



# Monitoring forest canopy structure dynamics from space using GEDI and Sentinel-1

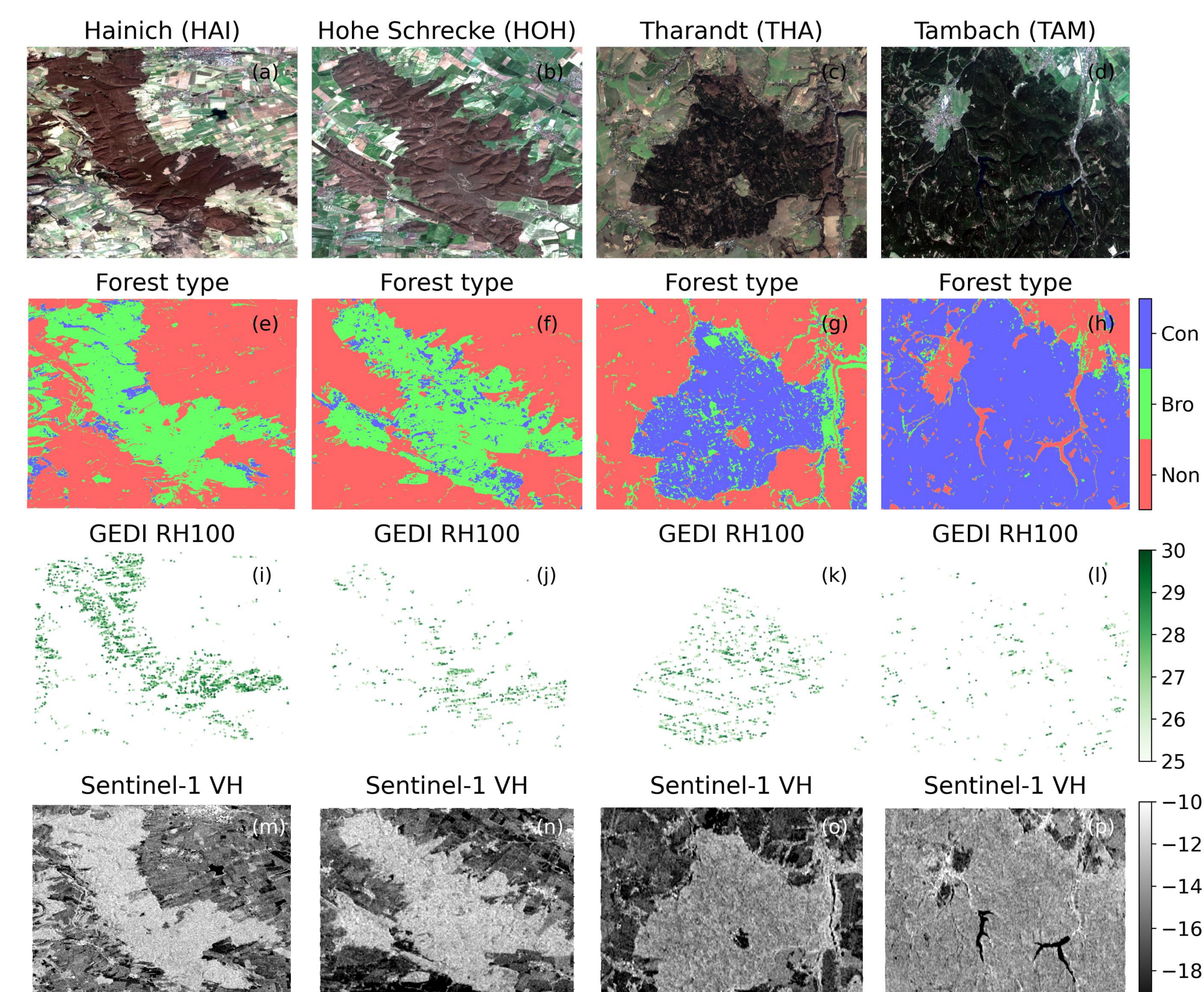
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## Motivation

- NASA's Global Ecosystem Dynamics Investigation (GEDI) lidar has dense multi-temporal observations around 51° N. However, the possibility of using GEDI to monitor the forest canopy structure dynamics over time has not yet been investigated.
- ESA's Sentinel-1 (C-band synthetic aperture radar) can collect forest structure information and has a larger spatial coverage than GEDI. The relationship between Sentinel-1 measurements with GEDI-derived canopy cover profile is not clear yet though.

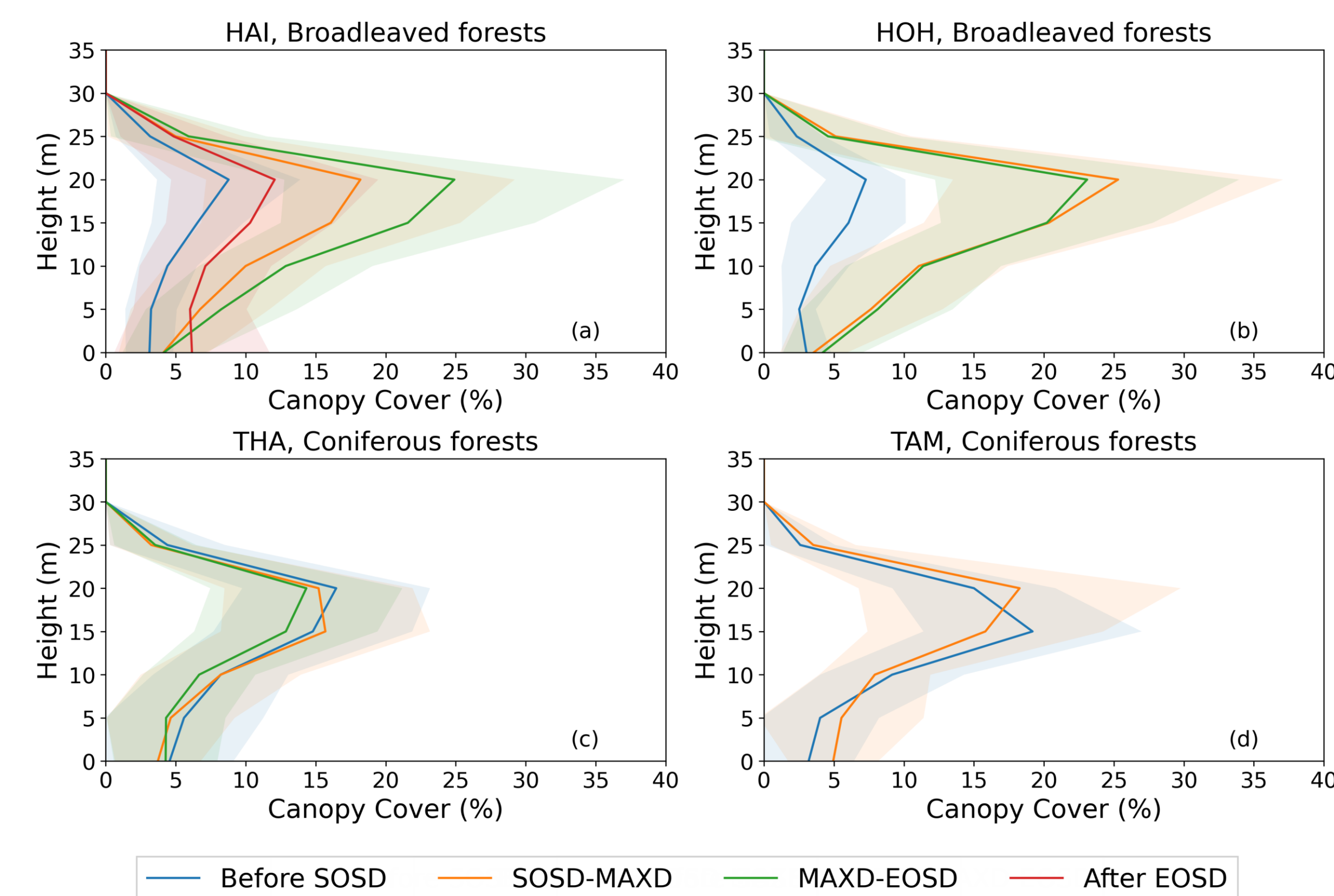
## Study Sites and Data

- Study sites : two coniferous (Con) forests and two broadleaved (Bro) forests in Germany.
- Data: GEDI Level 2B product, Sentinel-1 RTC backscatter, and Copernicus forest type and phenology products (SOSD: Day of start-of-season, MAXD: Day of max-of-season, EOSD: Day of end-of-season).

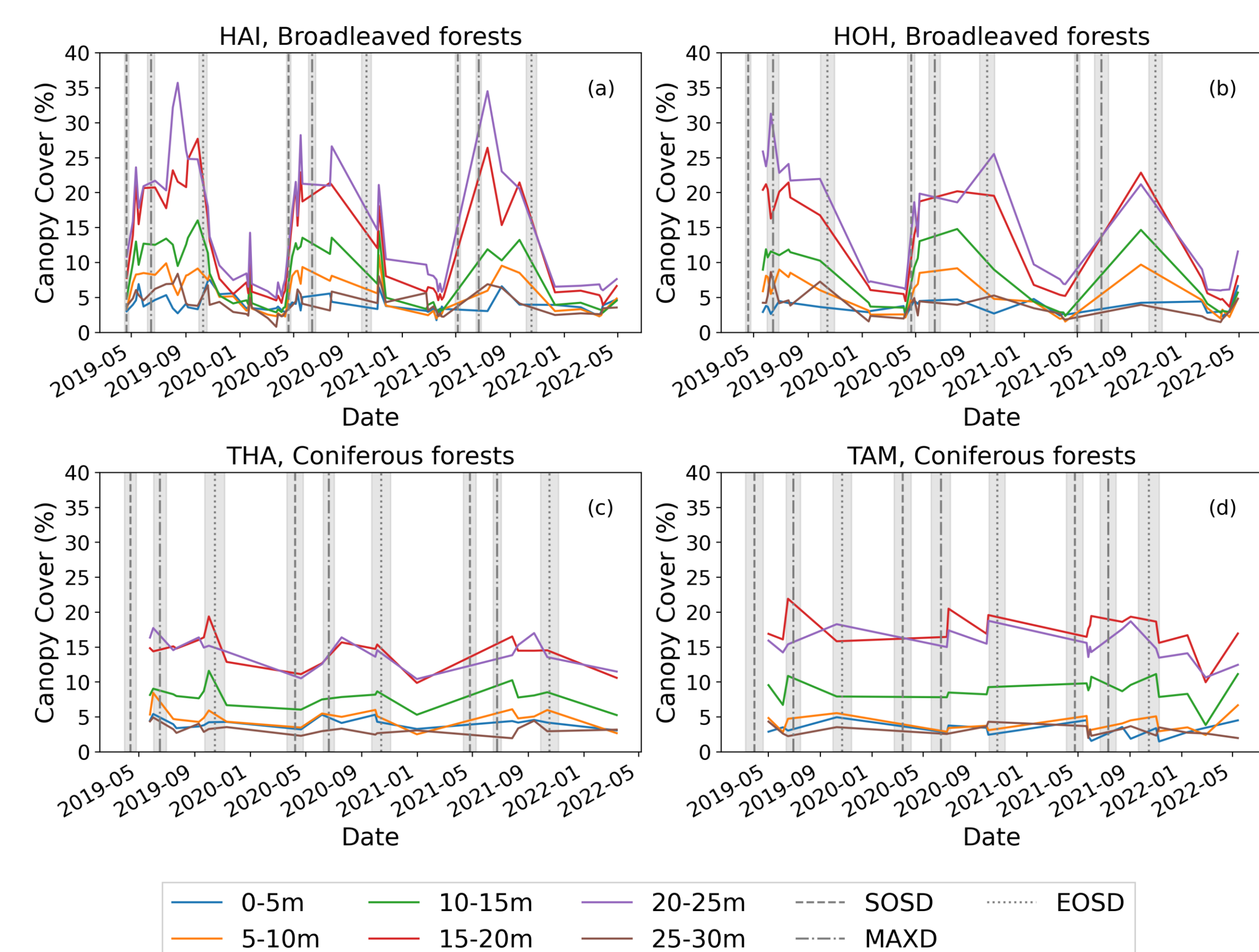


## Results

### 1. GEDI mean canopy cover profiles in 2019



### 2. GEDI mean canopy cover profiles from 2019 to 2022



## Conclusions

- GEDI can detect canopy structure changes in broadleaved forests.
- Sentinel-1 VV/VH ratio is sensitive to GEDI canopy cover at middle canopy layer, e.g., the 10-25 m layer for broadleaved forests with canopy height around 30 m.
- There is no significant relationship between GEDI canopy cover and Sentinel-1 backscatter in coniferous forests.

### 3. Comparing GEDI canopy cover time series with Sentinel-1 VV/VH time series in broadleaved forests

