

# TREE CANOPY COVER LOSS DYNAMICS BETWEEN 2018 AND 2022 IN GERMANY

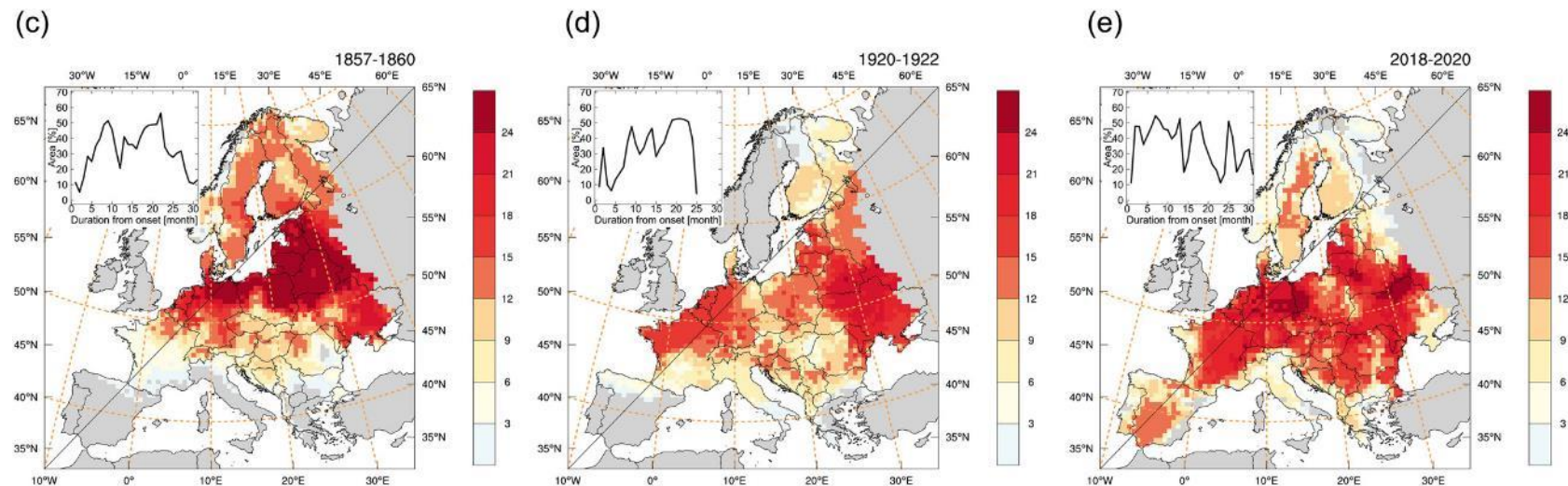
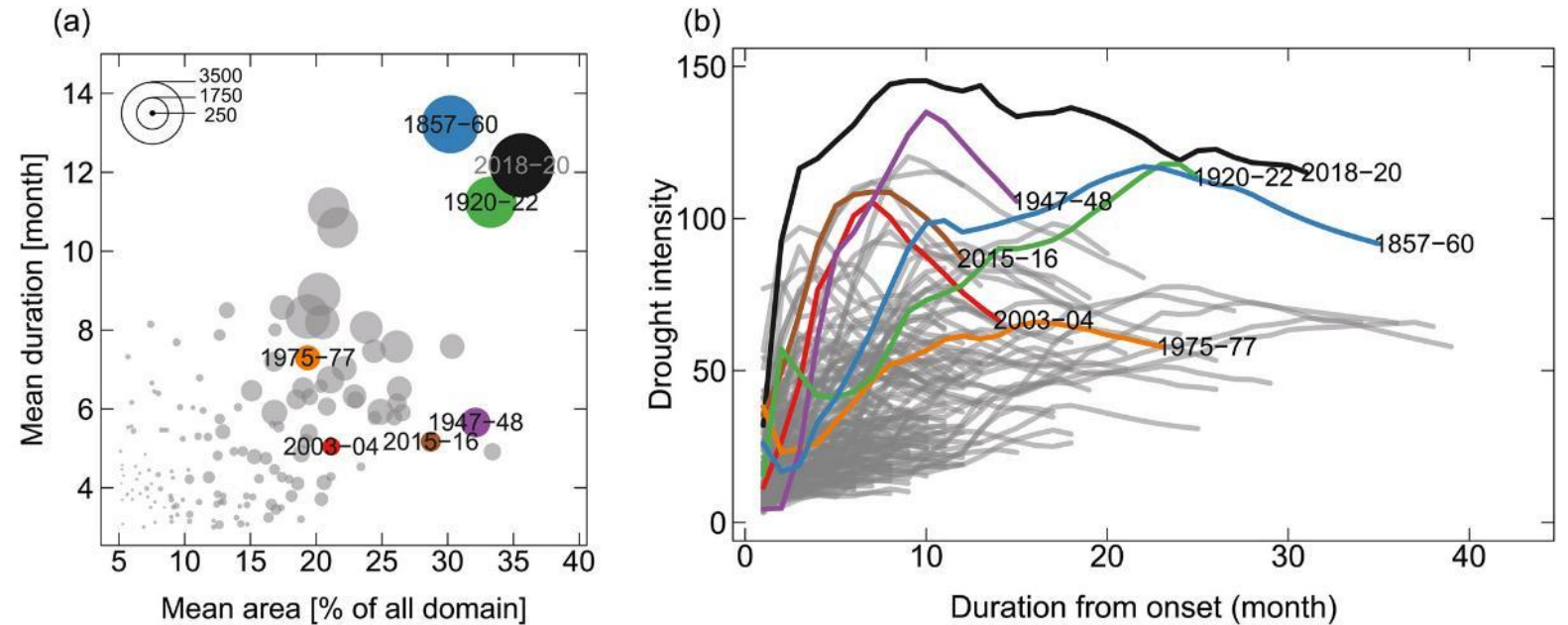
Frank Thonfeld, Ursula Gessner, Stefanie Holzwarth, Juliane Huth



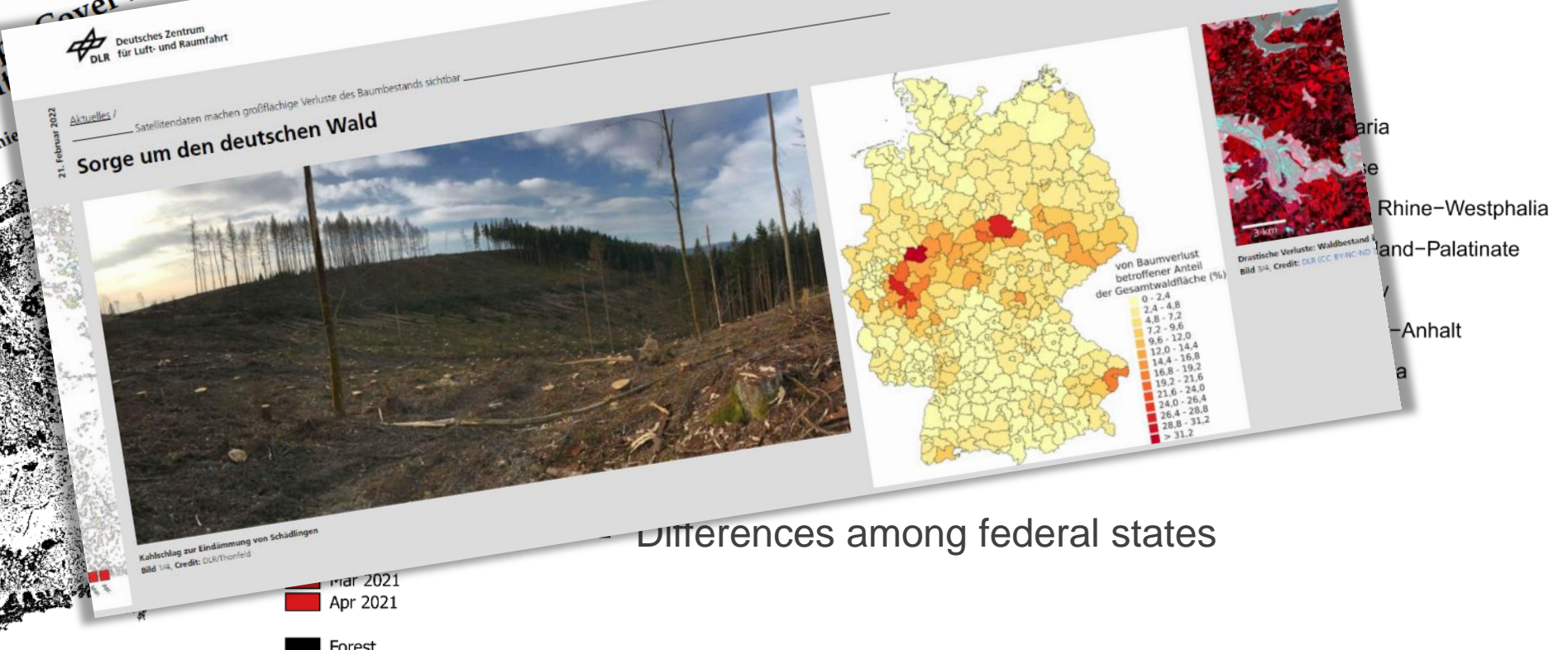
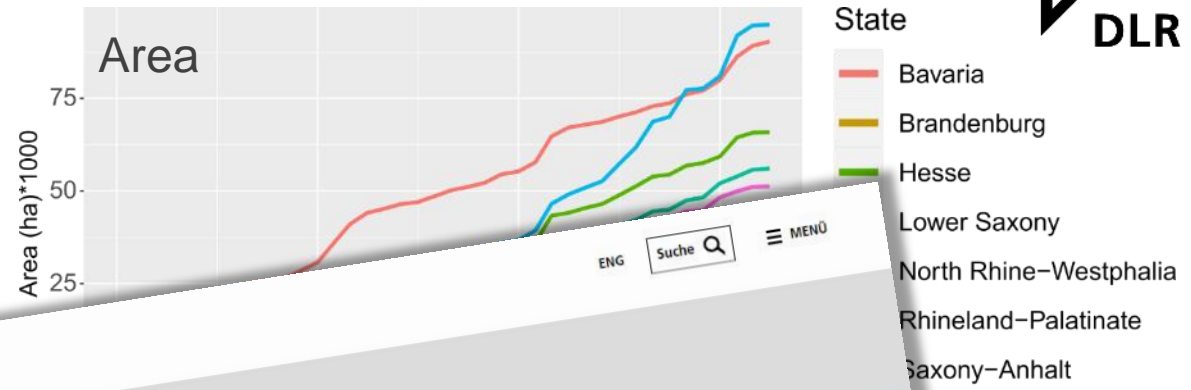
# BACKGROUND

# The 2018-2020 drought

- 2018-2020 drought most severe in the last 250 years (soil moisture)



# Tree canopy cover loss in Germany



Differences among federal states

- 501.000 ha (vs. 295.000 ha reported by BMEL)  $\approx$  5 %



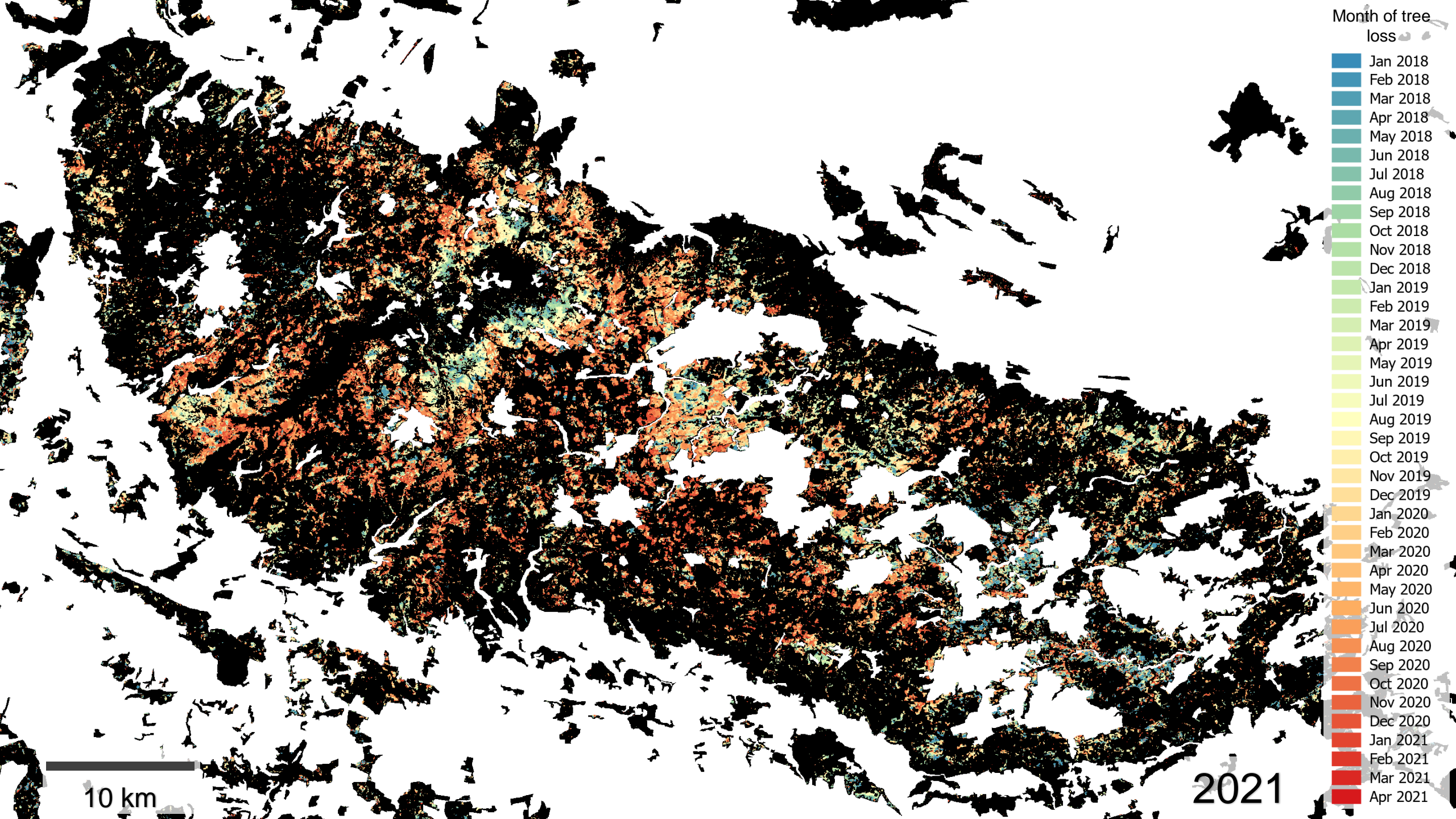
10 km

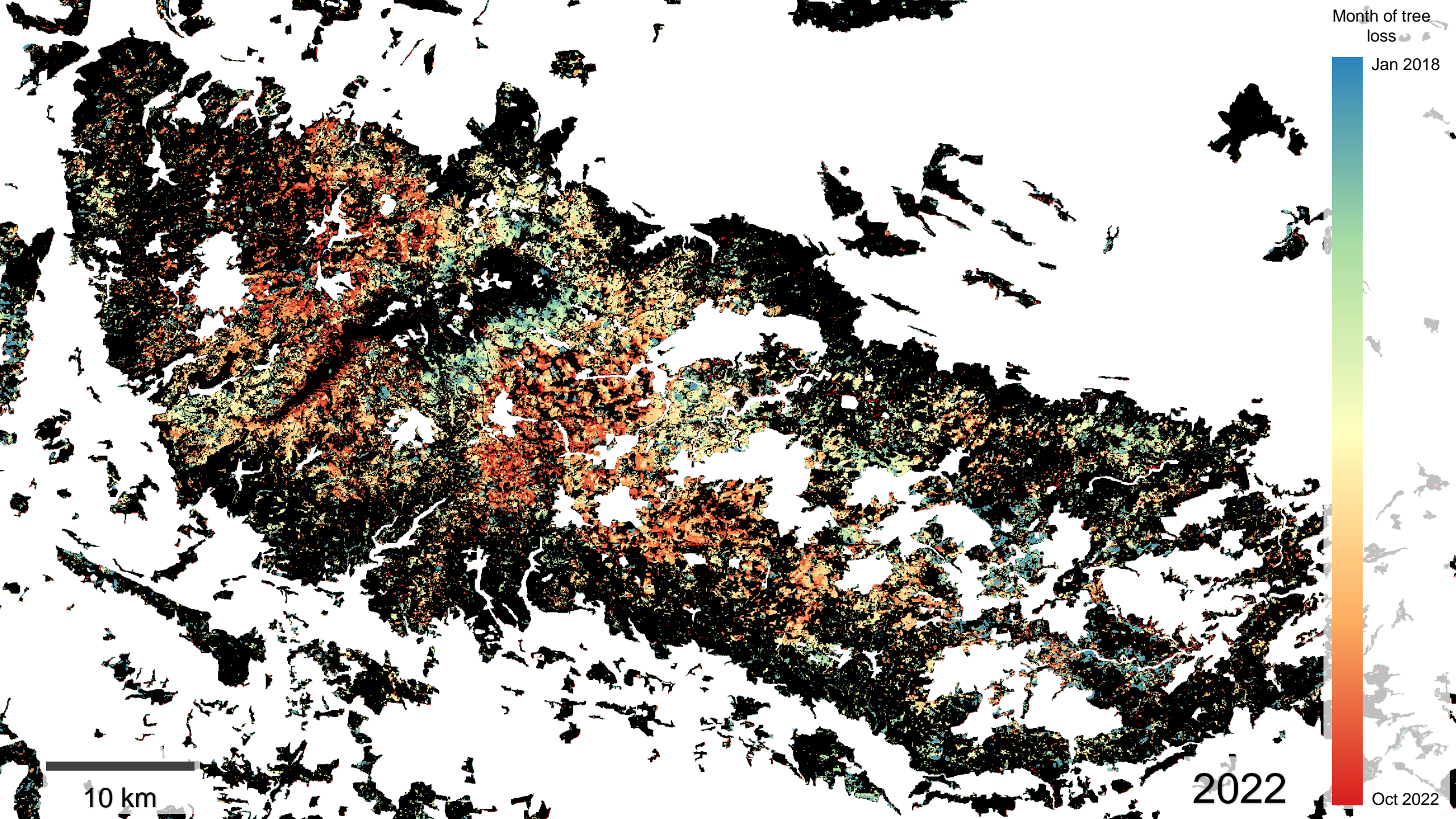
2018



10 km

2021





Month of tree loss

Jan 2018

Oct 2022

10 km

2022



# Objectives



- Which disturbances are detected?
- Which dynamics can be observed?
- Lessons learned & future developments

# DISTURBANCES

Tesla factory site, SE of Berlin

Juli 2018



June 2021

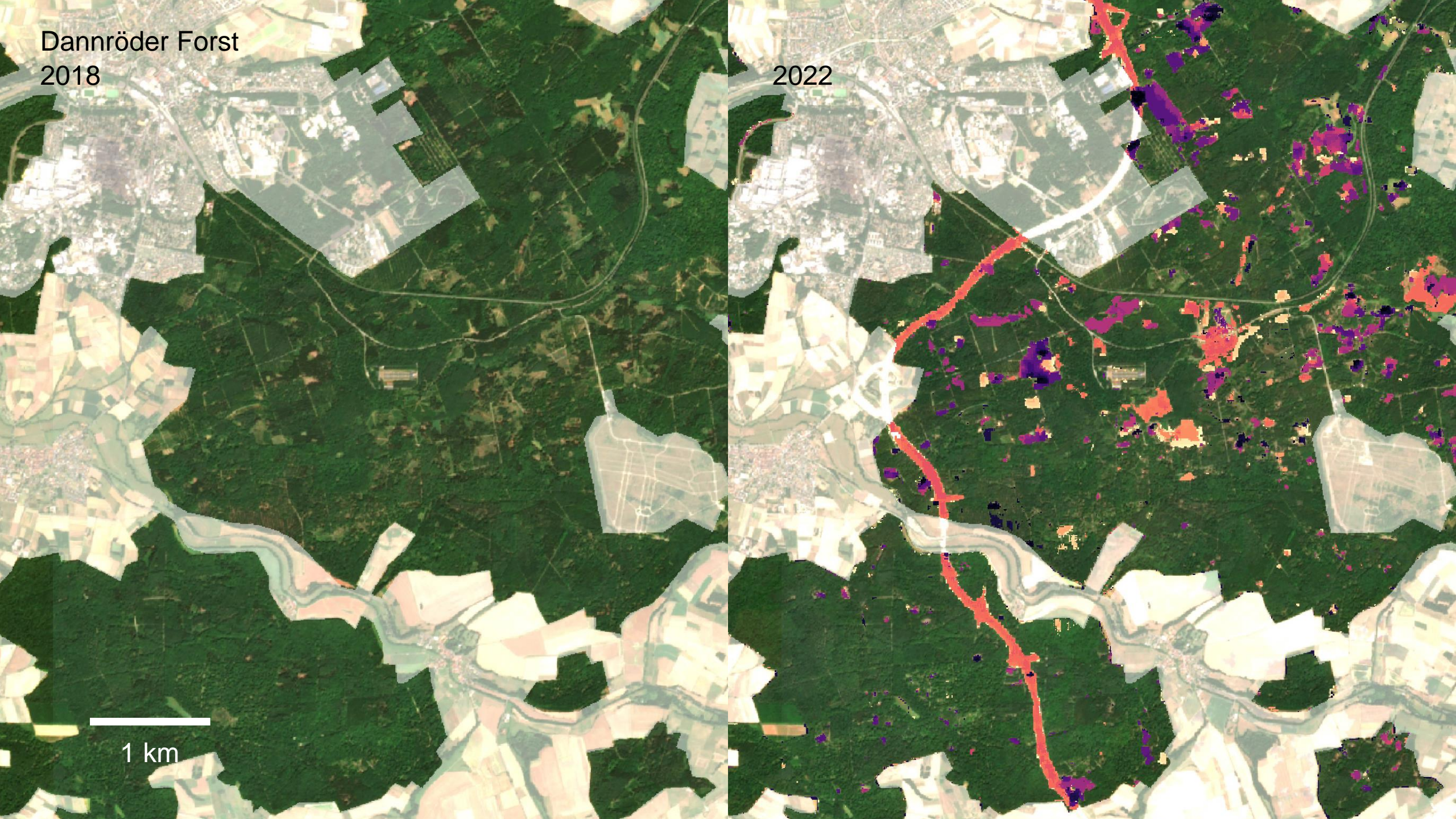


1 km

Dannröder Forst  
2018

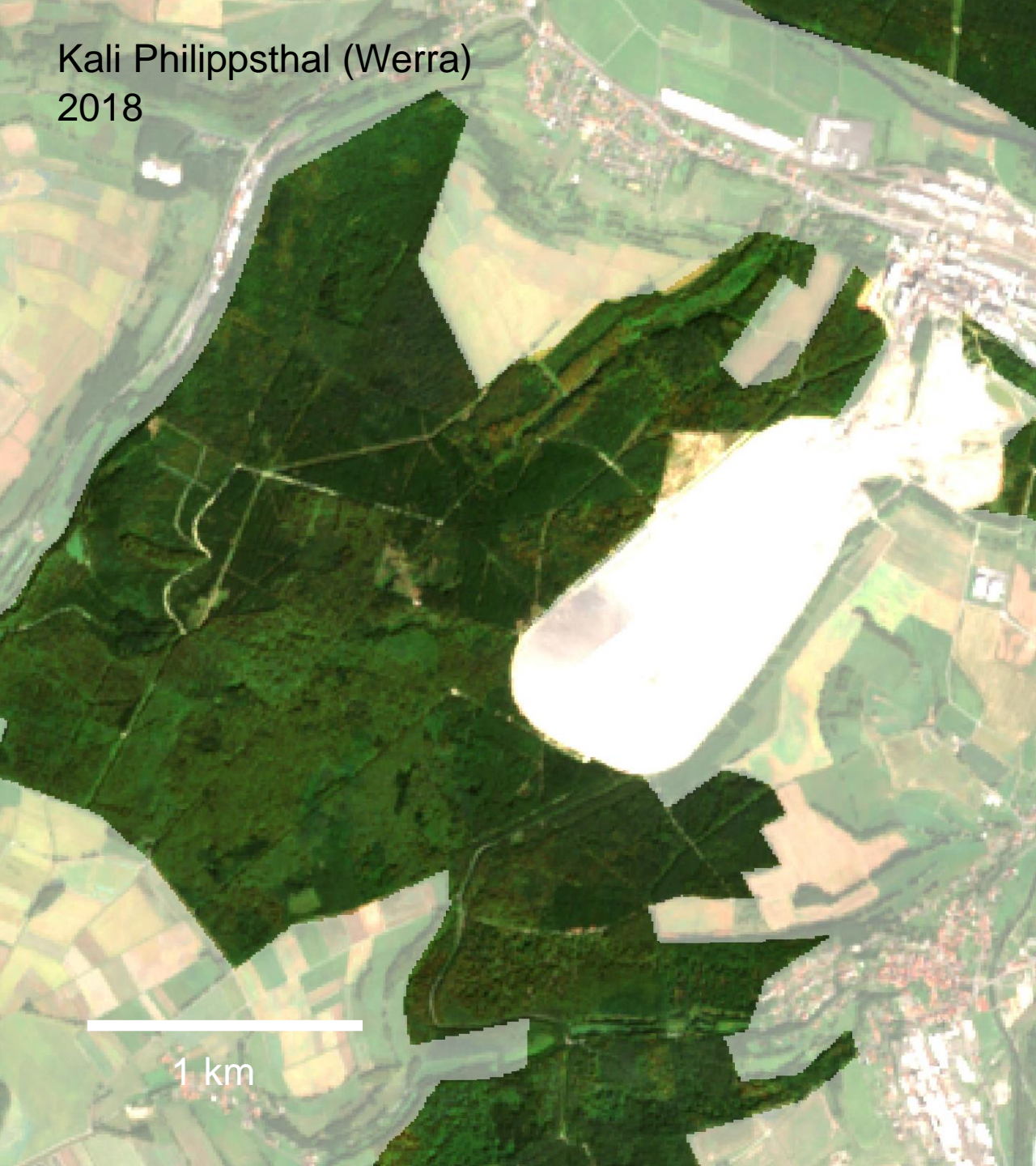
2022

1 km

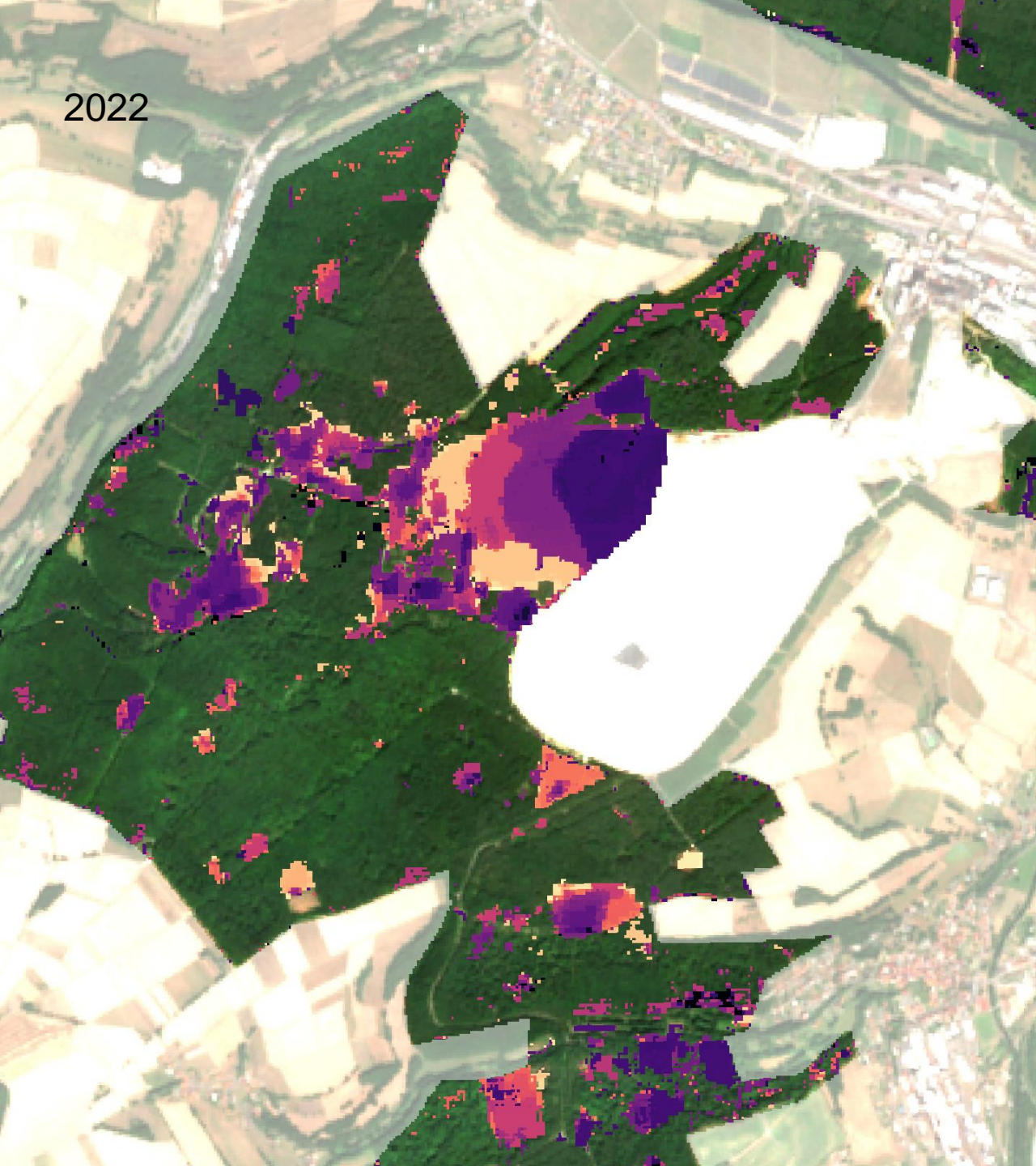


Kali Philippsthal (Werra)

2018

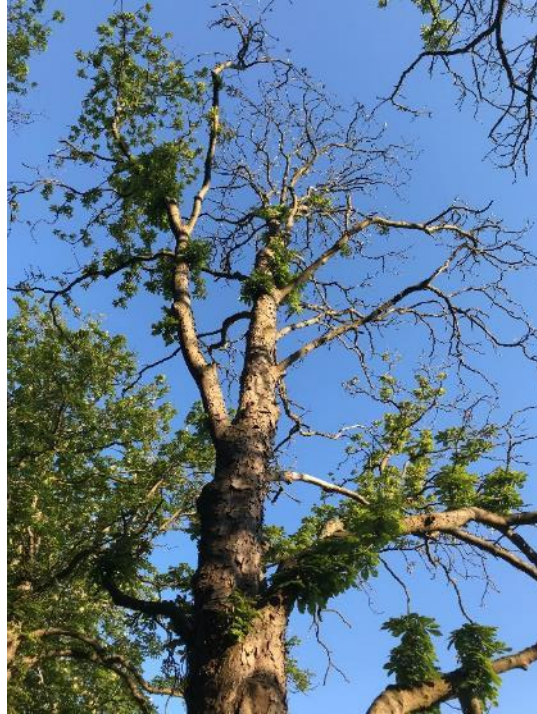


2022



1 km

# Impact on crown condition



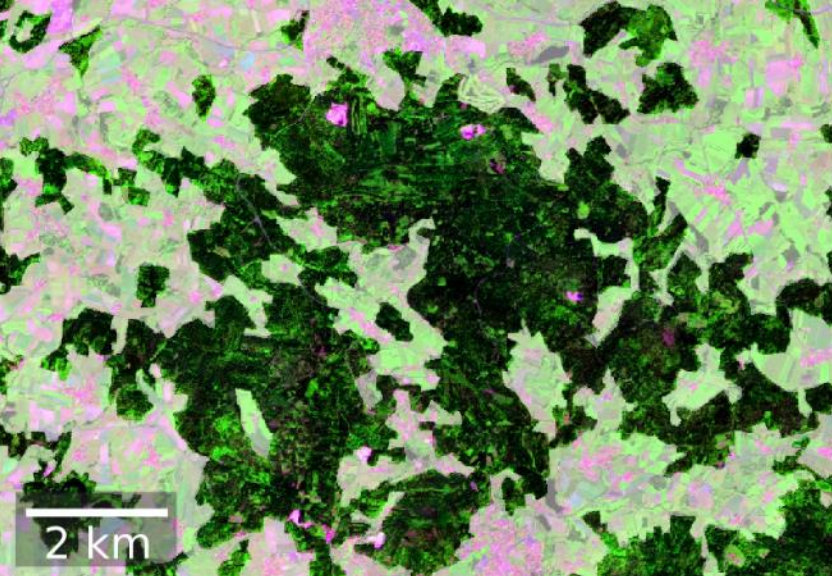
Crown defoliation as drought response in pine, larch, oak, beech, and even chestnut



Spruce bark beetle *Ips typographus*  
with larvae, photo: Roman Modlinger,  
Hlásny et al. 2019

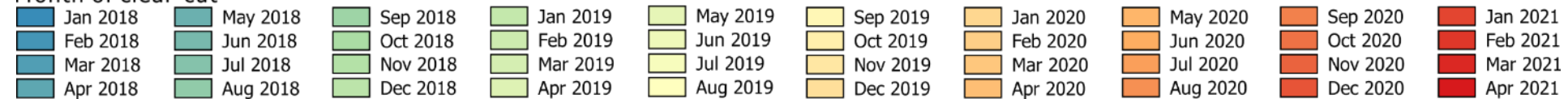


Photos: Frank Thonfeld

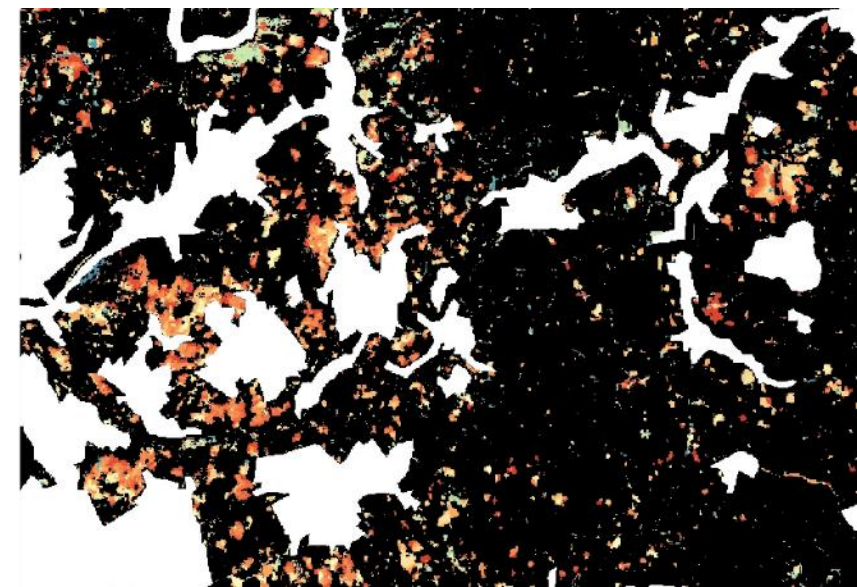
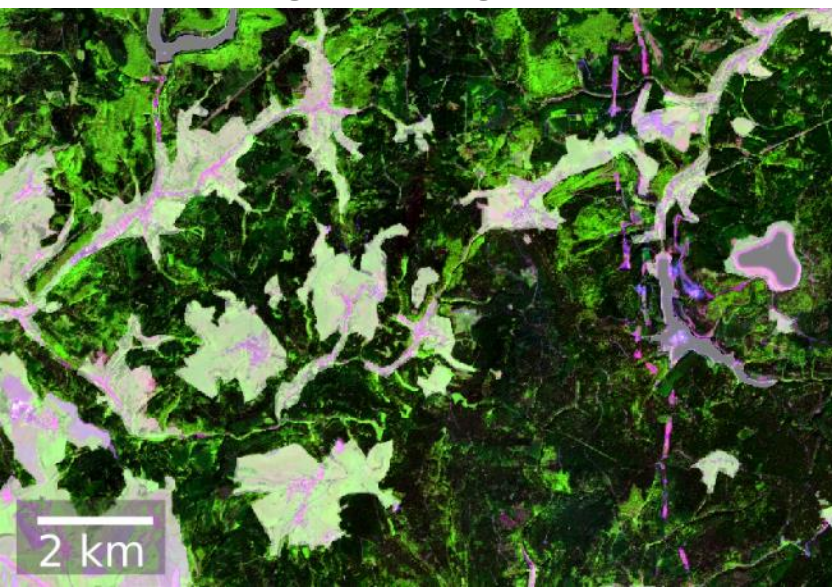


Hauzenberg, Bavaria

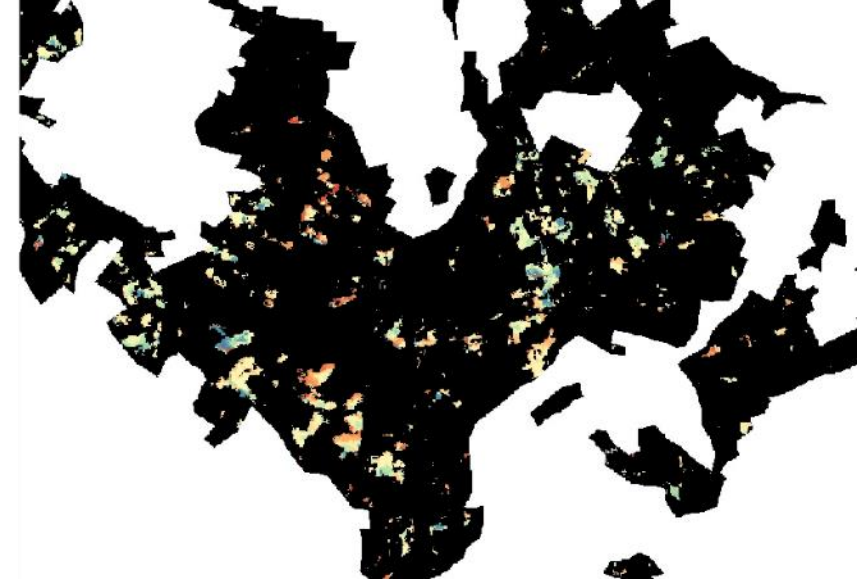
Month of clear-cut



Masserberg, Thuringia

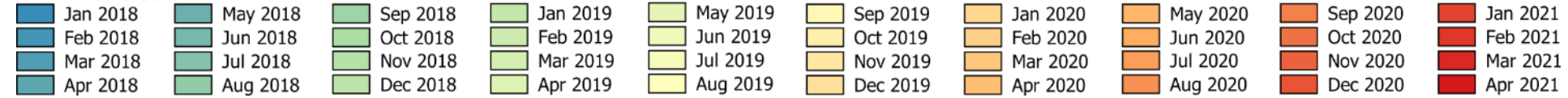




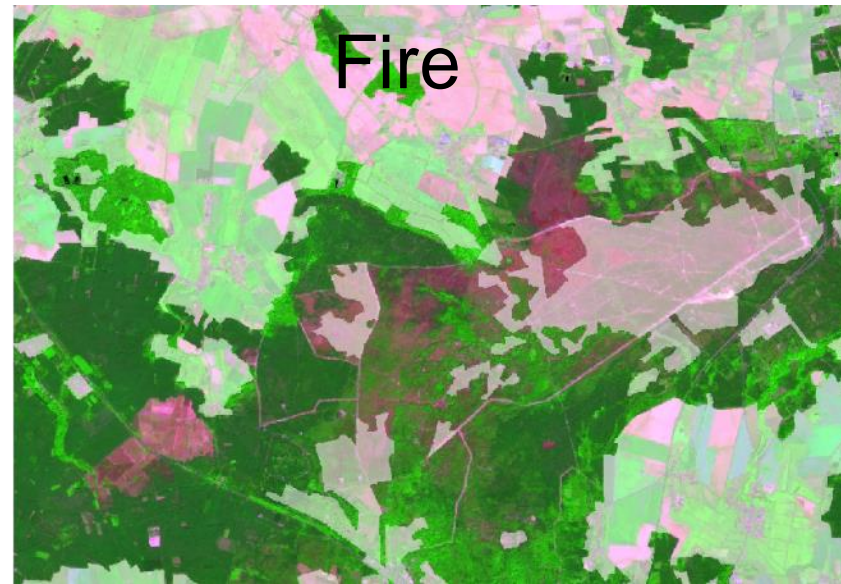


Kottenforst, Bonn, NRW

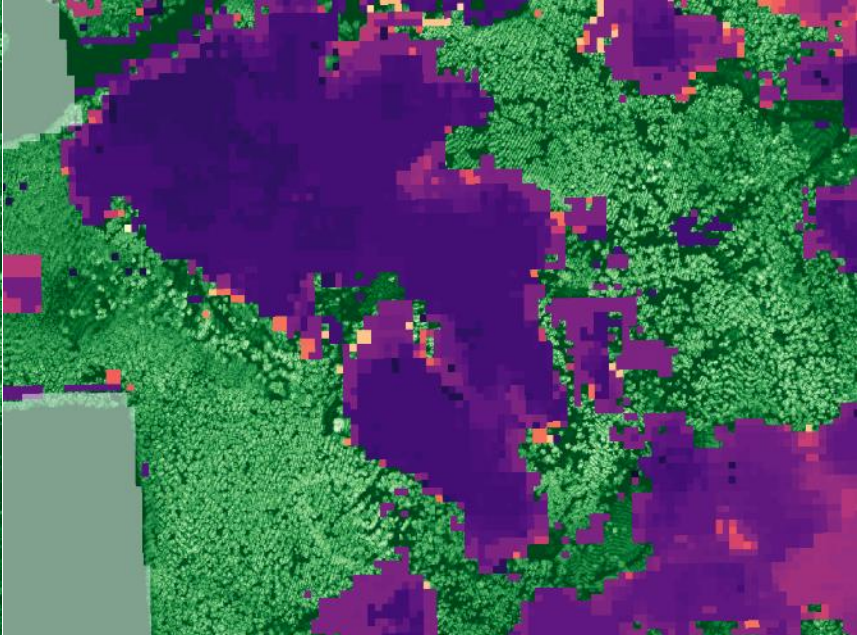
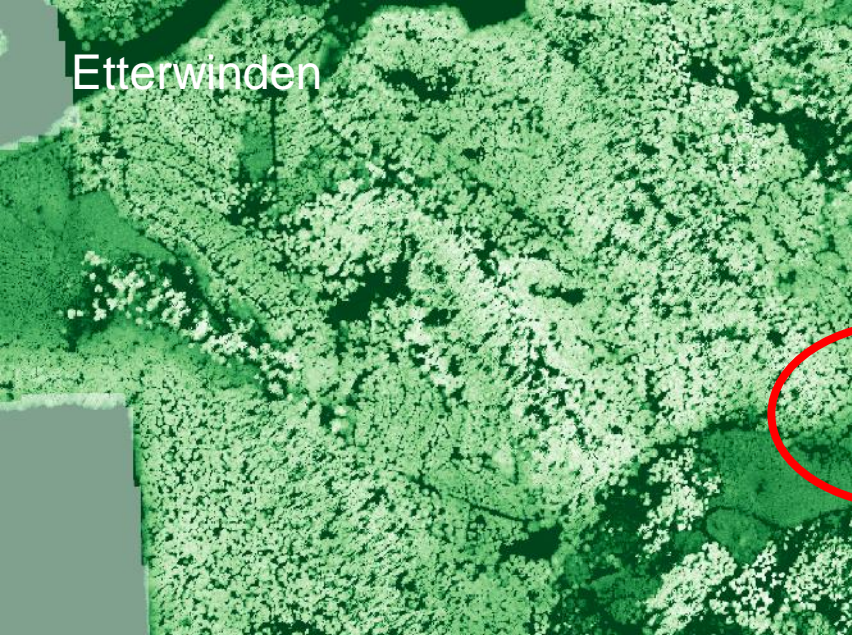
Month of clear-cut



Treuenbrietzen, Brandenburg



Etterwinden



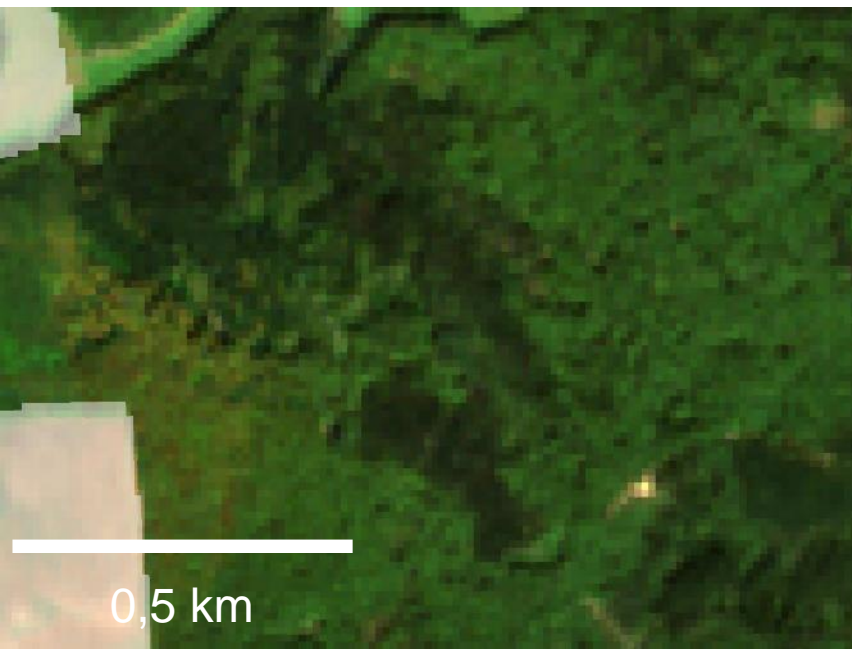
2013 – ALS (GDI Thüringen)

2021 – ALS (GDI Thüringen)

Jan 2018  Aug 2022

2018 – Sentinel-2

2022 - Sentinel-2



0,5 km



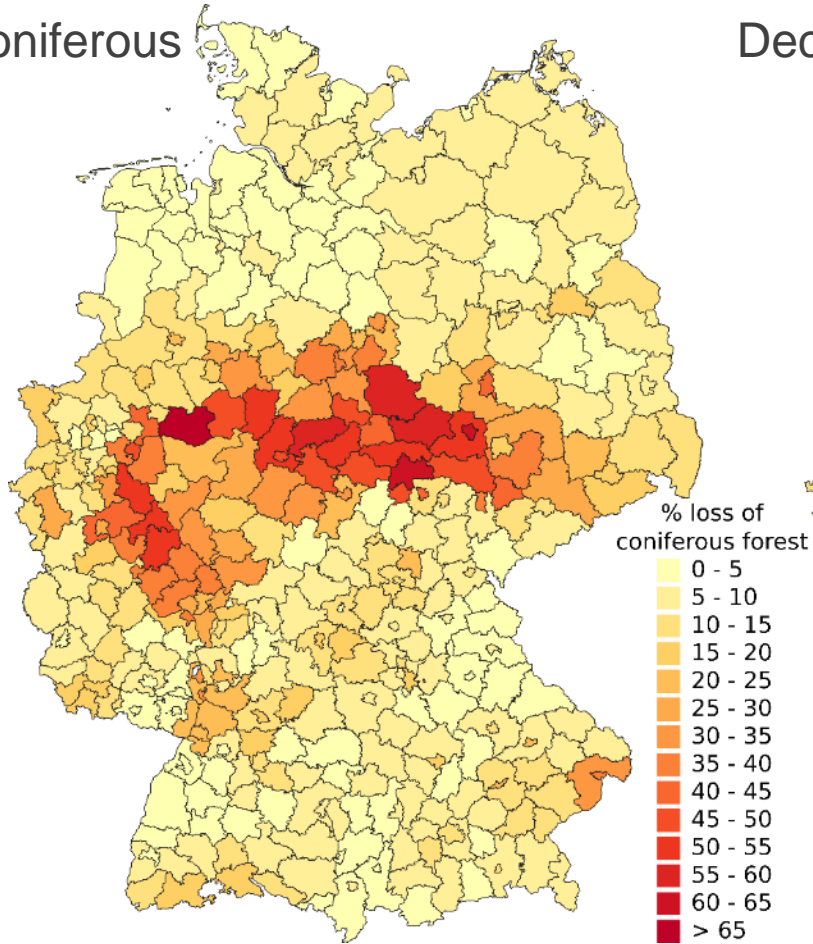
# DYNAMICS

Photo: F. Thonfeld

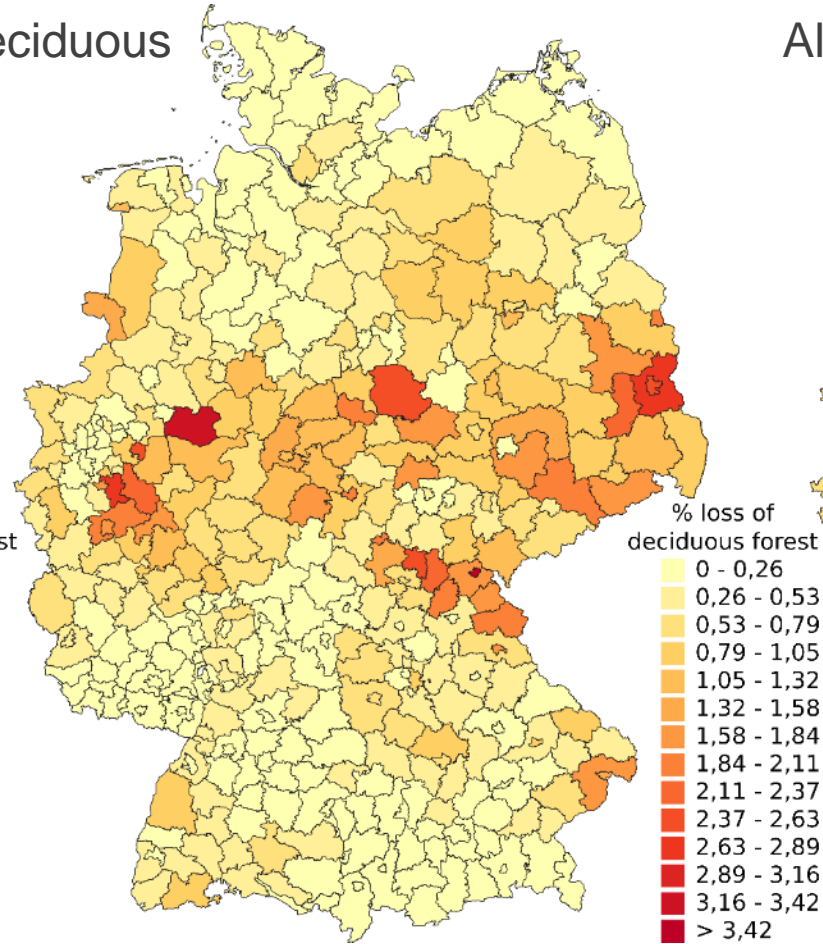
# Tree loss spatial pattern (districts = Landkreise)



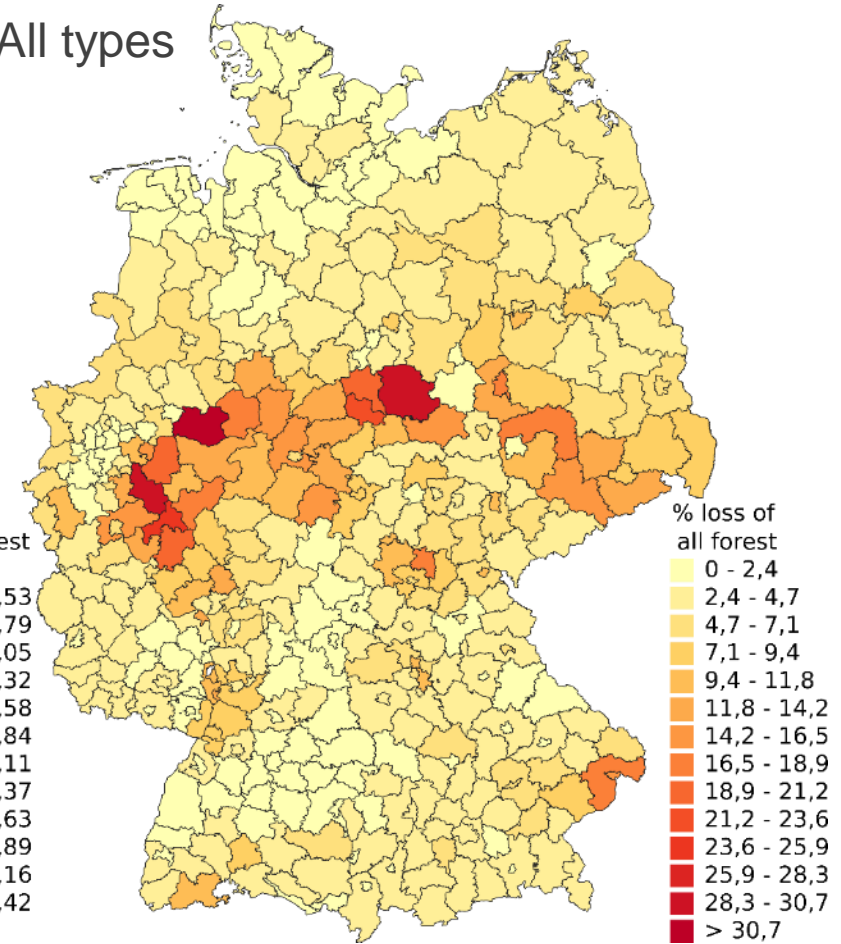
Coniferous



Deciduous



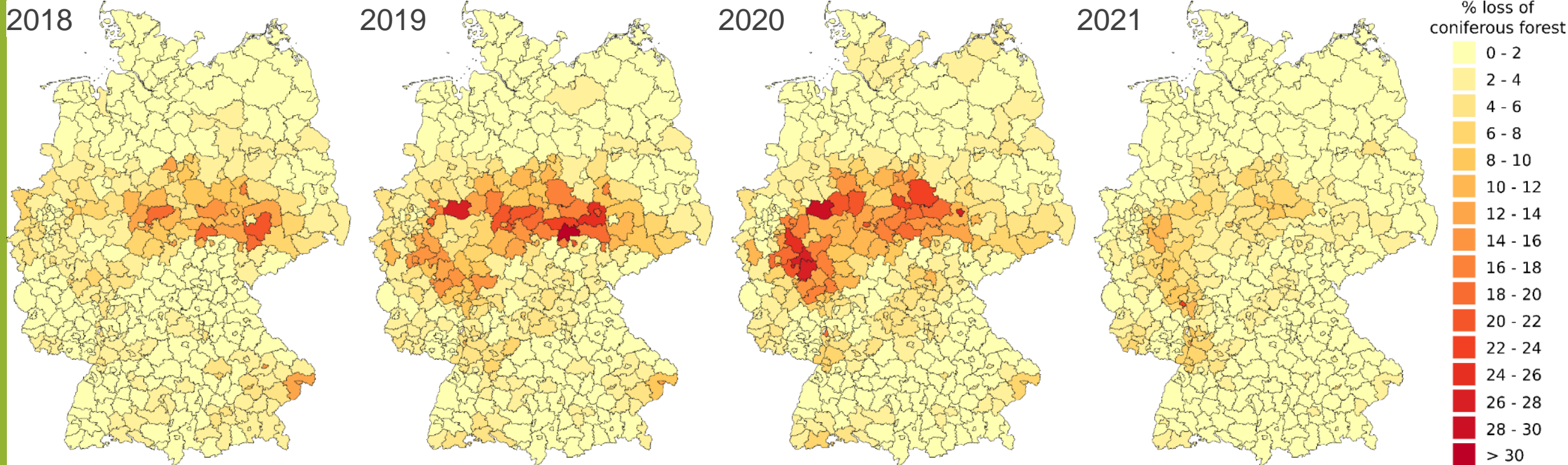
All types



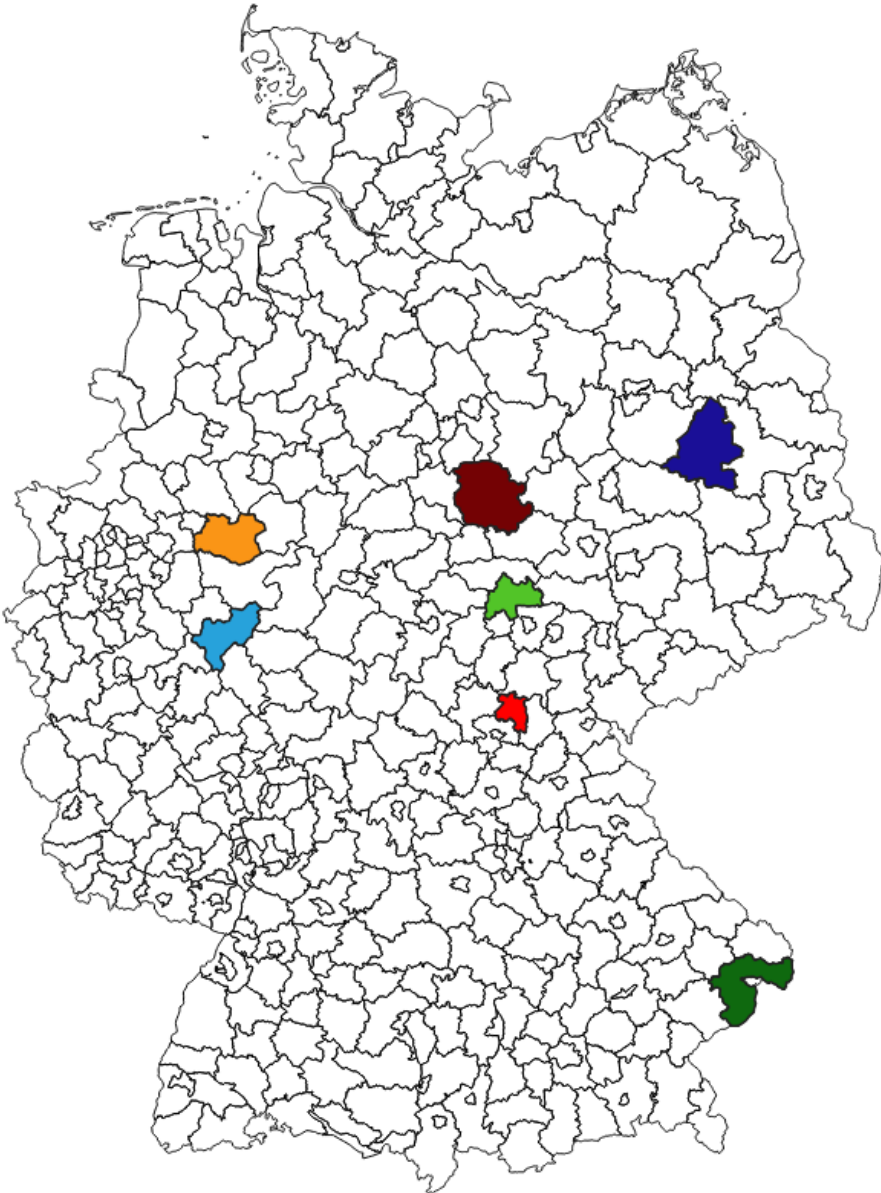
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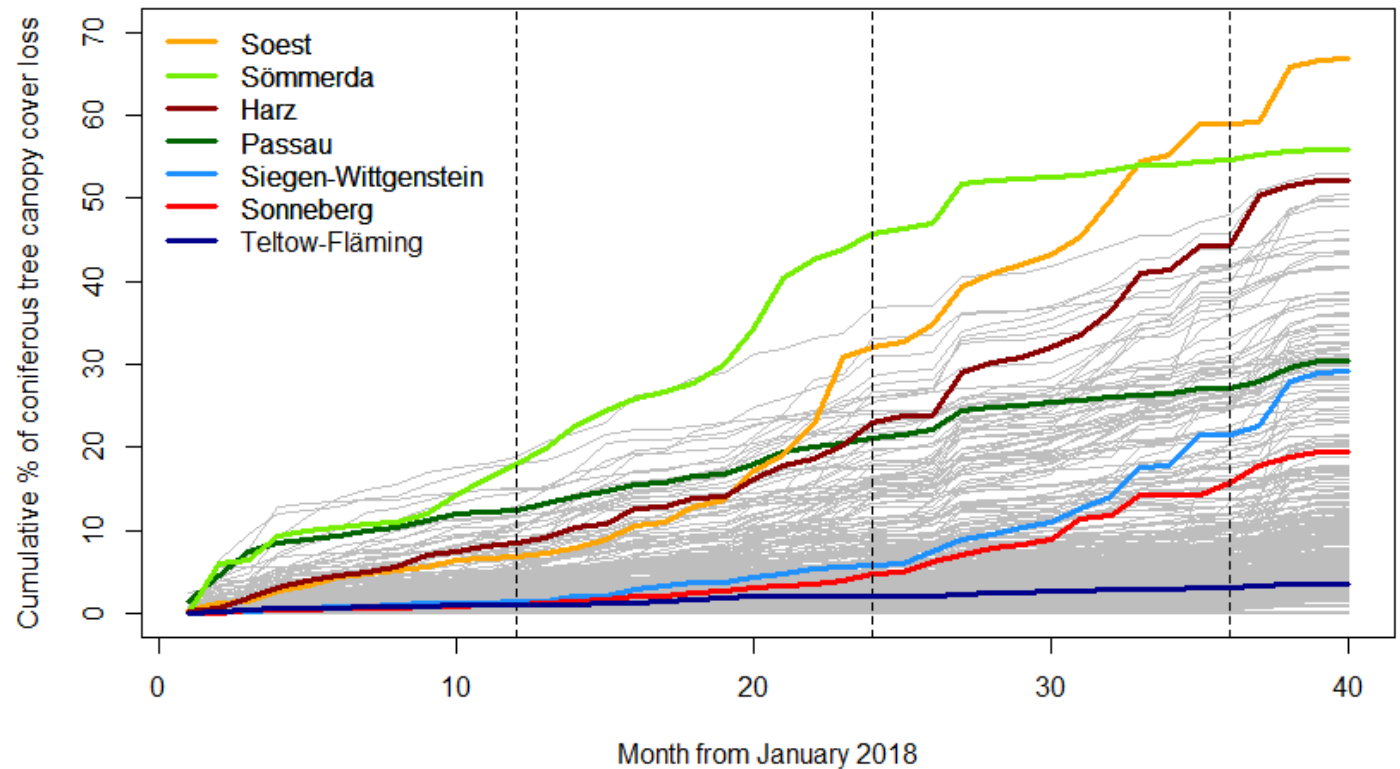
## Coniferous forests



# Tree Canopy Cover Loss in Selected Districts



Tree canopy cover loss 01/2018 – 04/2021



# Tree Canopy Cover Loss in NRW

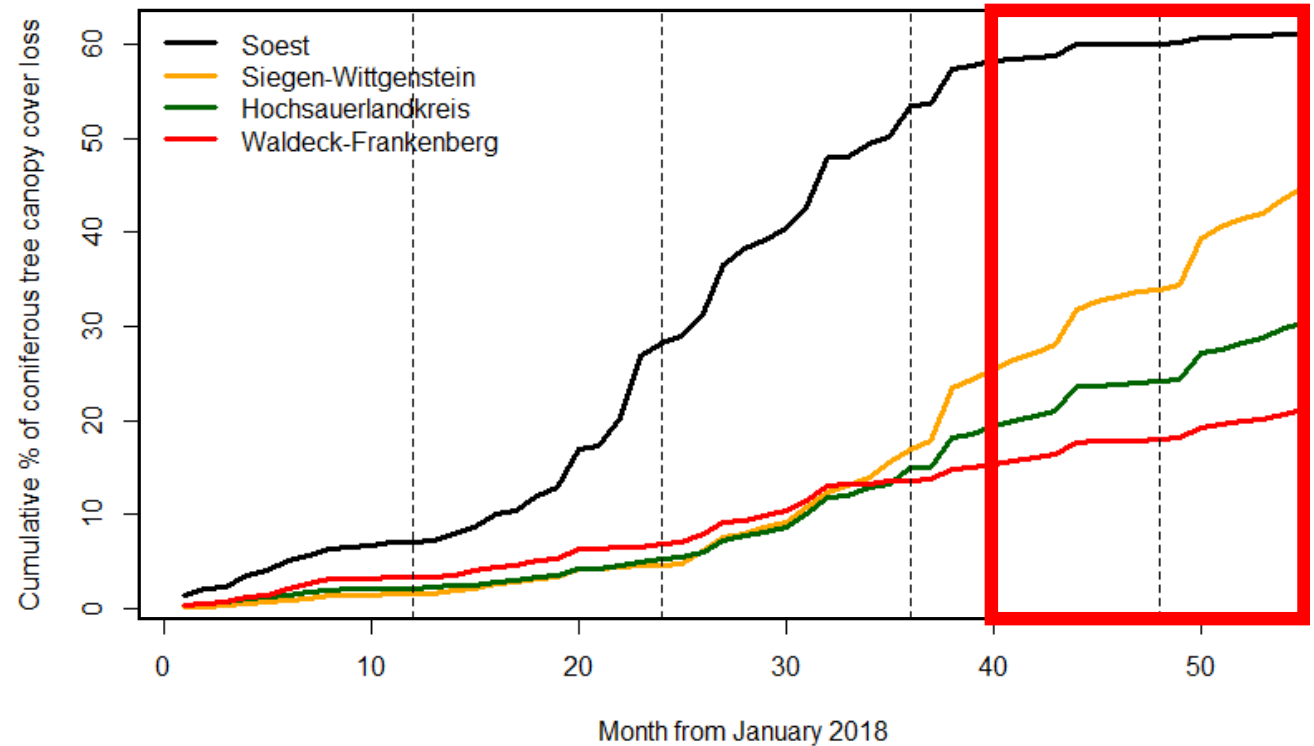


Jan 2018



Jul 2022

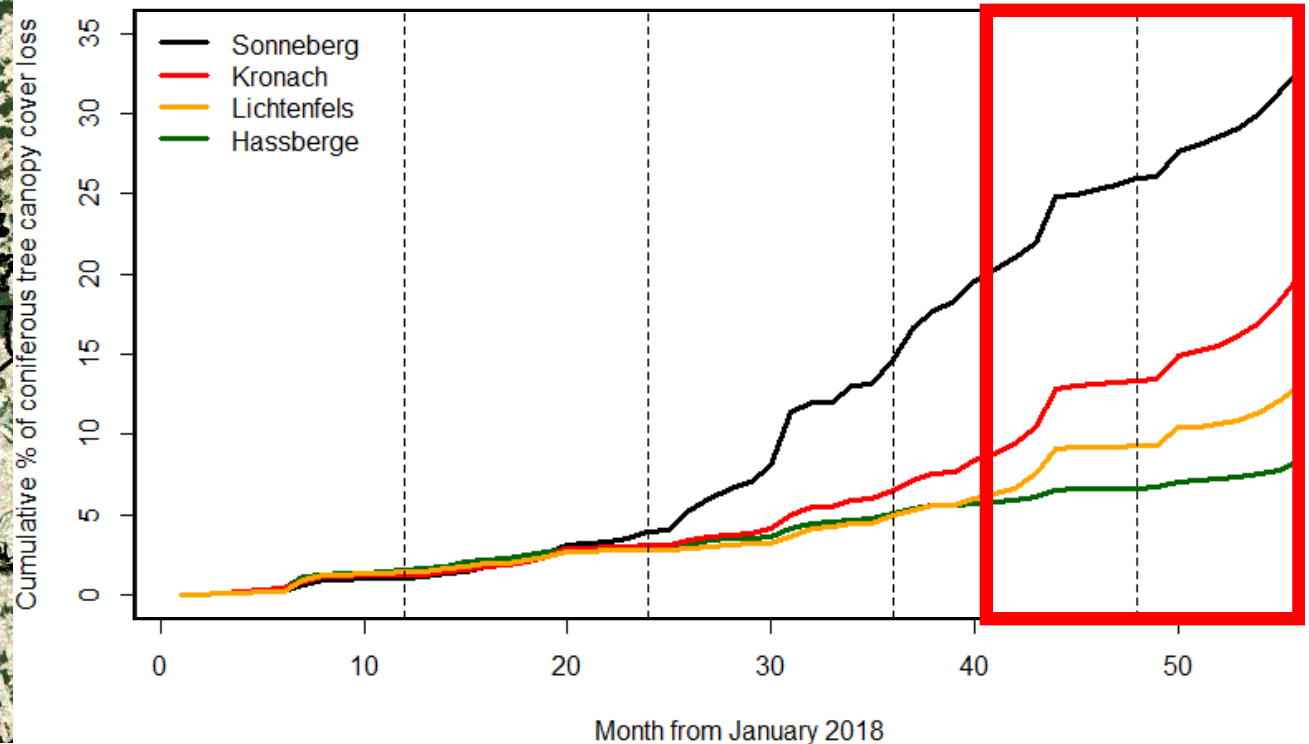
Tree canopy cover loss after April 2021



# Tree Canopy Cover Loss in Northern Bavaria & Southern Thuringia



Tree canopy cover loss after April 2021





# SUMMARY & CONCLUSION

# Summary & Conclusion



- Tree canopy cover loss at high spatial (10 m) and temporal resolution (monthly)
- Good results in detection of stand-replacing disturbances
- Method not designed to detect recovery (e.g. insects in deciduous forests)
- No separation of disturbance drivers & causes
- No differentiation of loss areas (clear-cuts, standing dead trees, single live trees, species etc.)

# ForstEO

Einsatz der Erdbeobachtung zur Erfassung von klimabedingten Schädigungen des Waldes in Deutschland

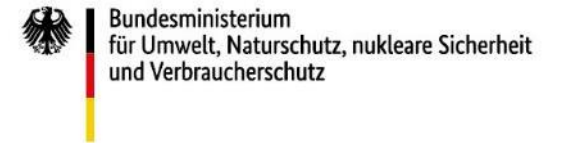
- Monitoring & Schaderkennung
- Differenzierung von Schadursachen
- Erfassung von Schädigungen am Laubholz

Gefördert durch:



aufgrund eines Beschlusses  
des Deutschen Bundestages

Gefördert durch:



aufgrund eines Beschlusses  
des Deutschen Bundestages



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**THANK YOU FOR YOUR ATTENTION!**

# Related Publications



Review

## Earth Observation Based Monitoring of Forests in Germany: A Review

Stefanie Holzwarth <sup>1,\*</sup>, Frank Thonfeld <sup>1,2</sup>, Sahra Abdullahi <sup>1</sup>, Sarah Asam <sup>1</sup>, Emmanuel Da Ponte Canova <sup>1</sup>, Ursula Gessner <sup>1</sup>, Juliane Huth <sup>1</sup>, Tanja Kraus <sup>1</sup>, Benjamin Leutner <sup>1</sup> and Claudia Kuenzer <sup>1,2</sup>



Article

## A First Assessment of Canopy Cover Loss in Germany's Forests after the 2018–2020 Drought Years

Frank Thonfeld <sup>1,\*</sup>, Ursula Gessner <sup>1</sup>, Stefanie Holzwarth <sup>1</sup>, Jennifer Kriese <sup>1</sup>, Emmanuel da Ponte <sup>1</sup>, Juliane Huth <sup>1</sup> and Claudia Kuenzer <sup>1,2</sup>



- Results available for download: <https://geoservice.dlr.de/web/>

