GOZDARSKI INŠTITUT SLOVENIJE
SLOVENIAN FORESTRY INSTITUTE

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AFORCLIMATE

Methods of leaf phenological monitoring to support management of resilient beech forest: networking activity between Life AForClimate and LIFEGENMON project.

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AWG Bayerisches Amt für Waldgenetik

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EU GREEN WEEK

Introduction and aim of the work

- Phenotypic plasticity is an useful trait for survival, especially in relation to climate change, which requires plastic responses in relatively short term
- Phenological monitoring is therefore considered a valuable tool to study the effect of climate change on species and provenances, to define their resilience and to modelling their distribution range in the near future.
- Traditional methods provide timely monitoring, but they require continuous inspections during the growing season. Remote monitoring is less expensive, nonetheless, even in case of high temporal resolution satellites, the possible presence of clouds could compromise the data acquisition.
- **Main aims are to improve the efficiency of the remote survey (data quality, objectivity of the monitoring, economic sustainability)**

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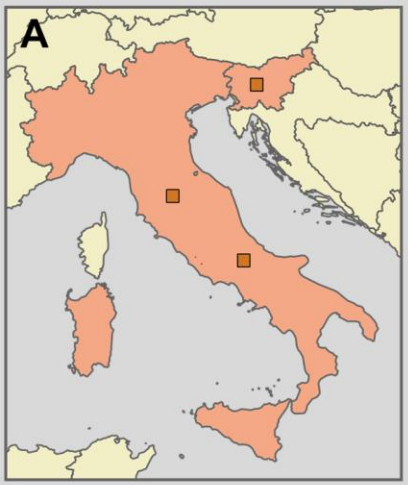
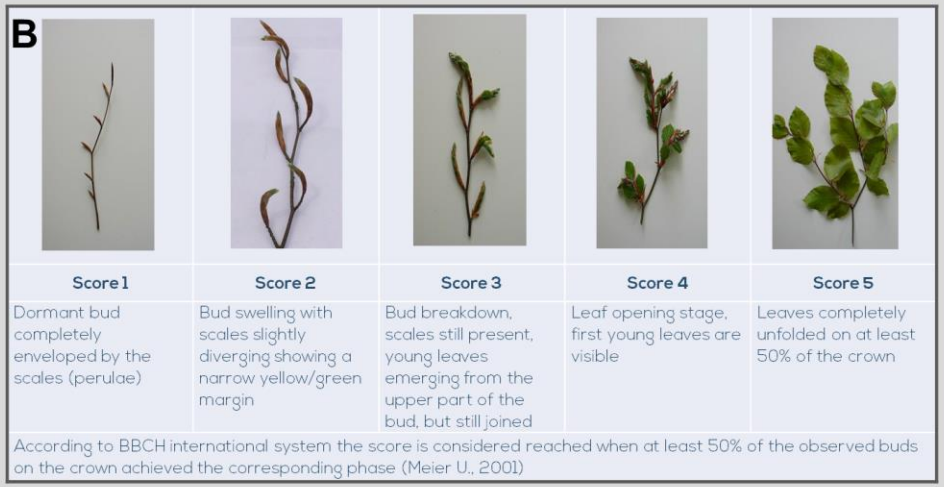
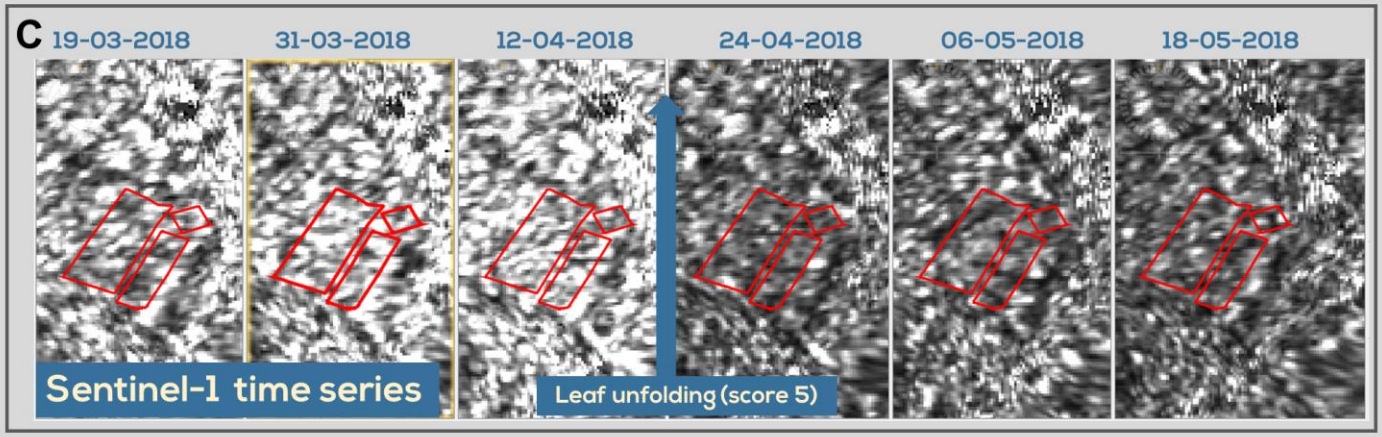
Material and Methods







A) Study sites (Italy and Slovenia).

B) Scoring system adopted for bud break monitoring on *Fagus sylvatica*.

C) Sentinel-1 time series of the Gamma backscatter against one observed leaf unfording date.

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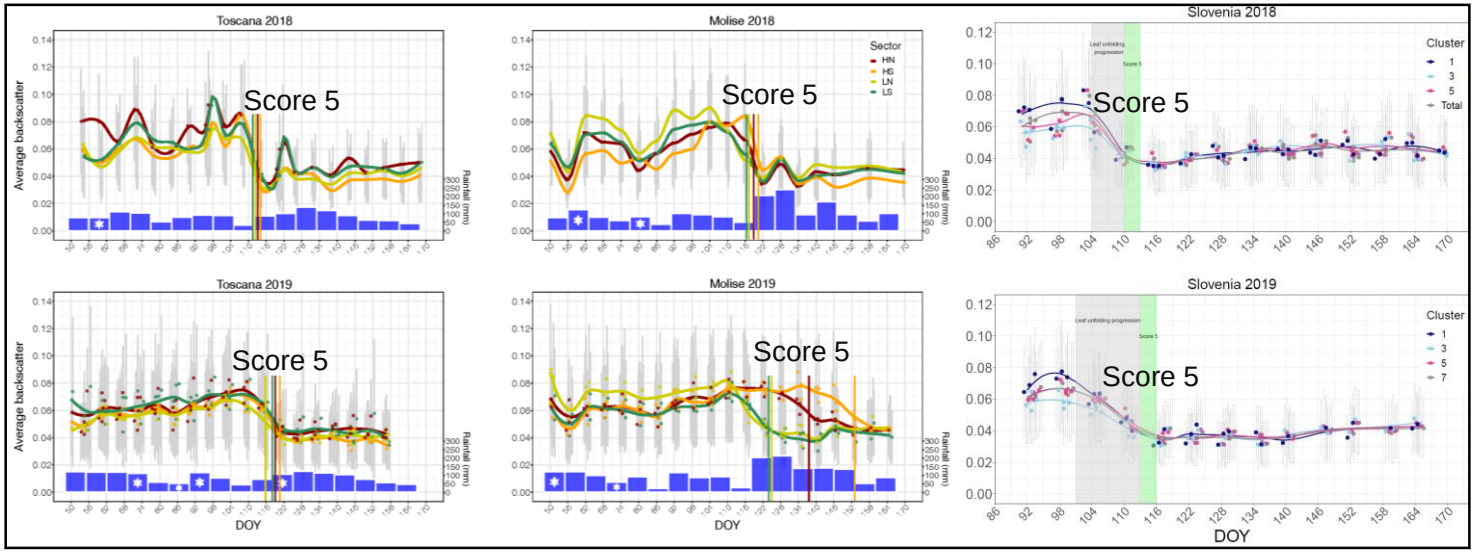
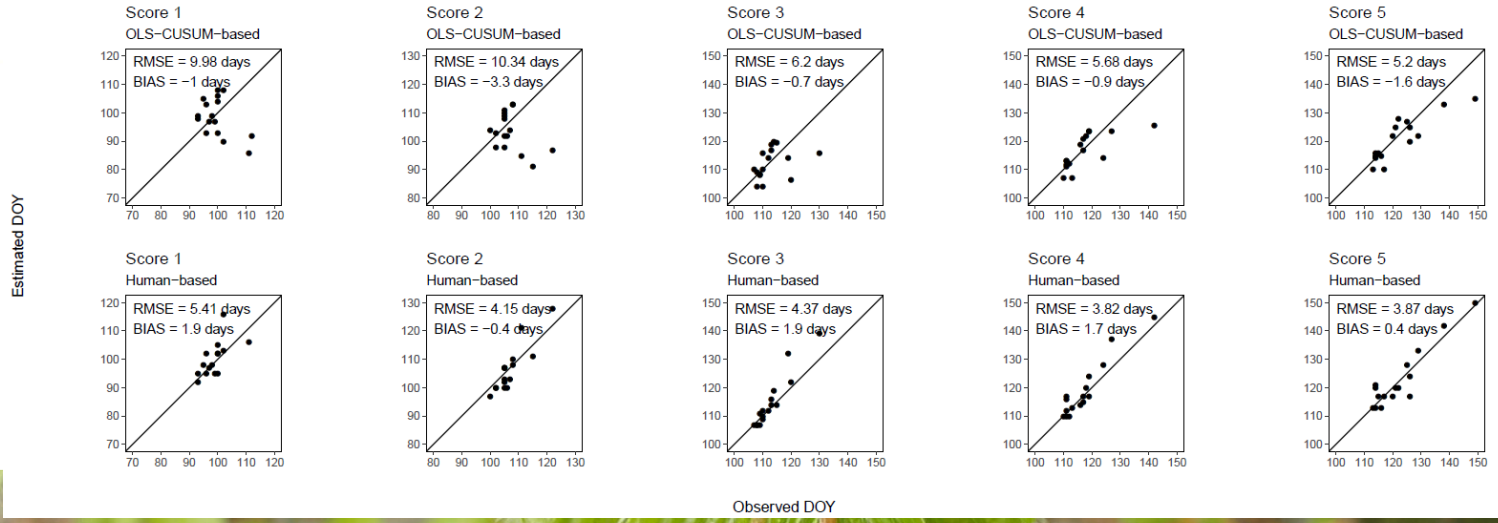
Results

Smoothed backscatter pattern against observed score 5 DOYs.



Observed versus remote sensing estimated DOY for all the scores with the two approaches used in this study. On the figures the Root Mean Squared Error (RMSE) and BIAS are reported.



Conclusions

- This study demonstrates that Sentinel-1 is an operational tool to support remote spring phenology monitoring. Specifically, the scores 4 (leaf opening) and 5 (leaf complete unfolding) can be monitored with extreme accuracy (RMSE ≈ 4 days) This result was confirmed for the two consecutive years of observation in all sites.
- This radar approach fixes the cloud problem typical of multispectral approach and very frequent in phenophase change periods in Mediterranean climate regime.
- These results promote the proposed remote sensing approach as a very useful tool to monitor growing season starting in remote areas, helping to reduce *in situ* observations.
- It also allows for historical reconstruction of phenological activity in areas with no past field observations.