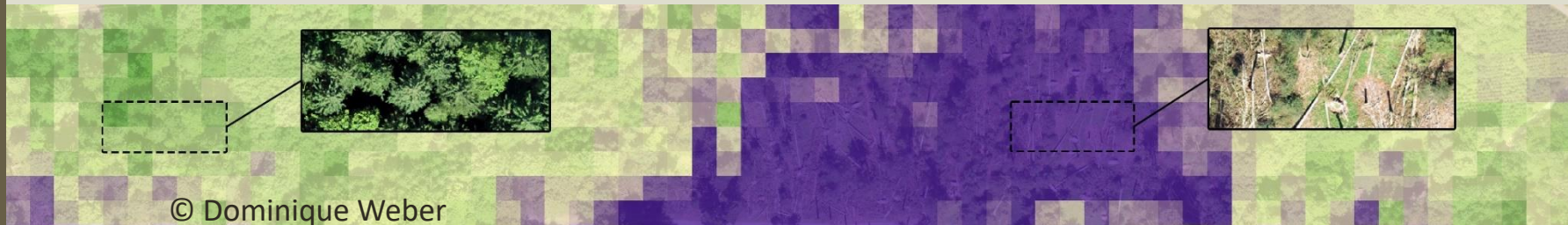**Remote sensing lectures present:**

Remote sensing of forest disturbances

Moderation: Lars T. Waser

Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland

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Information about this webinar

➢ 15 minutes break around 10:30

➢ Discussion after each presentation

➢ Chat (sharing additional information, asking questions etc.)

➢ Organization committee:
Tiziana Koch, Dominique Weber and Marius Rüetschi, Lars Waser
(Remote sensing group WSL)

➢ Don't want to miss upcoming remote sensing lectures?

Send an email to waser@wsl.ch to be added to the
remotesensing@wsl.ch list.

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Schedule

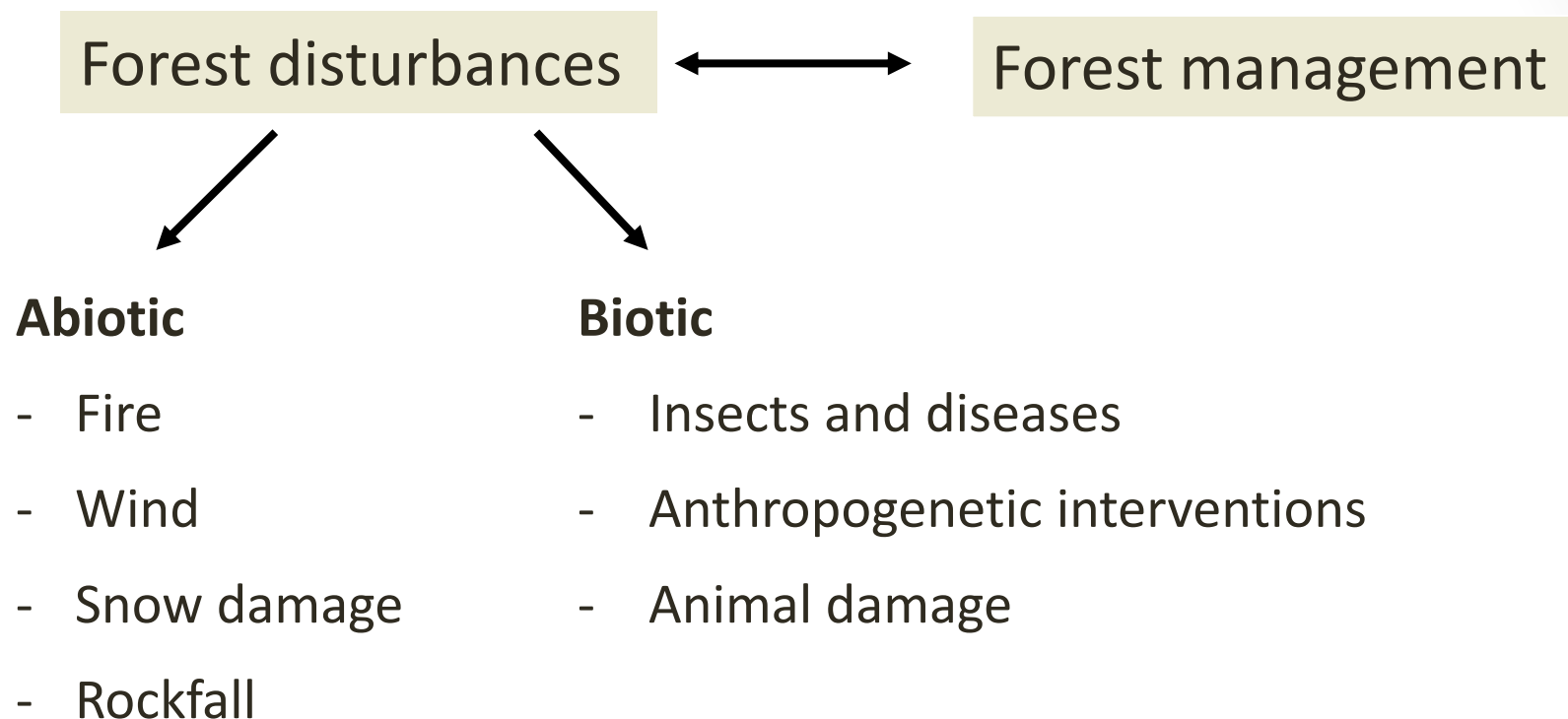| Time		
9:00-9:10	**Welcome note, overview disturbances at WSL**	
	Lars Waser, Remote sensing group, WSL	
9:10-9:30	**Remote Sensing for monitoring ash dieback in Germany**	
	Petra Adler, FVA Freiburg, Germany	
9:30-9:50	**Bark beetle damage detection in Bavaria**	
	Christoph Straub, LWF Freising, Germany	
9:50-10:10	**Large-scale early-wilting response of Central European forests to the 2018 extreme drought**	
	Philipp Brun, Dynamic macroecology group, WSL	
10:10-10:30	**The drought of 2018 and its effects on bark beetle outbreaks in Swiss forests**	
	Achilleas Psomas, Remote sensing group, WSL	
10:30-10:45	**Break**	
10:45-11:20	**Overview, Big data**	
	Gherardo Chirici, University of Florence, Italy	
	Storm damages "Vaia" using multi-remote sensing data	
	Francesca Giannetti, University of Florence, Italy	
	GEE for large-area disturbance mapping	
	Saverio Francini, University of Florence, Italy	
11.20-11:40	**Rapid Sentinel-1-based detection of windthrows - first results of the FNEWs project**	
	Marius Rüetschi, Remote sensing group, WSL	
11:40-12:00	**From pixels to events: identifying storms and fires from satellite-based disturbance maps**	
	Cornelius Senf, TUM, Freising, Germany	
12:00	**Wrap-up and closing**	

Disease, Pathogens

Insects

Drought

Storm, Windthrows

Fires

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Forest disturbance categories

| Forest disturbances | ⟷ | Forest management |

Abiotic

- Fire
- Wind
- Snow damage
- Rockfall

Biotic

- Insects and diseases
- Anthropogenetic interventions
- Animal damage

-> Detecting real disturbances challenging

Ceccherini et al. 2020
Palahí et al. 2021
Senf & Seidl 2021

Basics

Ranking of forest disturbances using RS

-> based on Web of Science
   literature research
   (ISI papers)

n = 5442
fire: 2402
windthrows: 12

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Overview disturbances of RS at WSL

Ranking

Windrows, storms

Drought, barkbeetles

Pathogens, Fire

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Windthrows

Windthrows, storms

- Large-scale (Friederike, Burglind 2018, Bernd 2019)

- Small-scale (Thunder storms 2018, 2021)

-> Rapid detection with Sentinel-1 (5 acquisitions after event)

-> Δ in backscatter values -> **Potential areas of windthrows**

-> Wet snow threshold determination to improve reliability

S1: areal damages, no single throws (=> S2, PlanetScope)

Rüetschi et al. 2019, Small et al. 2021

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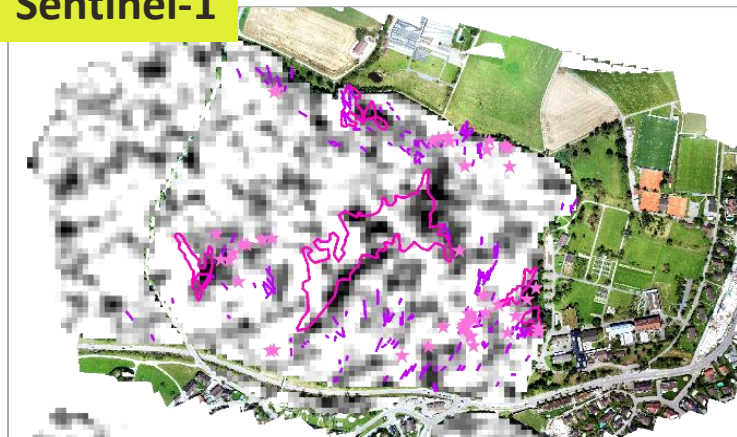May 11, 2022, Webinar

Sensor comparison

Thunder storm July 2021

Weber et al. 2021, Zürcher Wald

Windthrows, storms

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-> see presentation of Philipp Brun

-> 2018 – a very hot and dry summer
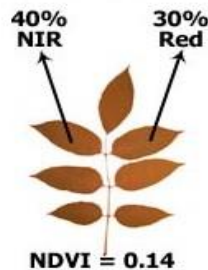
2018 drought

Normalized Difference Vegetation Index

NDWI = (NIR - MIR) / (NIR + MIR)

Normalized Difference Water Index

+ LAI, NDMI etc.
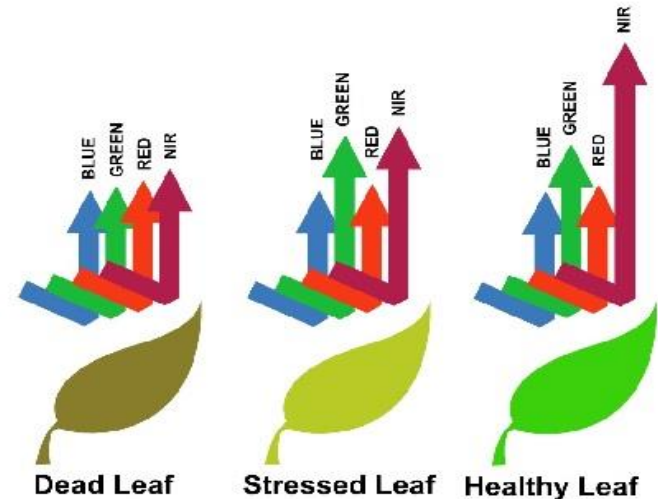
Brun et al. 2020, Global Change Biology

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Long-term effects

of 2018 drought on Swiss forest ecosystems

Bark beetle hotspots

🛡 Drought stress based on NDWI anomalies

🟡 Bark beetle infestation since 2018

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Disease, vitality of trees

- **Sentinel-2** time series and vegetation indices:
  Tintenkrankheit *Phytophthroa cambivora / P. cinnamomi*
  Sweet Chestnut, Southern Switzerland
  2015

- Reference data:
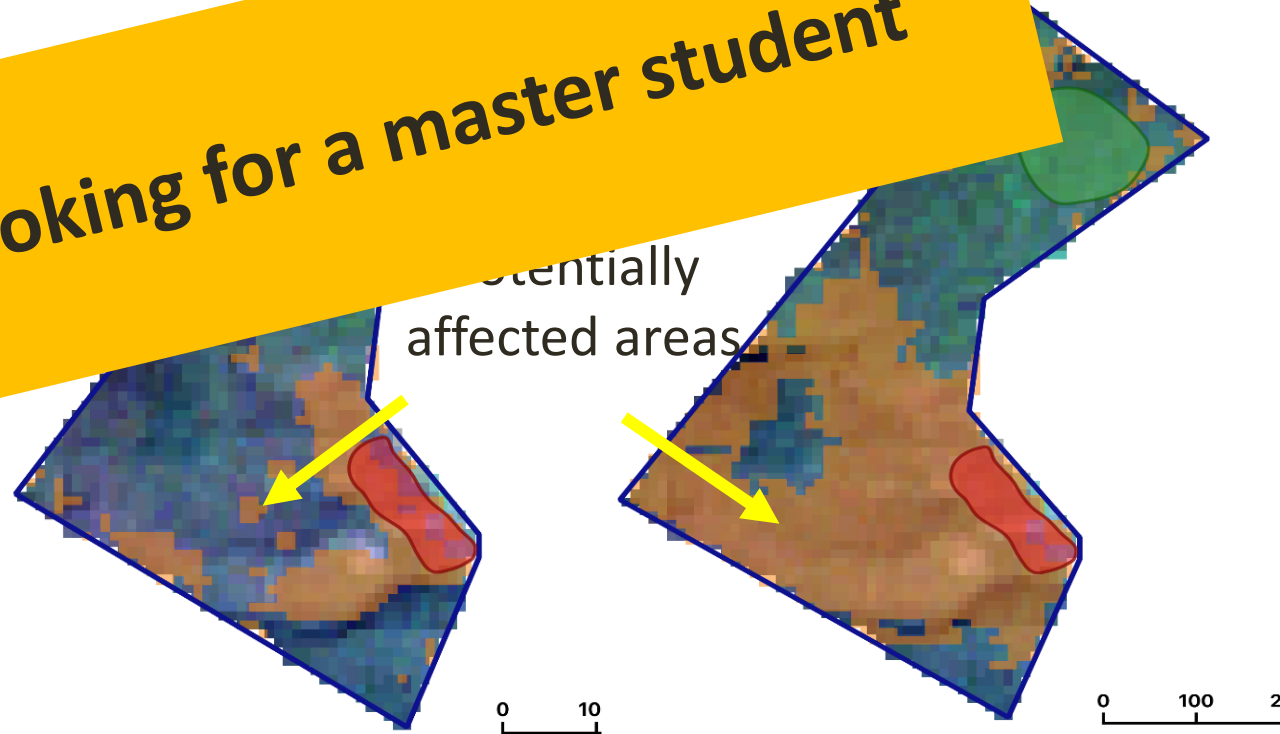 aerial images an
  field s

Looking for a master student

...tentially
affected areas

Source: Eva Augustiny, Simone Prospero, WSL

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Break

Wrap-up

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Wrap-up

- Most disturbance categories at different spatial extents are detectable with RS

  -> Near-realtime often not feasible

- High potential for multi-source approaches (active, passive)

  -> Infrared bands relevant => Vegetation indices (NDVI, NDWI, LAI…)
  -> SAR-data are (almost) weather independent

- Quantification of disturbances must be handled with care

- Feedback from pratice indispensable! Collaboration!
  Real damages ≠ forest management

- Additional use of existing data sets (e.g VHM, crown cover etc.)

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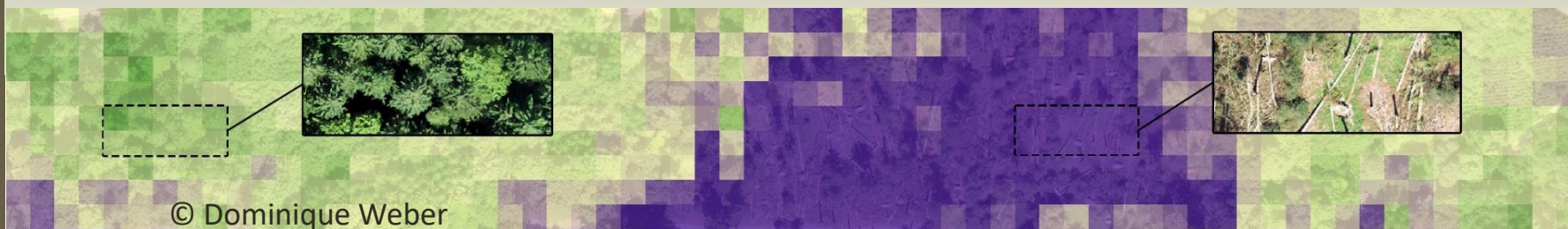
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> ➤ **Organization committee:**
>   Tiziana Koch, Dominique Weber and Marius Rüetschi, Lars Waser

> ➤ Send me your feedback / suggestions etc.

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