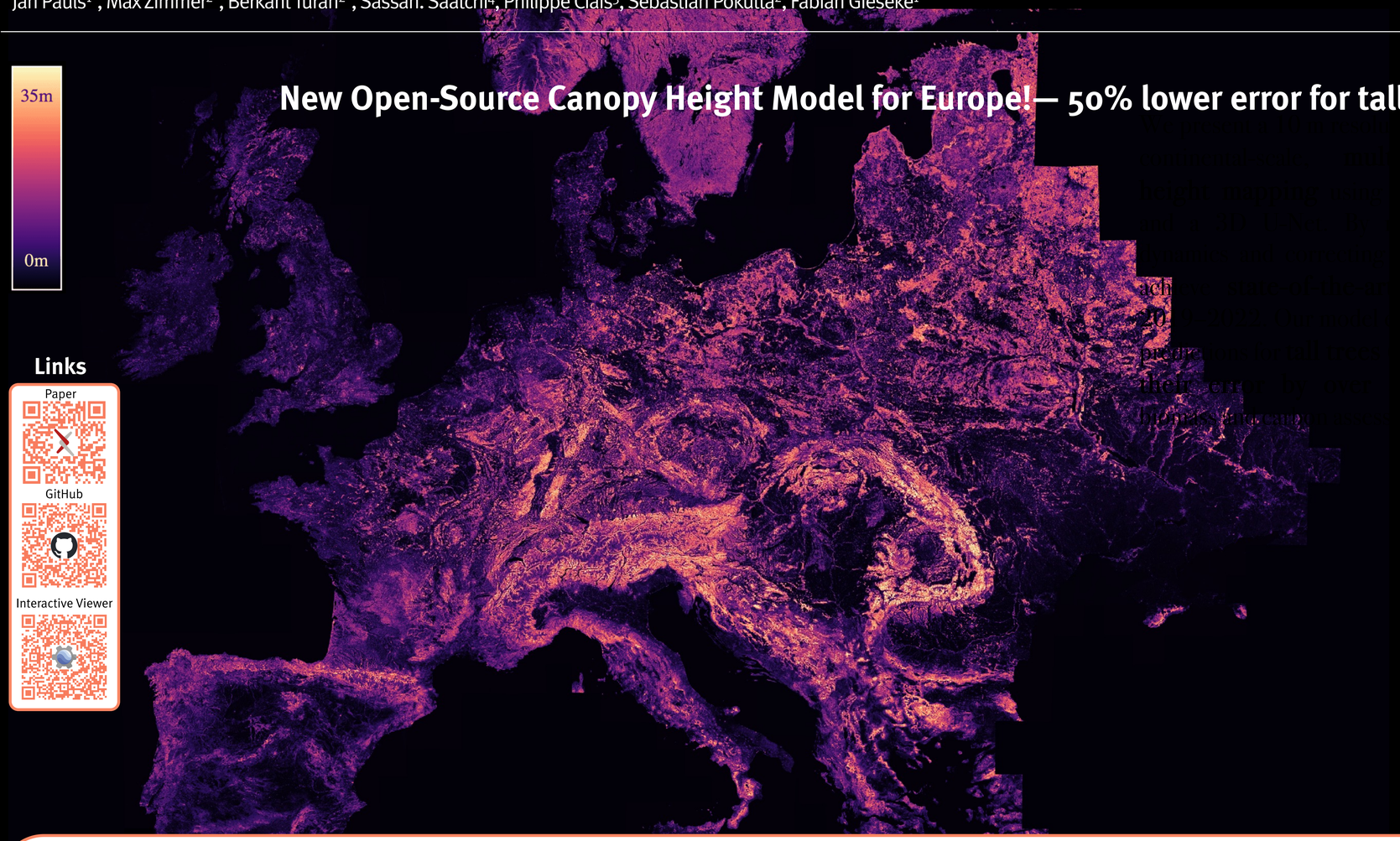
Capturing Temporal Dynamics in Large-Scale Canopy Tree Height Estimation

Jan Pauls[1*], Max Zimmer[2*], Berkant Turan[2*], Sassan. Saatchi[4], Philippe Ciais[3], Sebastian Pokutta[2], Fabian Gieseke[1]

1 Universität Münster 2 ZIB 3 LSCE 4 NASA



New Open-Source Canopy Height Model for Europe! — 50% lower error for tall trees

Links

Paper

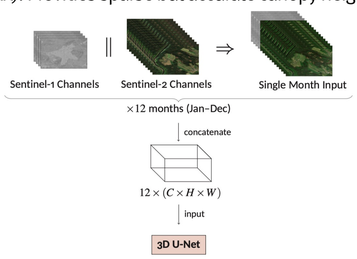
GitHub

Interactive Viewer

Methodology

We combine satellite data to map tree height at 10 m resolution:

- Sentinel-1 (Radar): Penetrates clouds, captures forest structure
- Sentinel-2 (Optical): Tracks vegetation across 13 spectral bands
- GEDI (LiDAR): Provides sparse but accurate canopy height for training



Benchmark Results

We benchmark our model against five leading global and continental-scale methods. Despite relying on 10 m Sentinel-1/2 data, our framework achieves the lowest metrics, surpassing higher-resolution approaches based on Planet and Maxar imagery.

	Source	MAE [m]	MSE [m^2]	RMSE [m]
Tolan et al. (2024)	Maxar	11.25	212.14	13.25
Liu et al. (2023)	Planet	8.17	138.25	10.36
Lang et al. (2023)	S2	5.74	84.68	7.57
Pauls et al. (2024)	S1/2	5.46	83.14	7.40
Turubanova et al.	Landsat	12.39	252.57	14.14
Ours	**S1/2**	**4.76**	**74.28**	**6.75**