A comparative study of the phase bias in C-band and L-band InSAR

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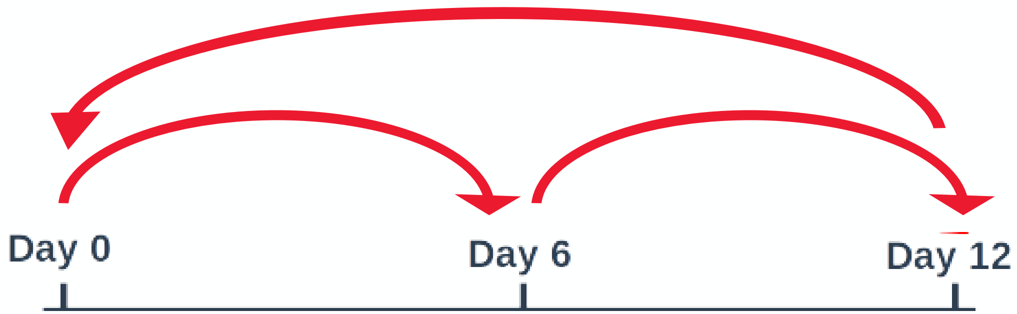
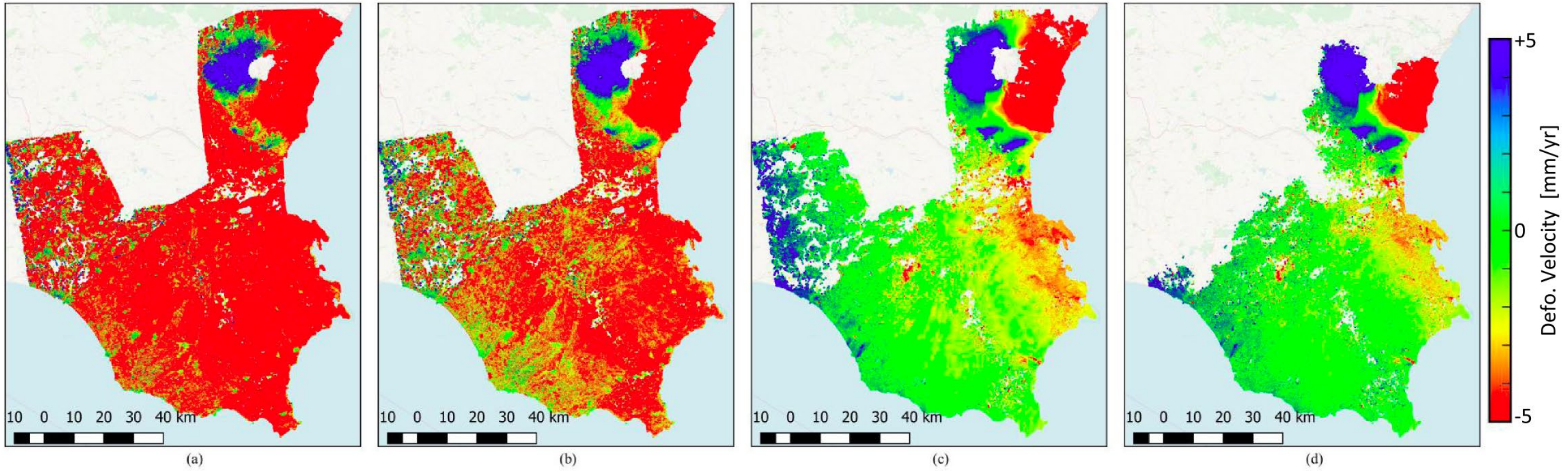
University of Leeds, UK | 11 - 15 September 2023.

Non-zero phase closure are a result of multilooking short-term interferograms



$$\left(\varphi_{0,6} + \varphi_{6,12}\right) - \varphi_{0,12} \neq 0$$

Small contributions accumulate to bias deformation



Displacement velocity maps of three different DS processing schemes (short temporal baselines) and PSI processing which is used as a benchmark.
Figure from H Ansari et al., IEEE TGRS 2021

Motivation

- How and where does phase misclosure present itself for L-band InSAR?
- With the difference in wavelength, how is this different to C-band?
- What can we learn about the underlying physical mechanisms from this dataset?

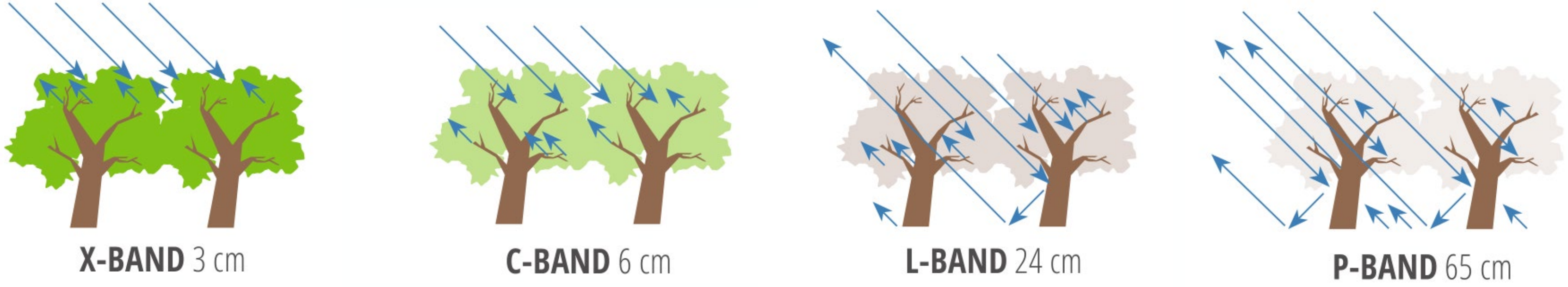


Figure from the NASA SAR Handbook, 2019

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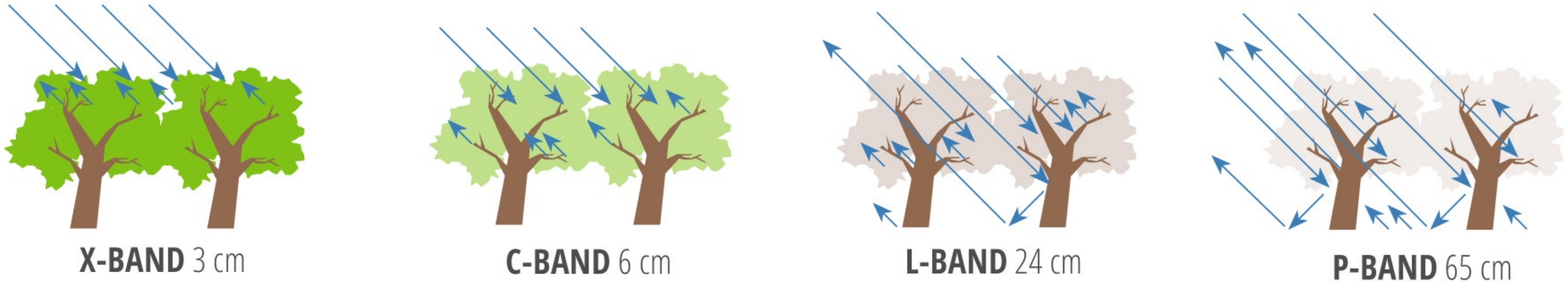


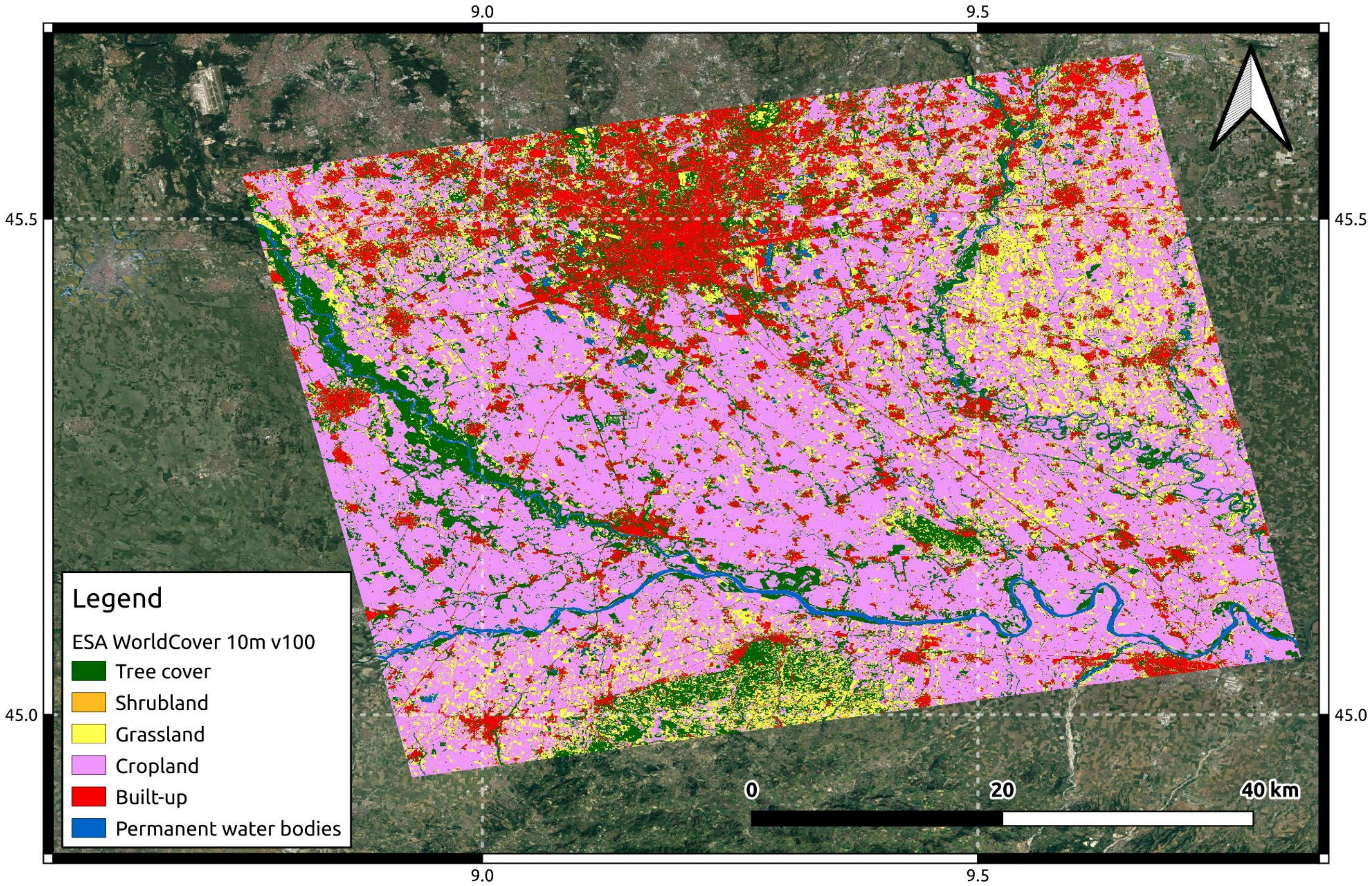
Figure from the NASA SAR Handbook, 2019

Study Region: Milan and surroundings, Italy

September 2020 to September 2021

Varied Landcover

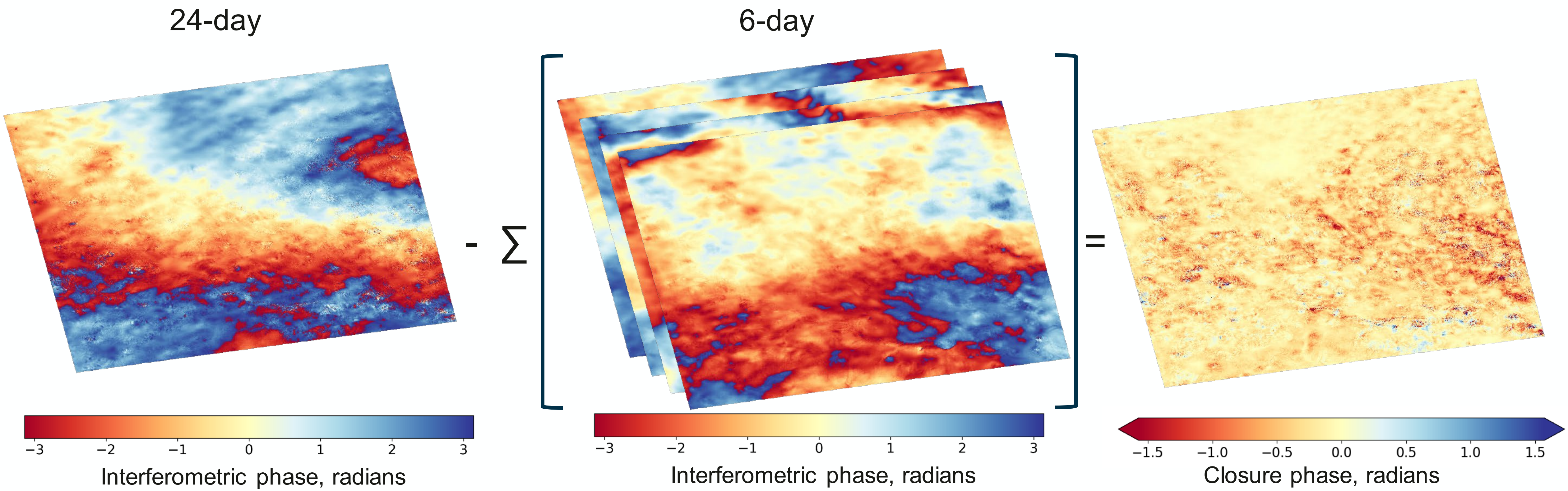
March 2020



Loop closure: Sentinel-1 C-band

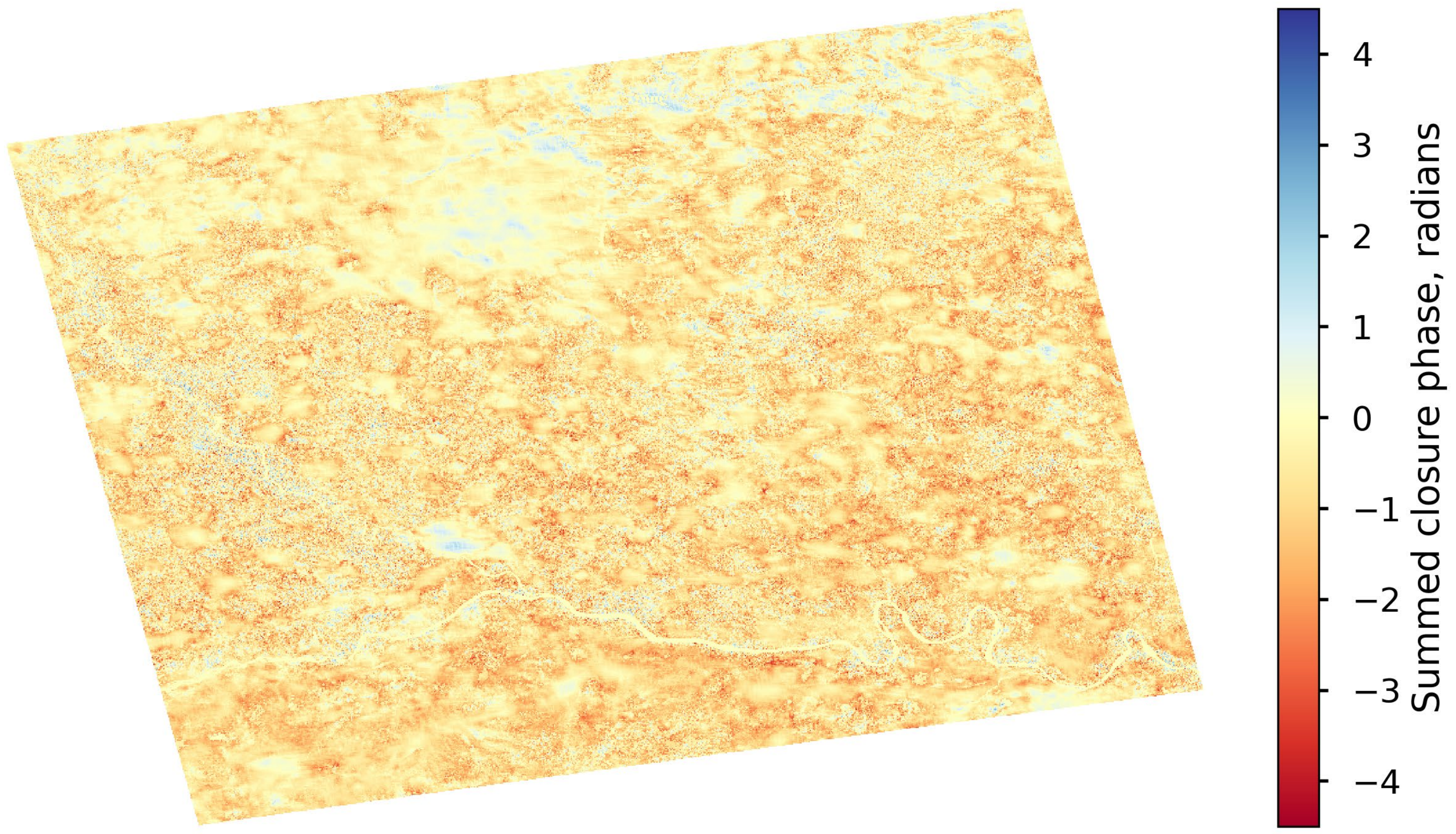
Interferograms processed by LiCSAR (COMET)

21st March 2021 to 14th April 2021, looks = 5 x 20



C-band: Cumulative loop closure

Sum of all 24 - (6 + 6 + 6 + 6) day loops



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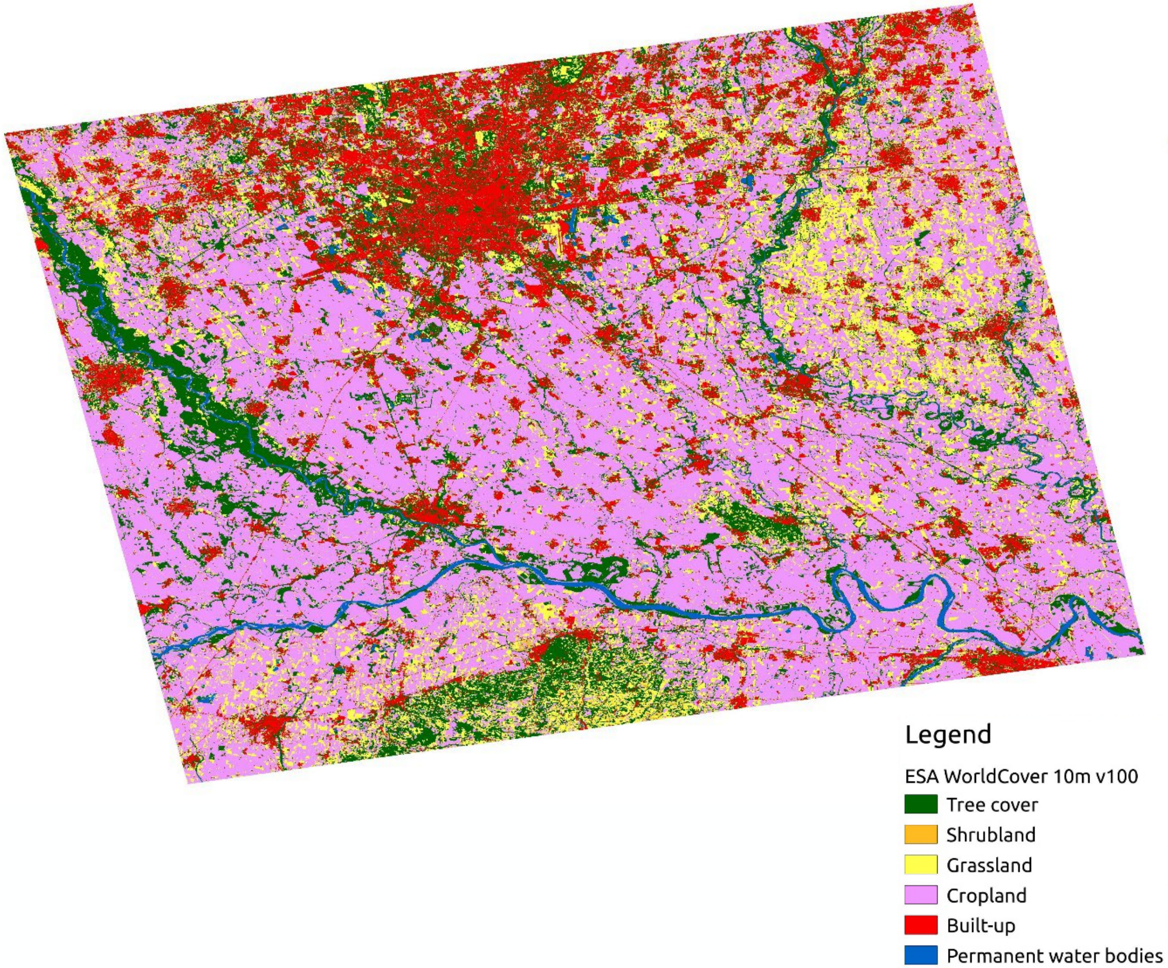

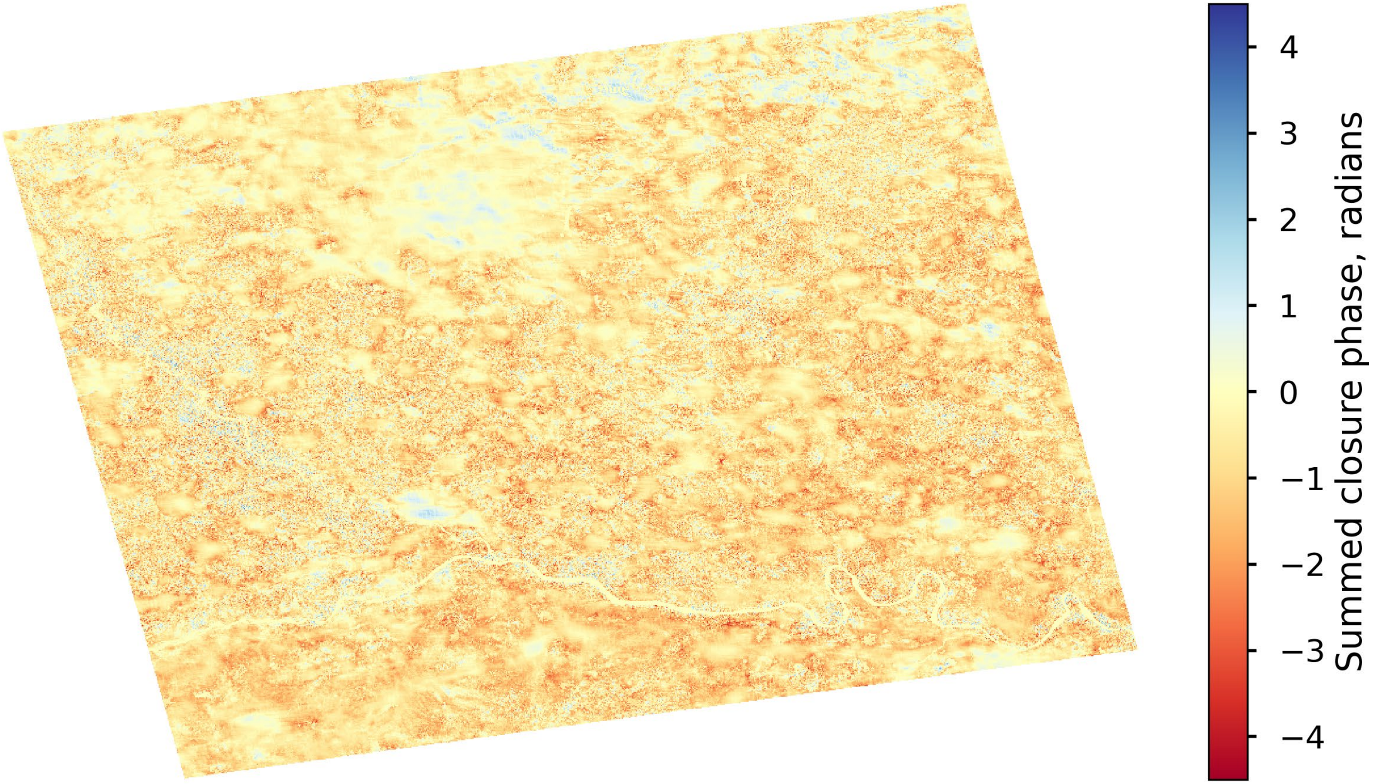

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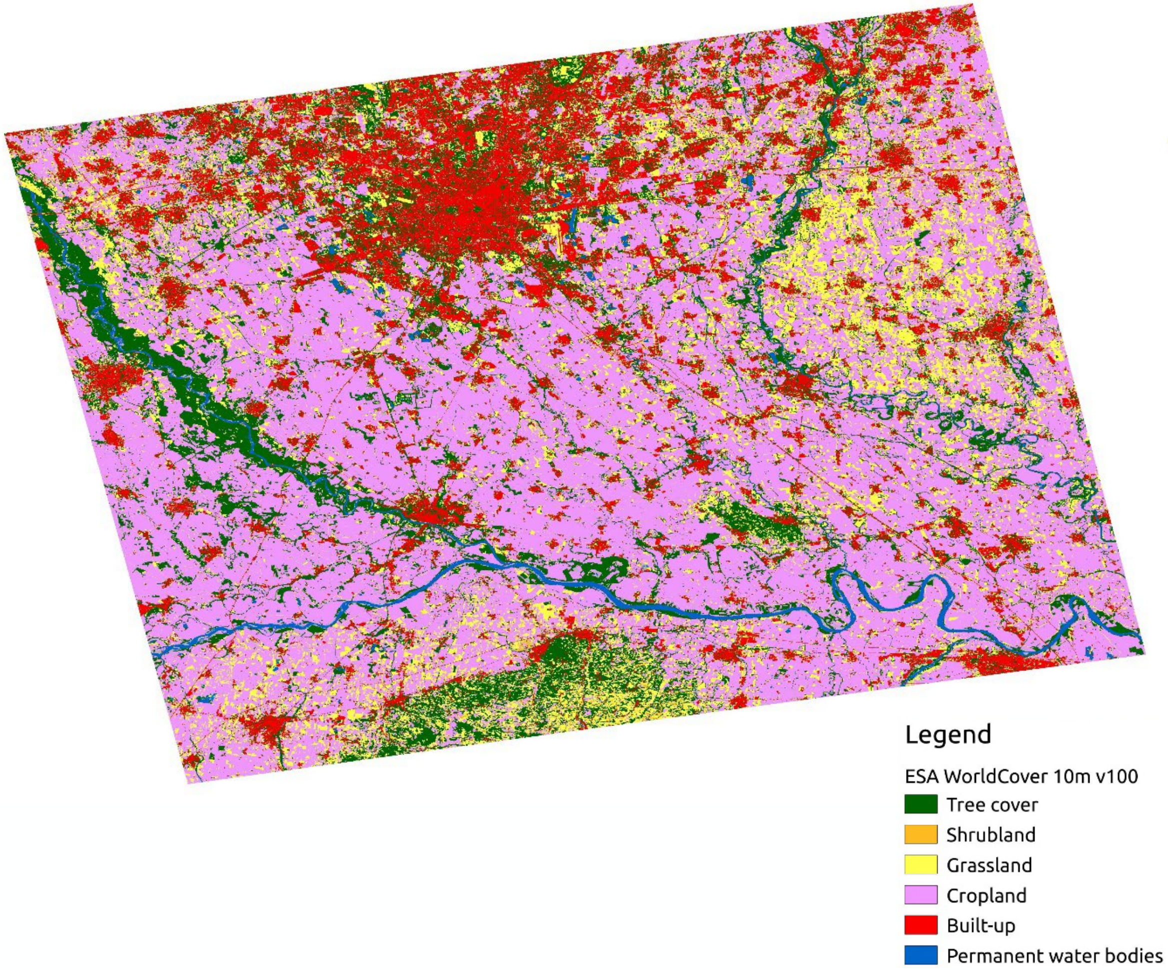

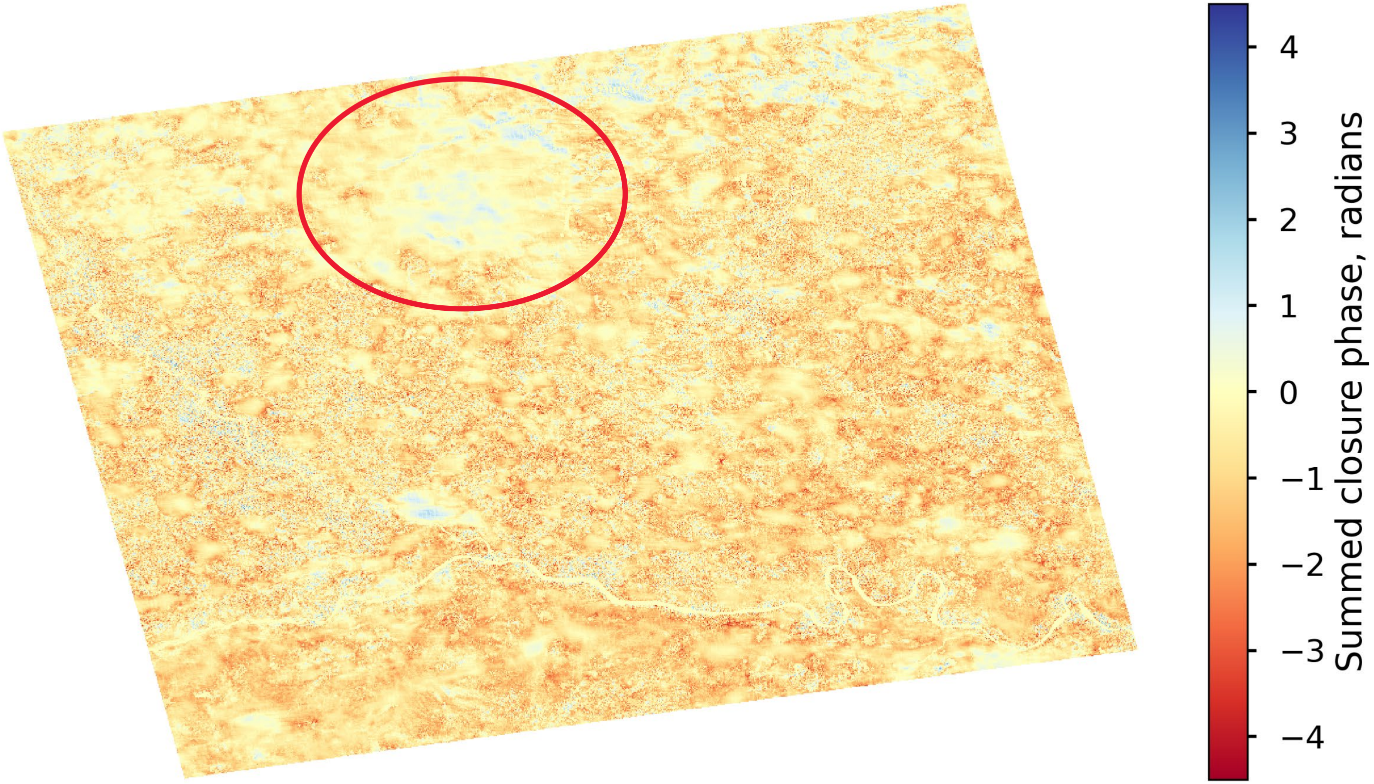

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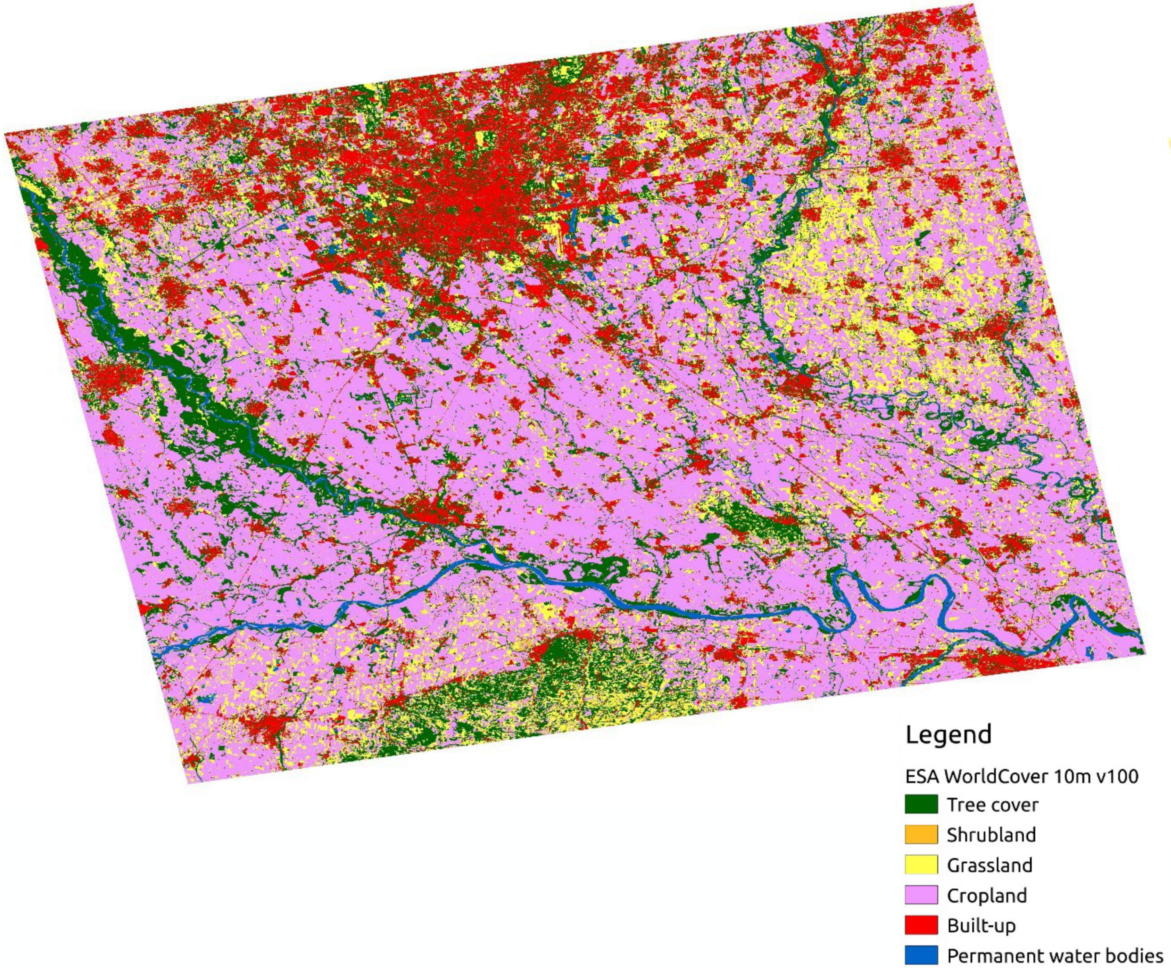
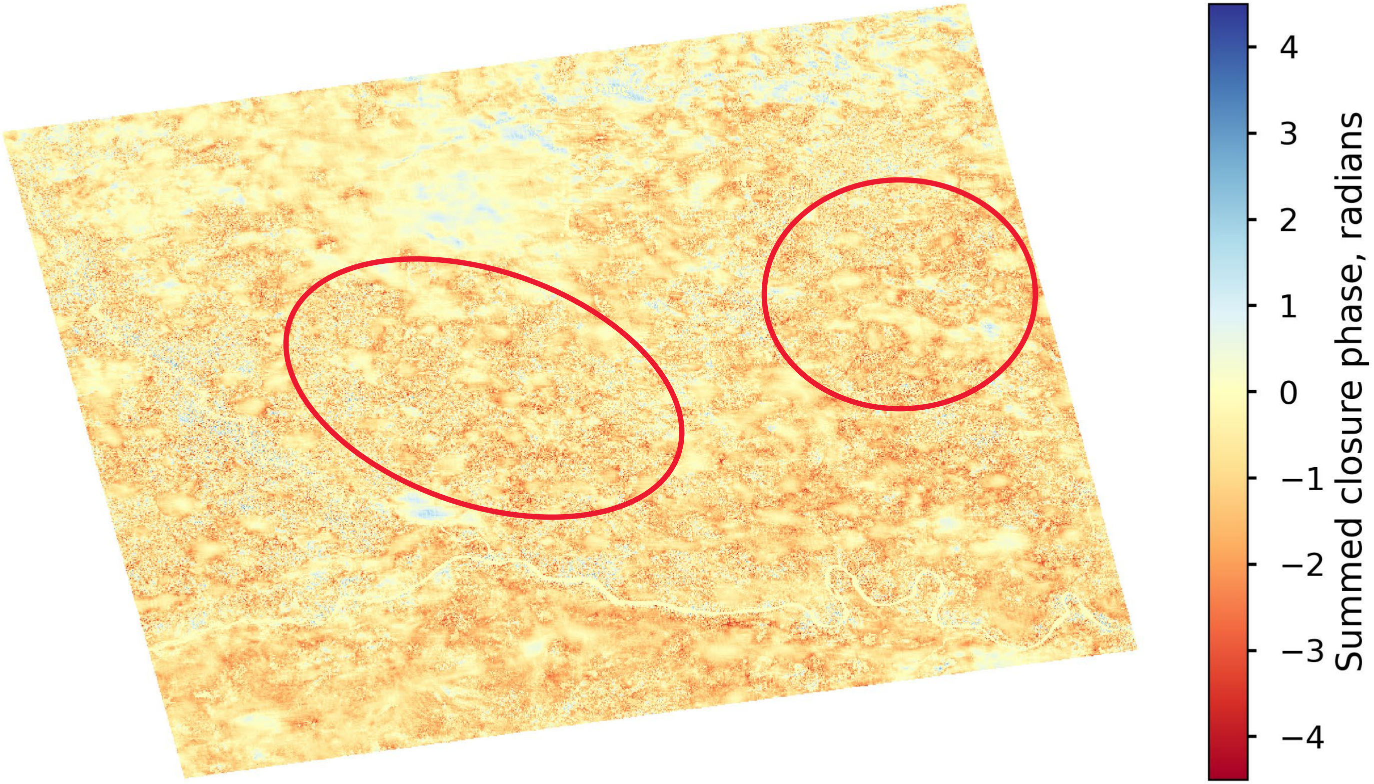
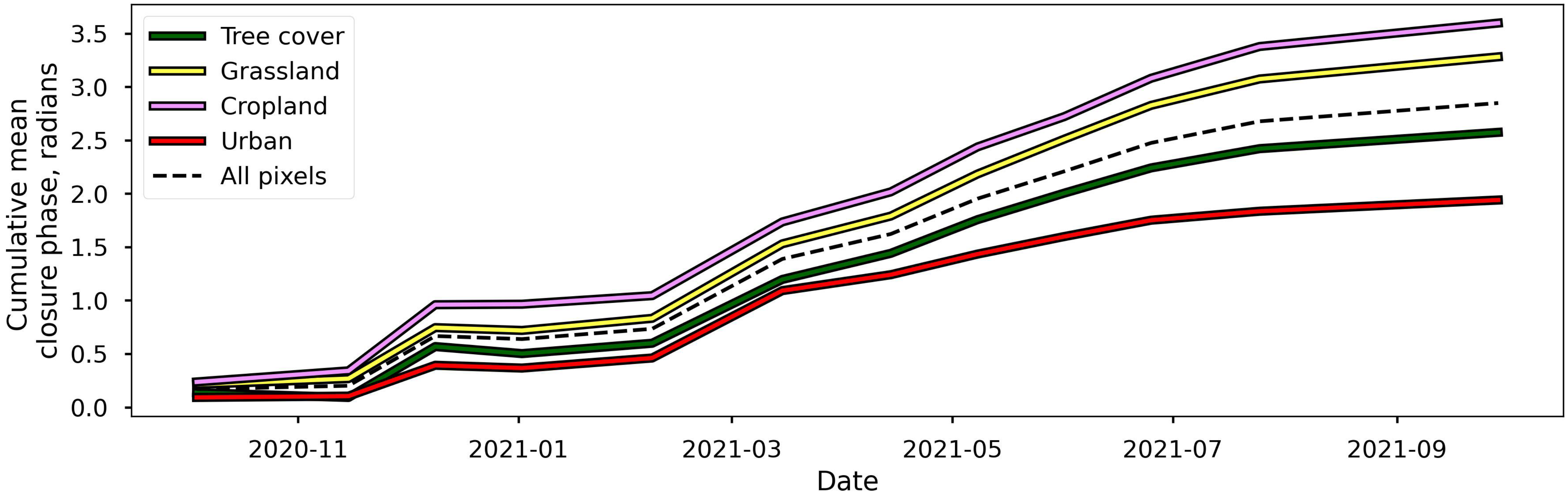




Loop closure time series by landcover: C-band



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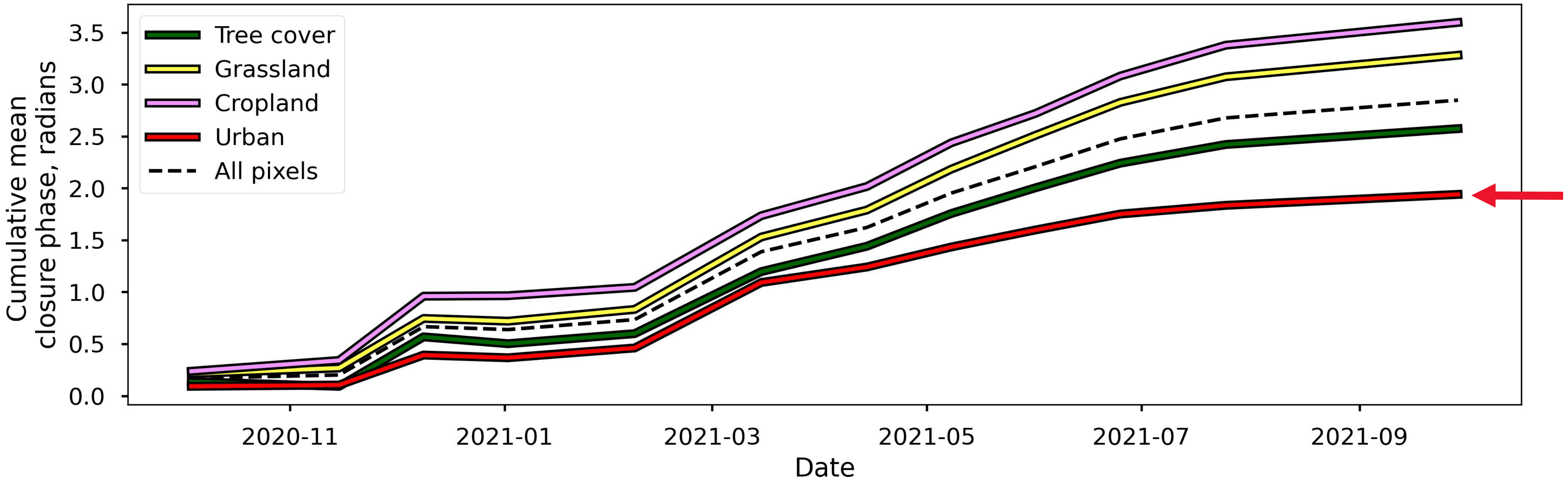
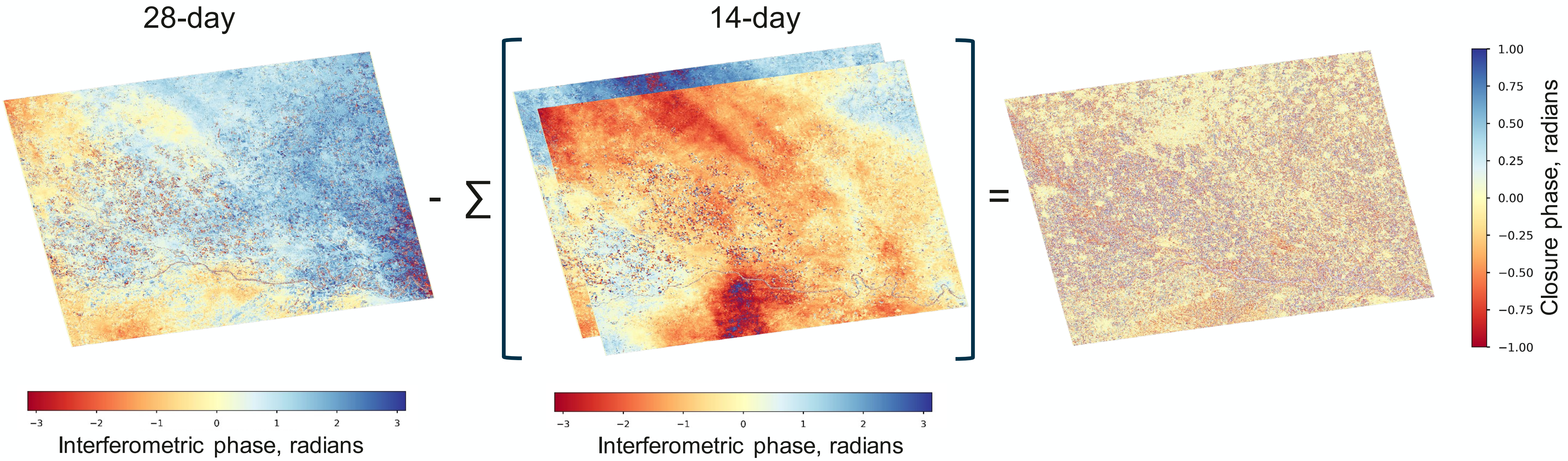


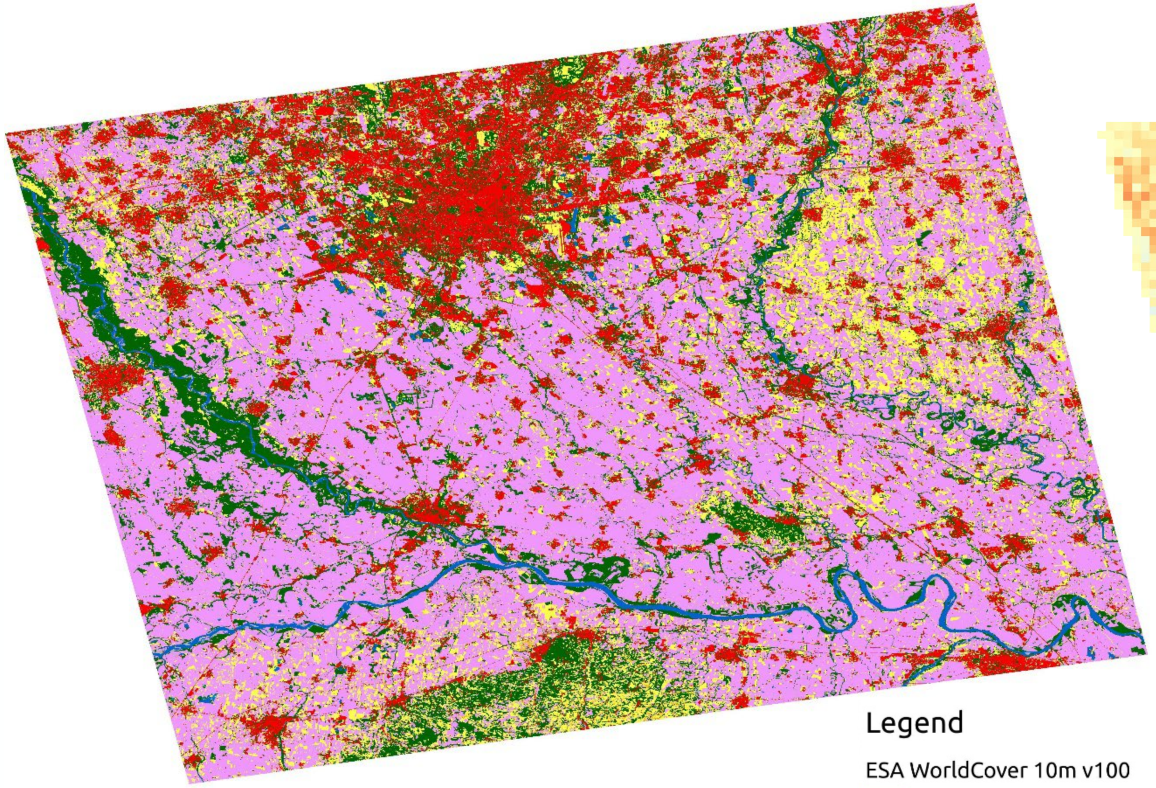
Loop closure: ALOS-2 L-band

28 - (14 + 14) day loop: 26th June to 12th July 2021

26th June to 12th July 2021, looks = 4, 14

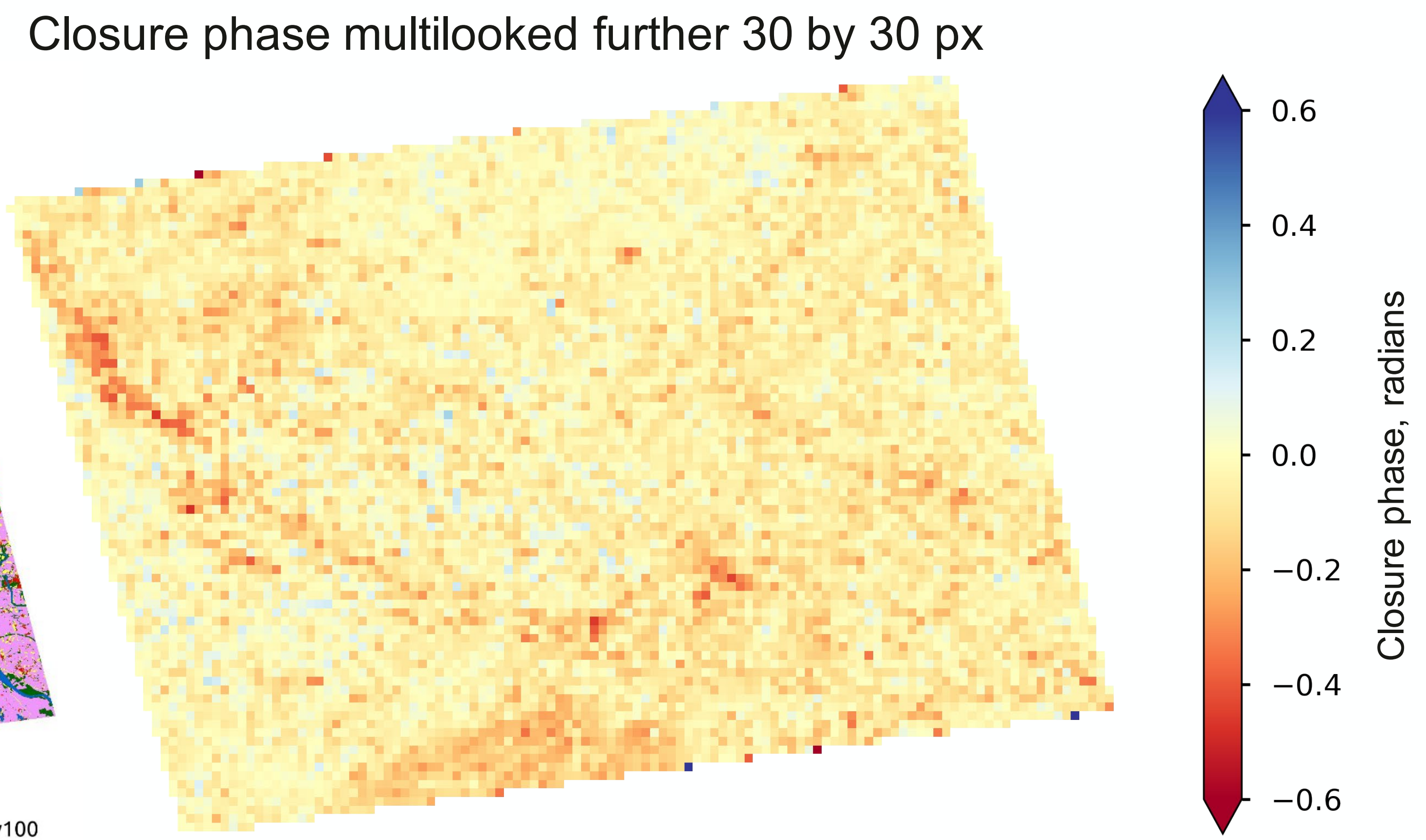


L-band: Greater loop misclosure for forested areas



Legend

ESA WorldCover 10m v100
- Tree cover
- Shrubland
- Grassland
- Cropland
- Built-up
- Permanent water bodies



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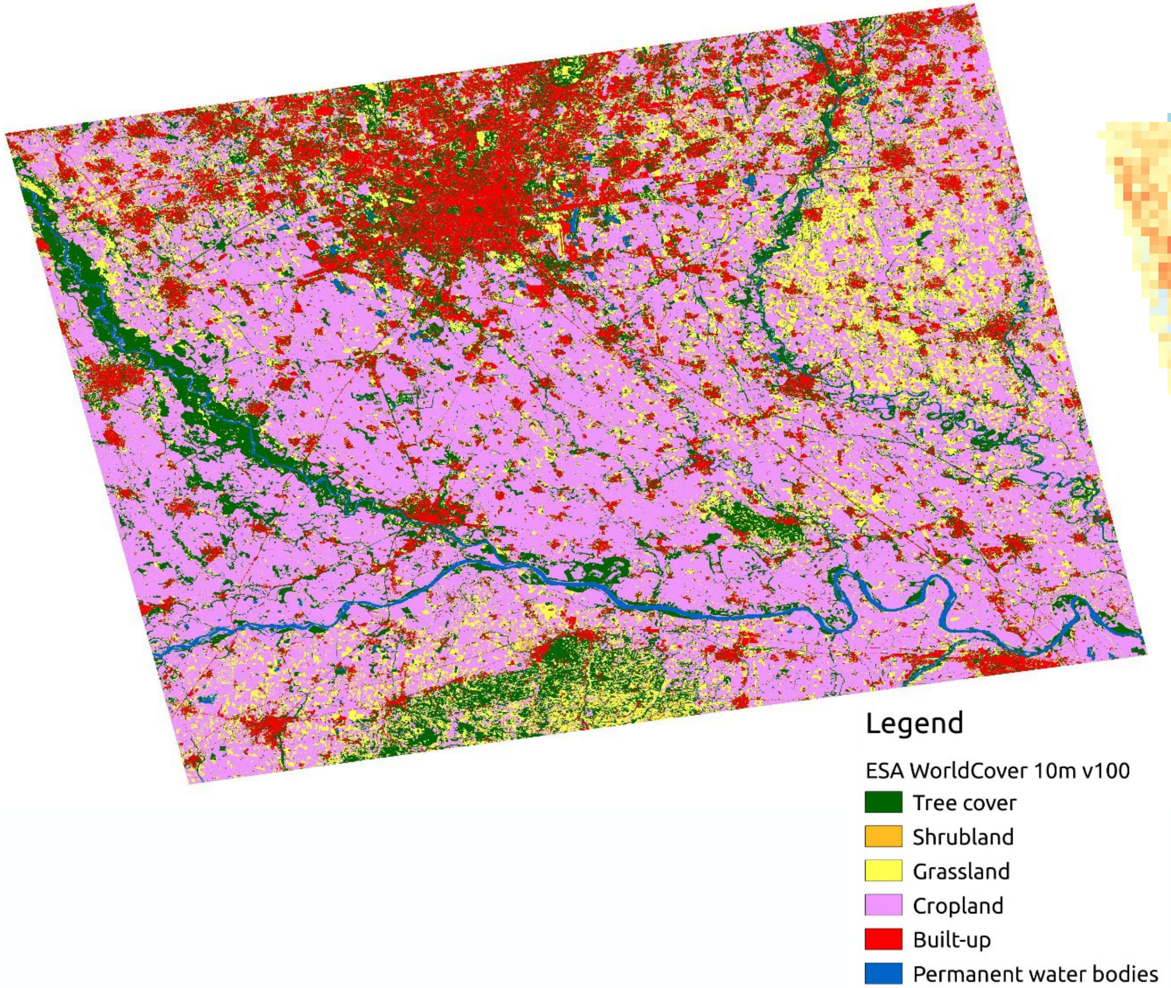

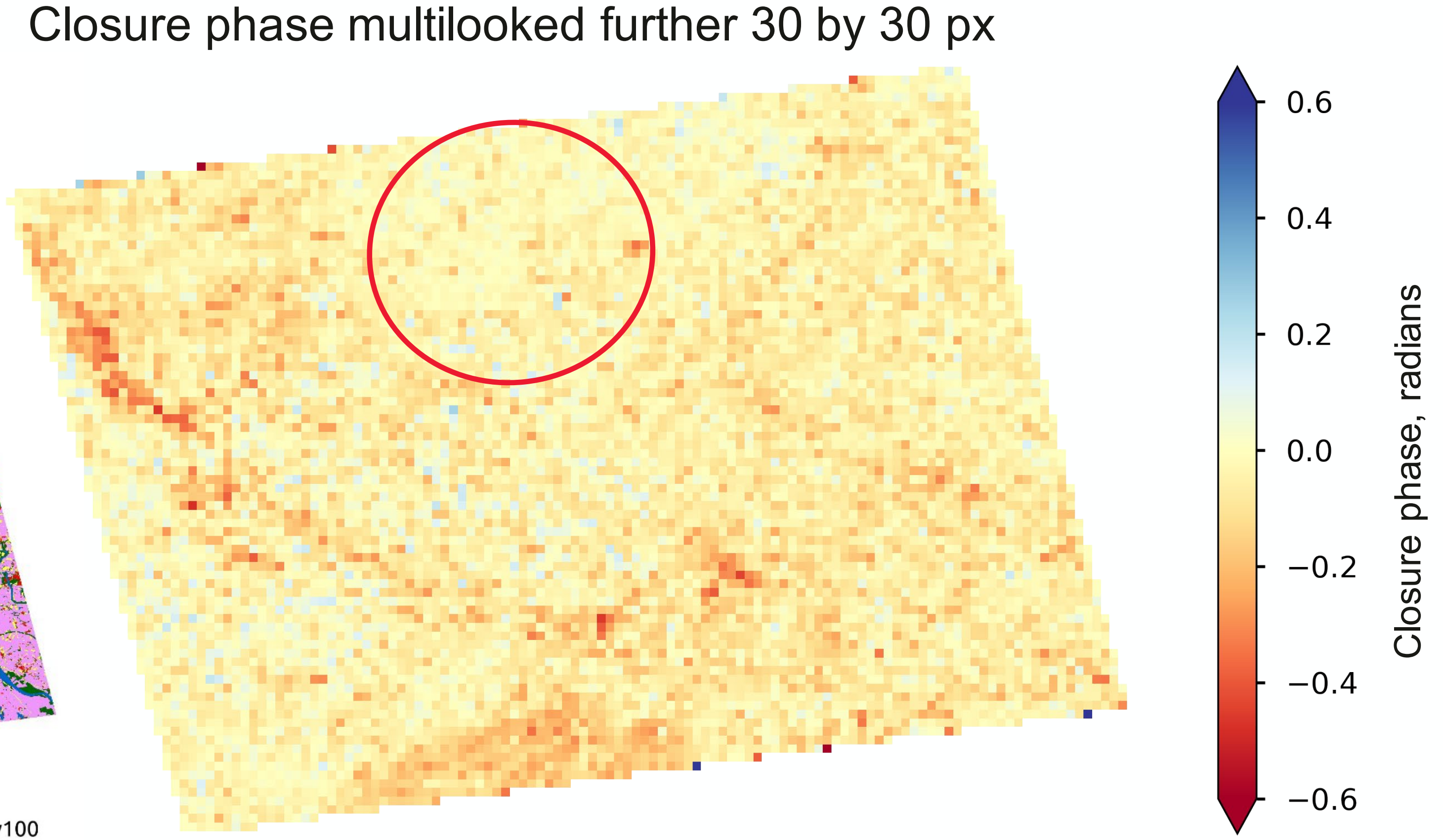

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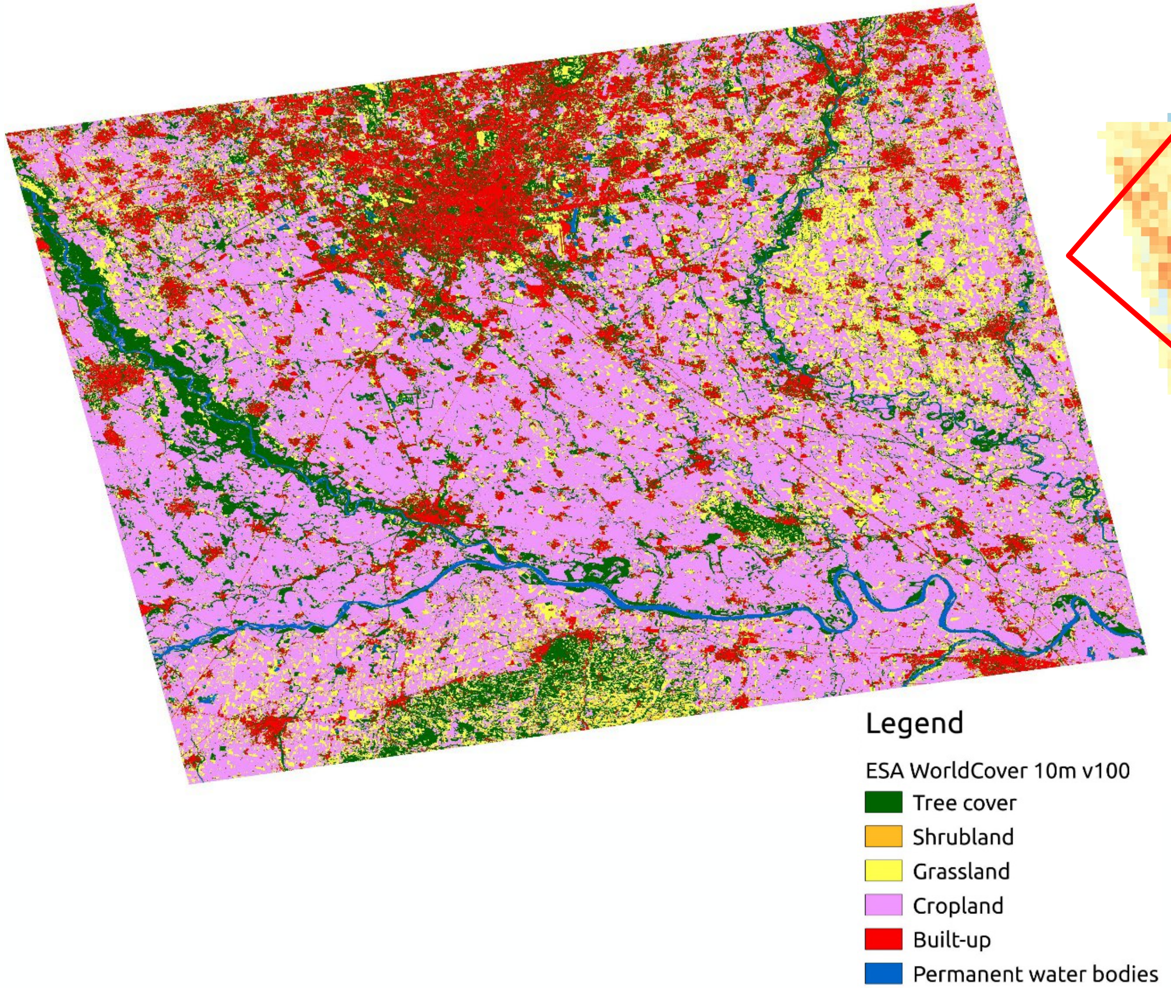
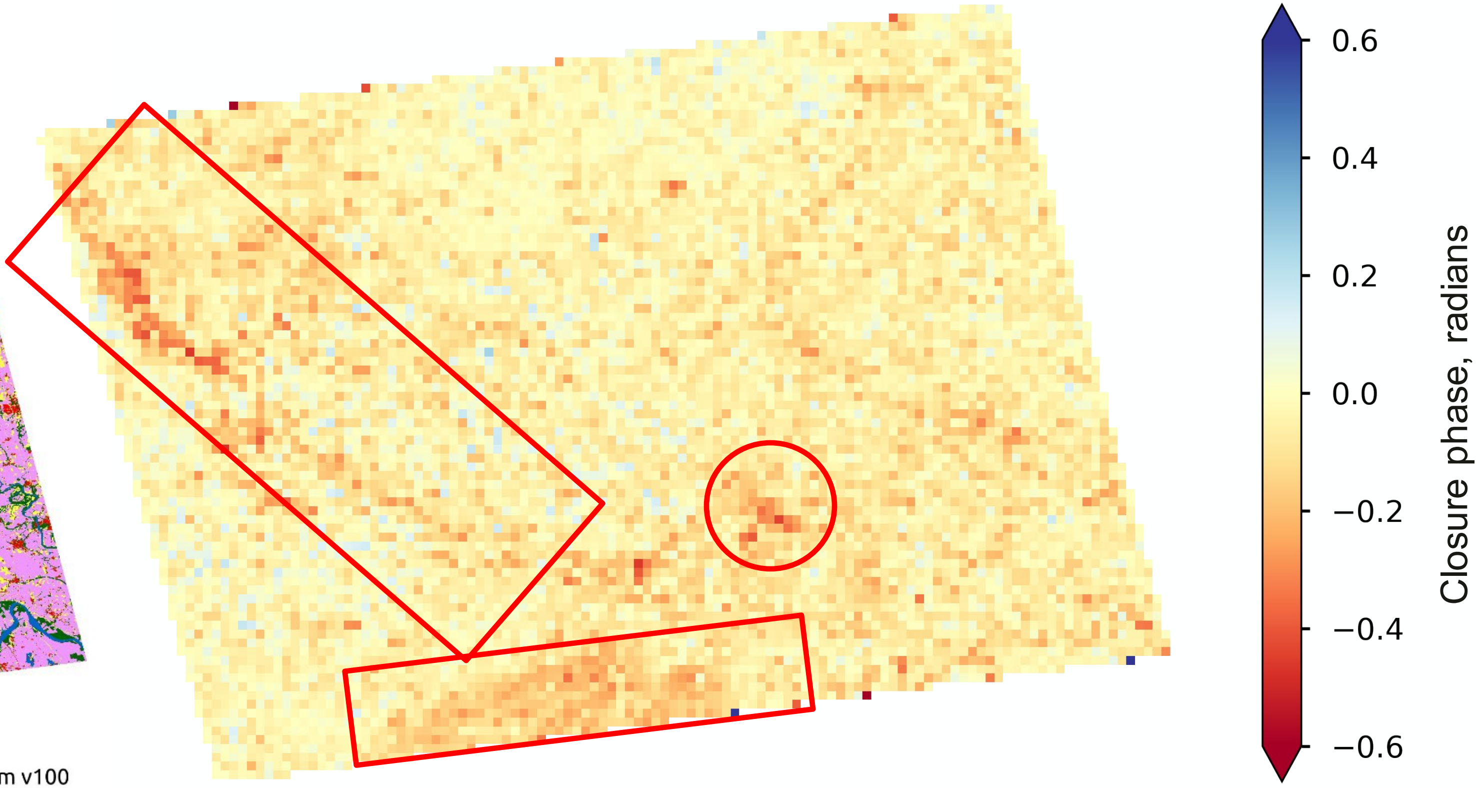
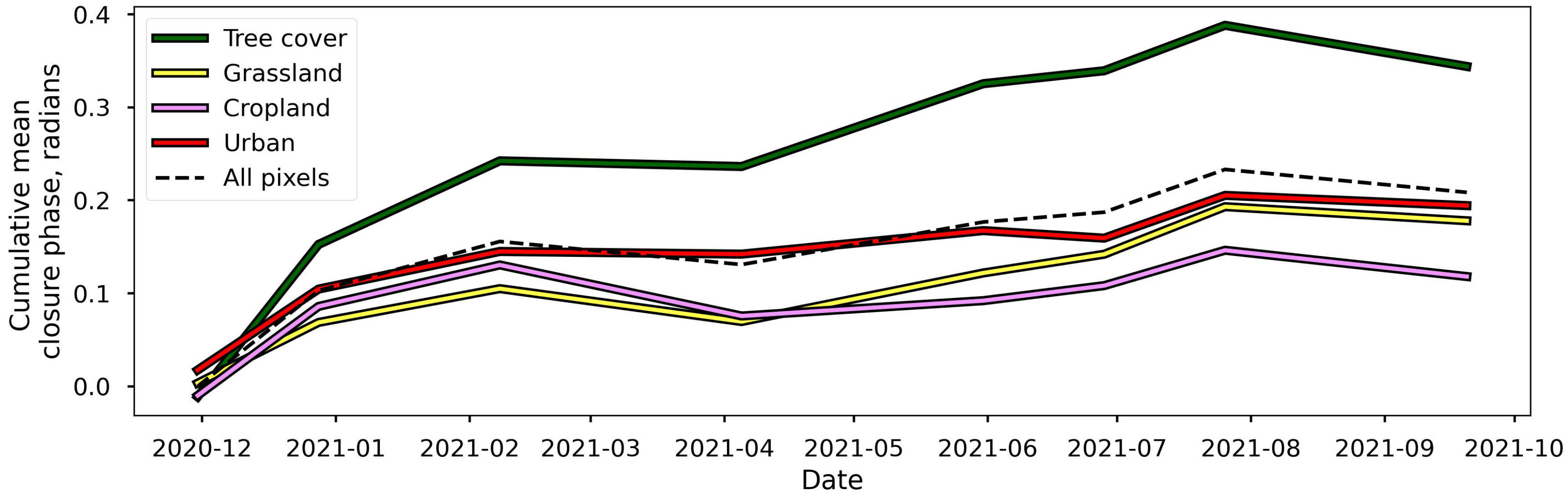


Closure phase multilooked further 30 by 30 px

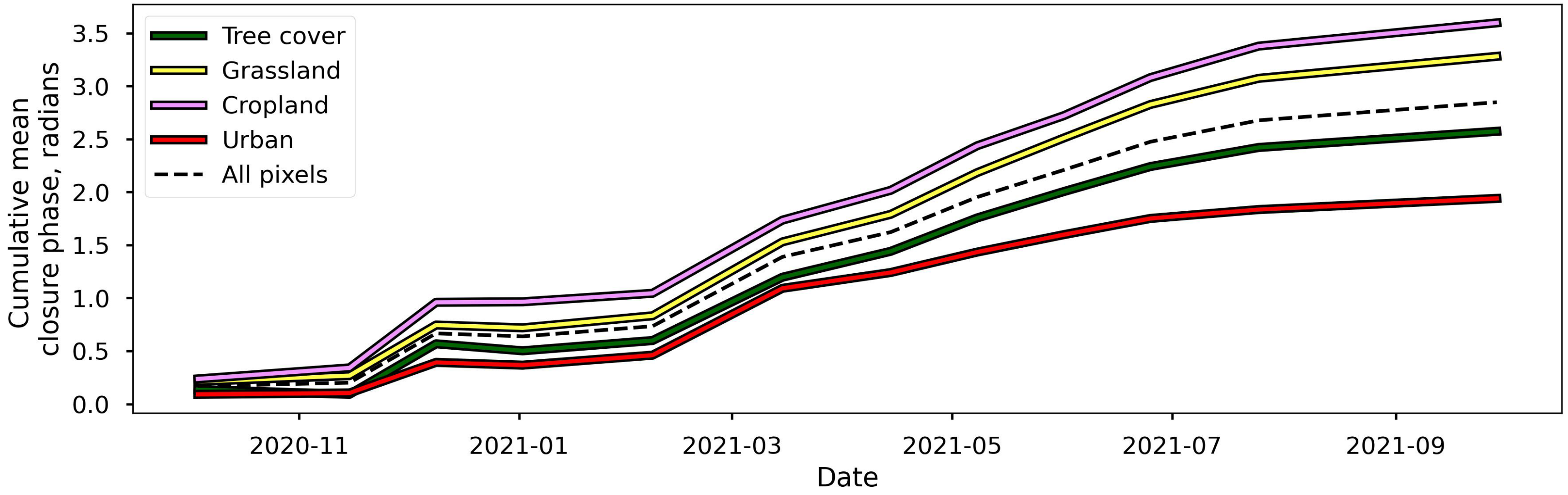


Loop closure time series by landcover: L-band

L-band



C-band



Conclusions and Outlook

- As expected, cropland and grassland exhibit the highest cumulative phase closure for C-band.
- Phase misclosure seems to be more prominent for forested areas over cropland for L-band.
- Points towards dependence on volume scattering in vegetation rather than soil moisture changes.
- More research is needed for different vegetation levels (dryer/wetter climates).

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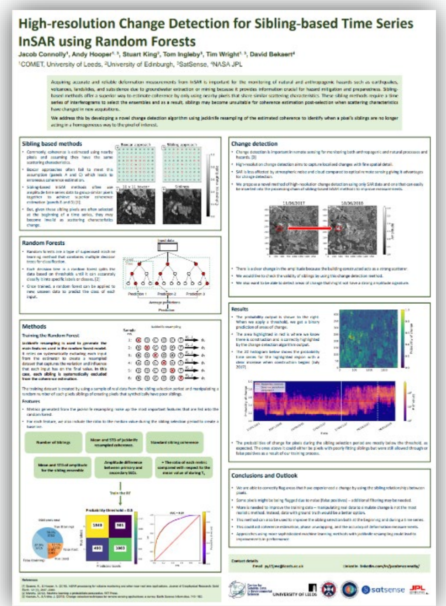
- Milan Lazecky for LiCSAR processing.
- Yasser Magsoudi for discussion on phase bias and tips with processing.

Poster 50



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