

River water input from upstream areas into the Cuvette Centrale peatland complex detected via SMOS data assimilation

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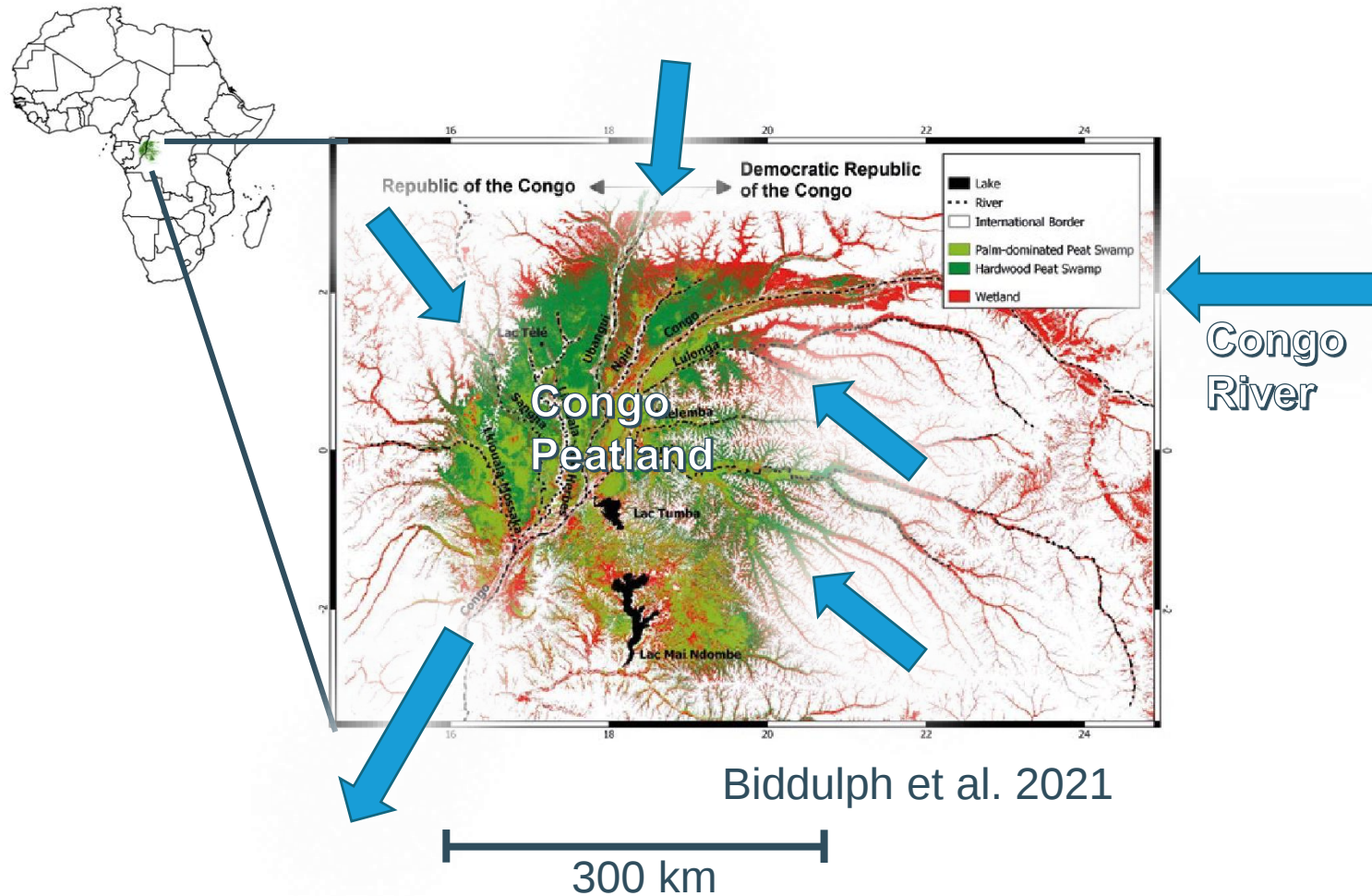
HS10.7 - Peatland hydrology: from tropical to subarctic latitudes
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Research question

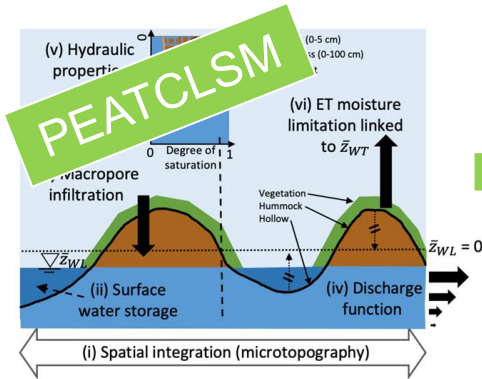


Does the Congo peatland depend on upstream water inputs?

- Peatlands are domed but with very low gradients: ~1m over 10km (Davenport et al. 2020)

Approach

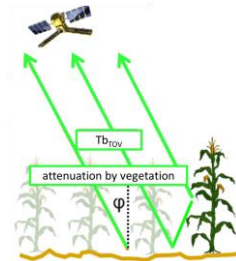
Peatland-Enabled Land Surface Modeling



Bechtold et al, 2019, JAMES
 → Boreal
 Apers et al., 2022, JAMES
 → Tropics

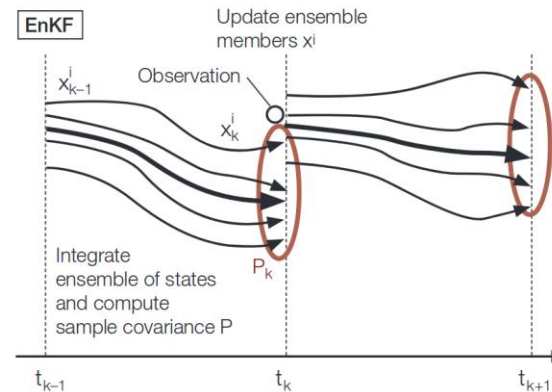
“Influence of river stage height NOT modeled in PEATCLSM” → Seen by SMOS ?

Radiative Transfer Model



3D Ensemble Kalman Filter

$$Tb(model) \Leftrightarrow Tb(obs)$$

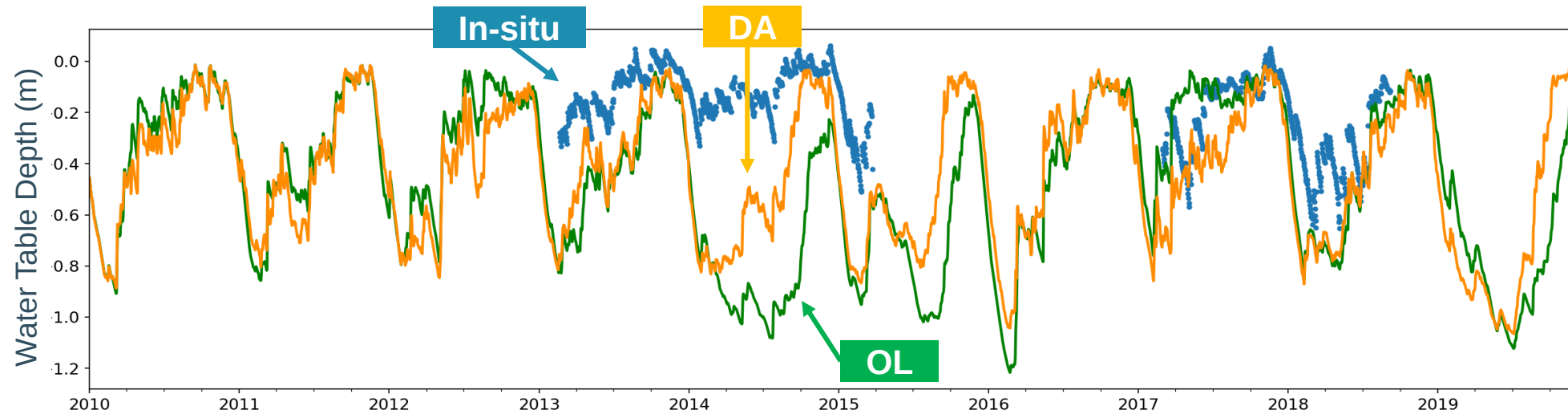


L-band Brightness Temperature (Tb)

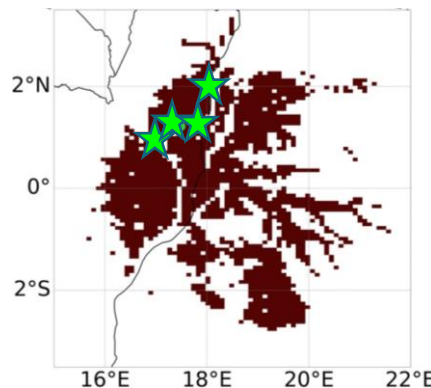


- State updating due to errors in meteorological forcings and model errors
- Only assimilation of anomalies after removing climatological bias
- Analysis of temporal correlation

Assimilation of SMOS L-band brightness temperature improves water table depth estimates



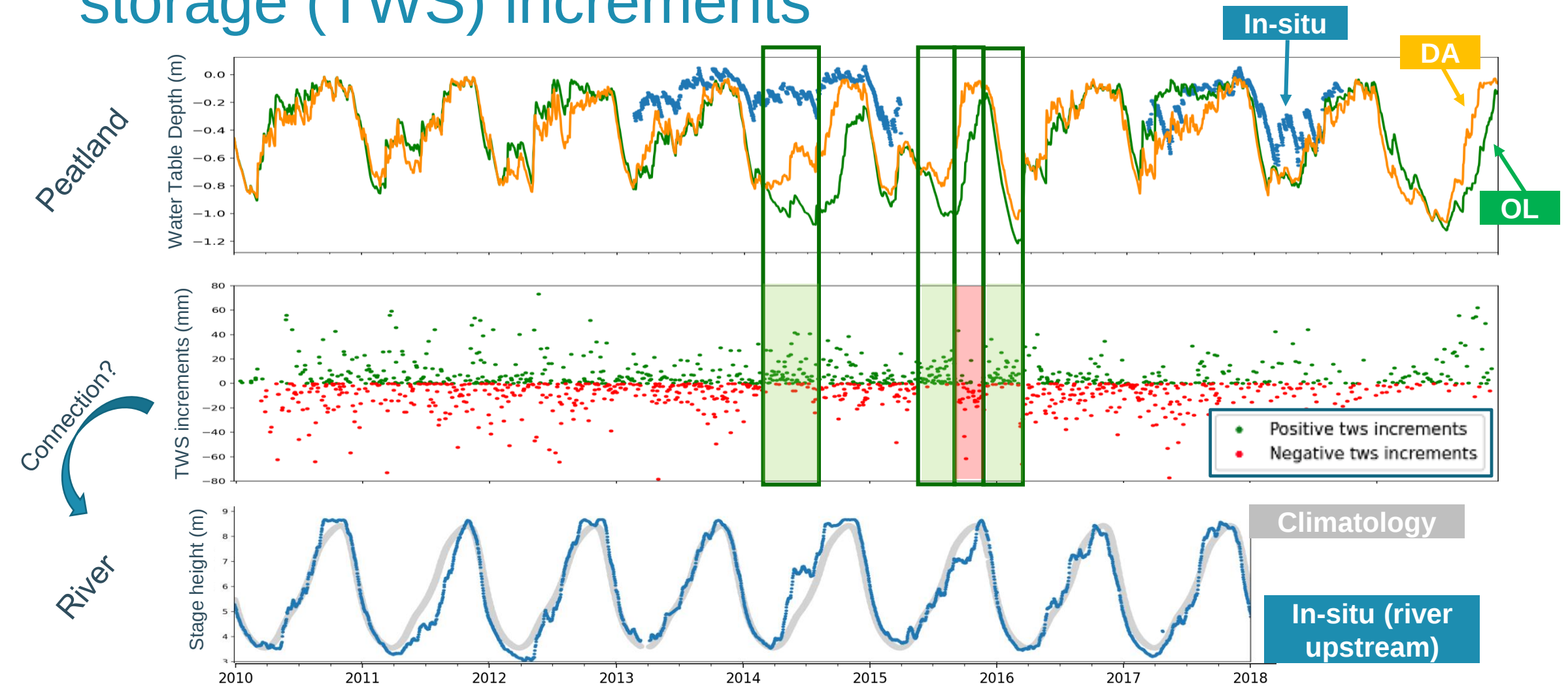
Example time series



Four in-situ sites
(Dargie et al. 2017 + CongoPeat project)

R_{OL} : 0.32 $Bias_{OL}$: -0.31 m
 R_{DA} : 0.67 $Bias_{DA}$: -0.26 m

Long periods of temporally-autocorrelated total water storage (TWS) increments

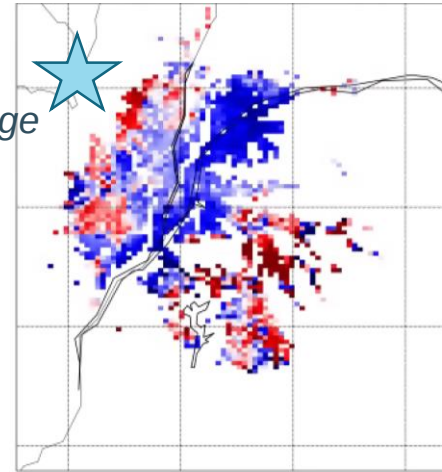


Wide spread positive correlation of increments with river stage height anomalies, with exceptions

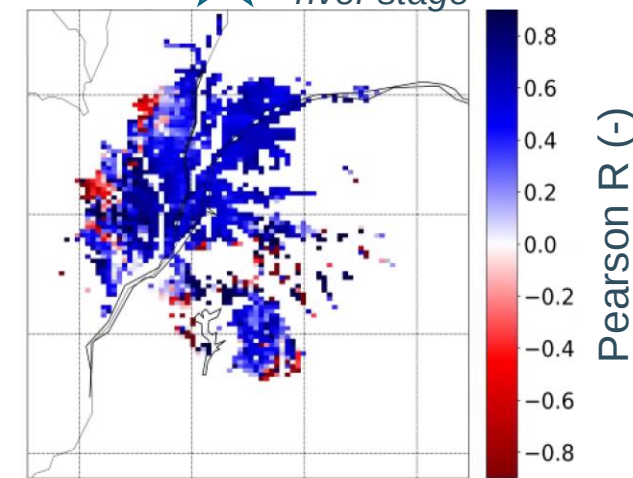
- Systematic identification of periods of autocorrelated TWS increments
- Connect to water stage height anomalies

Correlation of all grid cells to specific upstream river location

Ouesso river stage

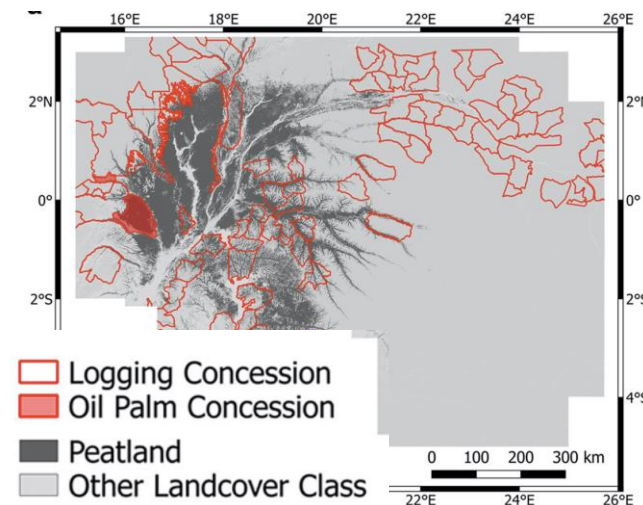


Bangui river stage



Conclusions

- Data assimilation diagnostics indicates influence of river stage height on peatland water tables
- Disentangling of impacts of river stage height and precipitation errors limited by lack of rain gauges



Dargie et al.
2019

References

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