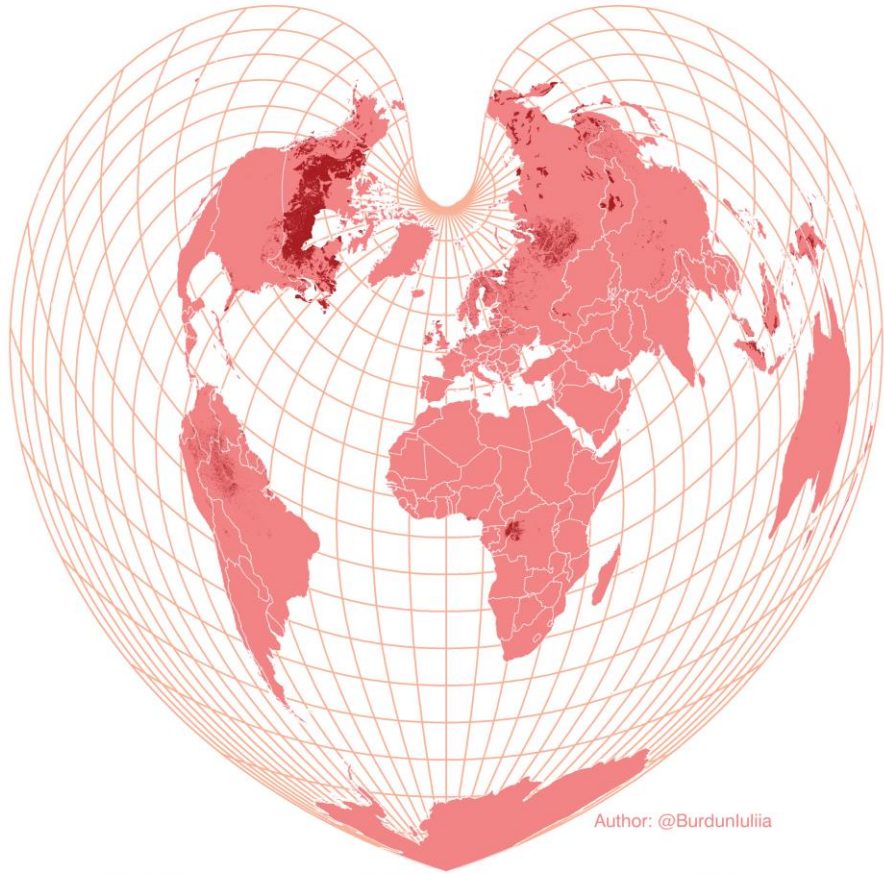


Fig.5. Exemplary one-year period (vegetation season only) time series of water table depth (WTD) and OPTRAM based on Sentinel with site-specific manual calibration and in GEE



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Peatlands

and

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