## Detecting Drought Effects on Tree Mortality in Forests of Franconia with Remote Sensing

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- Forest Health & Remote Sensing
- Research Questions

## Content

- Methods and Data
- Results and Discussion
- Conclusion





### Trends

Forests especially suffer during lasting heatwaves without precipitation, which occur more frequent lately.

### Climate (Change)

- 410 ppm CO<sub>2</sub>
- higher mean temperatures
- more extreme events

- infrequent rain fall
- severe droughts
- temperature records

### Forest health

- dryer soils
- lower ground water levels
- water stress
- limited cooling through evapo-transpiration
- discoloration / defoliation
- mortality
- competition of better adapted species





### Forest Health from Remote Sensing

= plant properties detectable in optical RS imagery

### **Spectral Traits**

- Phenology
- Biomass and productivity
- Damage and disturbance
- Leaf size/form/area/angle
- Plant height/age/ growth form/crown size
- Vegetation density/extent/ heterogeneity/ diversity
- etc.

...indicate declining forest health and are detectable in multispectral RS data

<u>Advantages over in-situ:</u> dramatic cost reduction for large spatial coverage and high temporal observation frequency



Discoloration + Defoliation









### **Research questions**

- . At which **spatial scale** (pixel size) can **dead trees** be detected among **live trees** in remote sensing imagery?
- 2. Which **satellite sensor** is most suitable for the estimation?













andeat

All Band

Fractional Co of Dead Trees







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### **Results: Land Cover Classification**







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![](_page_13_Picture_1.jpeg)

![](_page_14_Figure_0.jpeg)

![](_page_14_Picture_1.jpeg)

![](_page_15_Picture_0.jpeg)

### Conclusion

- Random sampling is <u>not suitable</u> for such few occurrences of dead trees
  → Stratified sampling approach?
- Fractional cover of dead trees <u>can</u> be estimated <u>if</u> training data is representative
- In this light: difficult to answer research questions
  - $\rightarrow$  Additional spectral information improve results
  - $\rightarrow$  Sentinel-2: good combination of spatial and spectral detail

![](_page_15_Picture_7.jpeg)

![](_page_15_Picture_8.jpeg)

R<sup>2</sup> of 0.5 was

already reached

with this aapproach

![](_page_16_Picture_0.jpeg)

# Thank you for stopping by!

![](_page_16_Picture_2.jpeg)

#### References:

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![](_page_16_Picture_8.jpeg)