PEP725, the European phenological database, not just an update

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Oral presentation, session 1

PHENOLOGY 2022 - Phenology at the crossroads - Avignon, France
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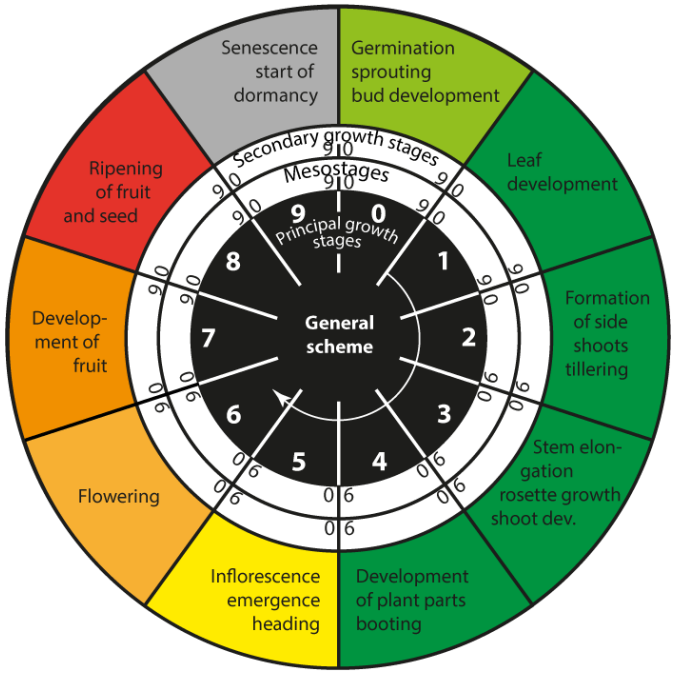
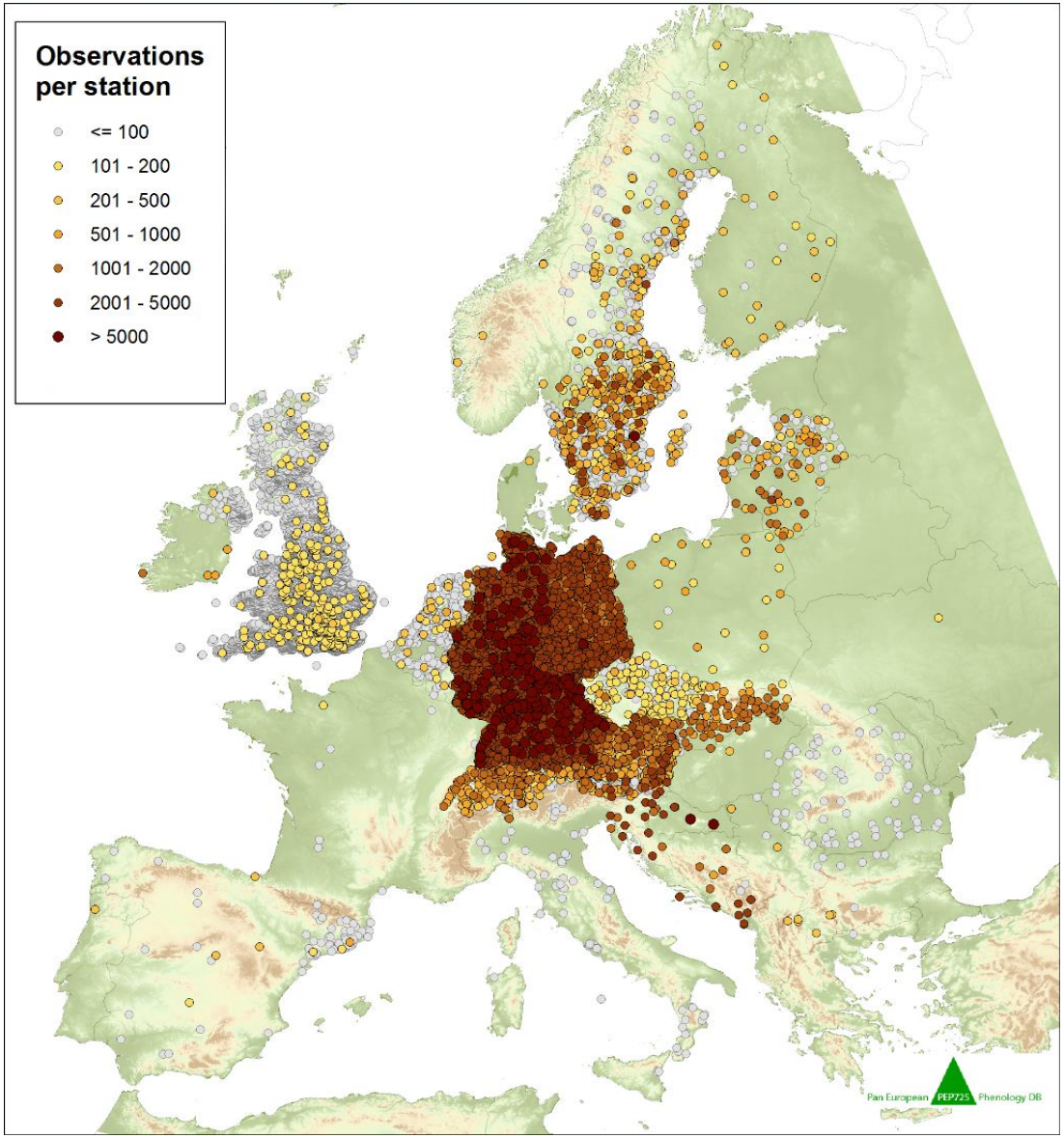
Aim of the PEP725 database: promotion and facilitation of phenological research

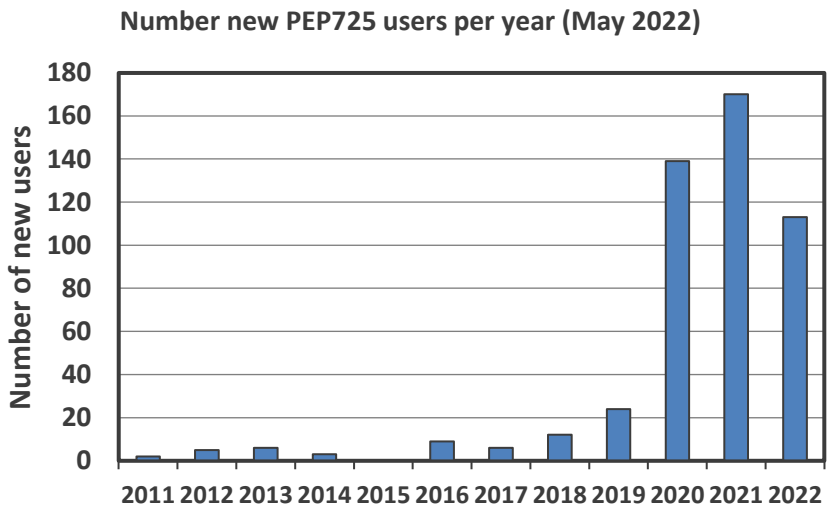
- Open, unrestricted data access
- 13020000 pheno records,
- Time period 1868/1951 – 2022
- Number of plants: >120
- Number of phase: > 50
- classified with the BBCH scale

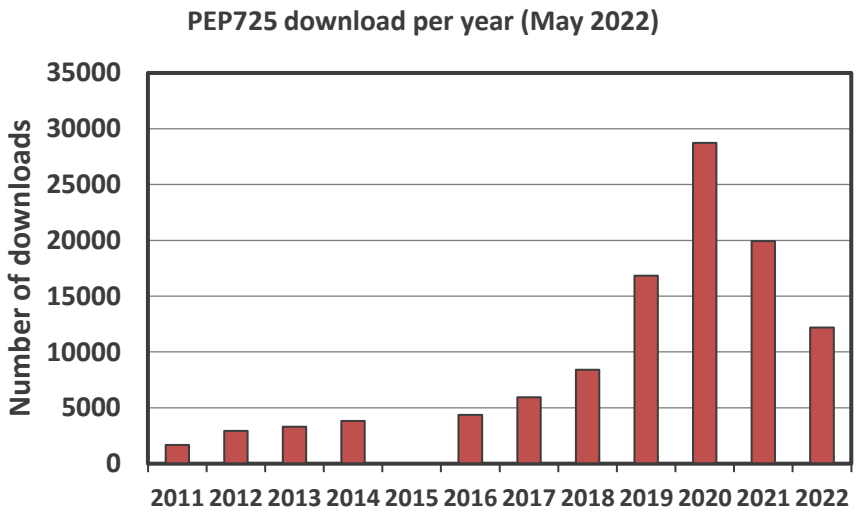




Statistic of the PEP725 Database: user and downloads

- Increasing access frequency to the PEP725 data set during the last years. A cyber attack caused a loss of the access data in 2015.
- The number of new registrations increased by large steps from 2016 to 2021.





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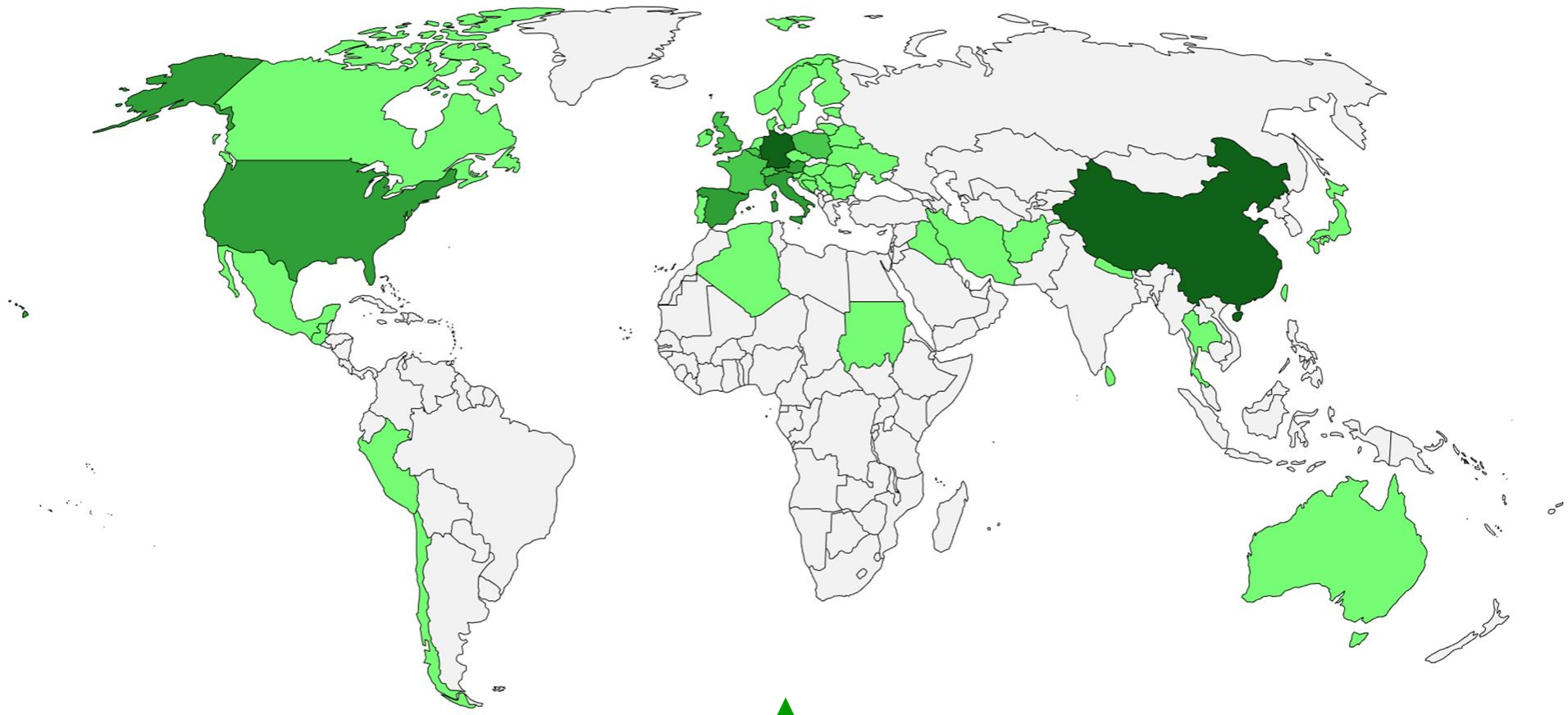
PEP725 user statistic



Pan European PEP725 Phenology DB

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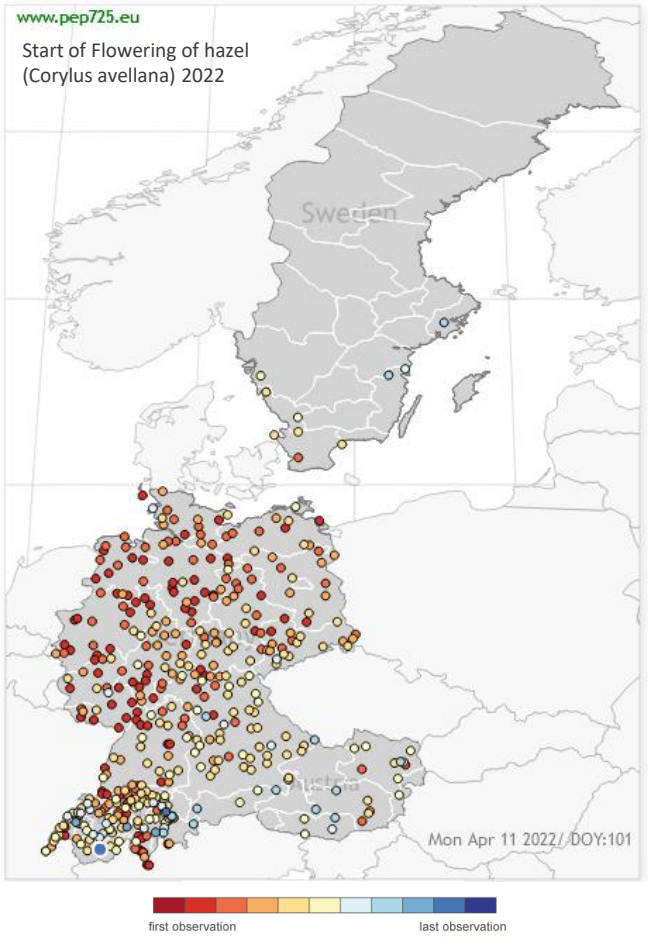
Applicability of the PEP725 database: science and education

- 104 reviewed publications based on the PEP725 data set (May 2022)
- Research:
  - Vegetation phenology
  - Remote sensing
  - Climate change
  - Ecology
  - Agriculture and forestry
  - Biometeorology
  - Pollen research

- Animated monitoring tool: citizen science based, real-time



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Reviewed literature relying on PEP725 data base 2020

FOREST ECOLOGY

Increased growing-season productivity drives earlier autumn leaf senescence in temperate trees

Deborah Zani[1], Thomas W. Crowther[1], Lidong Mo[1], Susanne S. Renner[2], Constantin M. Zohner[1]*

Climate change has increased the length of the growing season in temperate forests as earlier leaf emergence and later leaf senescence.

This trend might be reversed as increasing photosynthetic productivity begins to drive earlier autumn leaf senescence.

Using experiments and observational data of European forest trees from the PEP725 dataset, the researchers conclude that leaf senescence will advance by the end of the 21st century by 3 to 6 days instead of lengthening by 1 to 3 weeks predicted by current phenological models.

This predicted phenological pattern will in turn limit the capacity of temperate forests to mitigate climate change through carbon uptake.

Reviewed literature relying on PEP725 data base 2021

Development of a global annual land surface phenology dataset for 1982–2018 from the AVHRR data by implementing multiple phenology retrieving methods

Wei Wu [a], Ying Sun [a,*], Kun Xiao [a], Qinchuan Xin [a,b,*]

Land surface phenology in association with vegetation dynamics plays an important role in influencing land surface processes and land-atmosphere interactions.

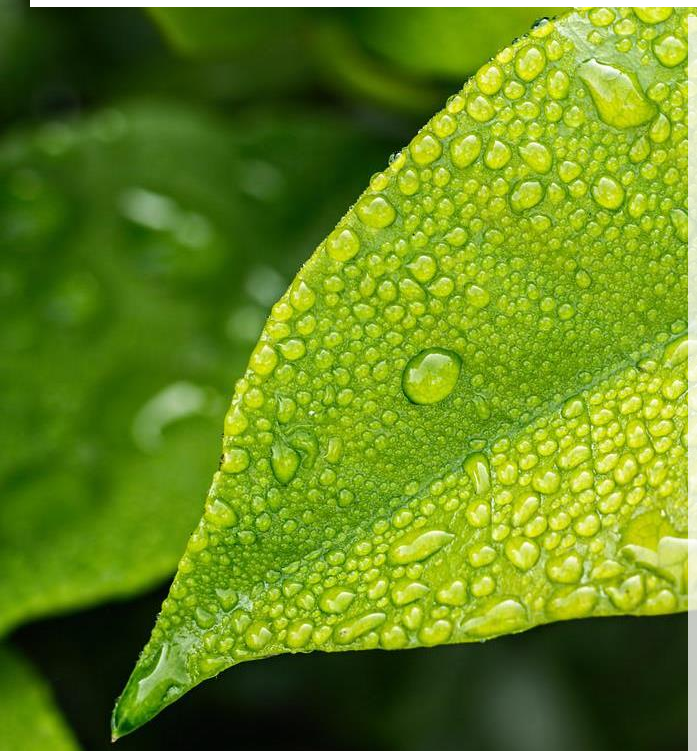
Six phenology methods to determine the growing season from Advanced Very High Resolution Radiometer (AVHRR) data. The methods were evaluated using observations from the PEP725 dataset.

The researchers presented longer time series (1982-2018) of phenology metrics with fewer gaps and multiple phenology extraction methods compared to the MODIS land cover dynamics product.

Reviewed literature relying on PEP725 data base 2022

Decreasing rainfall frequency contributes to earlier leaf onset in northern ecosystems

Jian Wang[1]✉, Desheng Liu[1]✉, Philippe Ciais[2] and Josep Peñuelas[3,4]



Climate change substantially advances the leaf onset date (LOD) and regulates carbon uptake by plants. Unlike temperature, the effect of precipitation remains largely elusive.

Usage of carbon-flux measurements, records of leaf unfolding from the PEP725 dataset and satellite data in northern ecosystems.

Widespread decreases in the number of rainy days during the past three decades positively contributed to the advance in LOD, possibly due to increased exposure to radiation. Fewer rainy days may also enhance chilling at night and warming at daytime.

Need for a comprehensive understanding of the impacts of precipitation on LOD, which is necessary for improved projections.

Literature sources

Zani, D., Crowther, T. W., Mo, L., Renner, S. S., & Zohner, C. M. (2020). Increased growing-season productivity drives earlier autumn leaf senescence in temperate trees. *Science*, *370*(6520), 1066–1071. https://doi.org/10.1126/science.abd8911

Wu, W., Sun, Y., Xiao, K., & Xin, Q. (2021). Development of a global annual land surface phenology dataset for 1982–2018 from the AVHRR data by implementing multiple phenology retrieving methods. *International Journal of Applied Earth Observation and Geoinformation*, *103*, 102487. https://doi.org/10.1016/j.jag.2021.102487

Wang, J., Liu, D., Ciais, P., & Peñuelas, J. (2022). Decreasing rainfall frequency contributes to earlier leaf onset in northern ecosystems. *Nature Climate Change*, *12*(4), 386–392. https://doi.org/10.1038/s41558-022-01285-w

Thank you for your attention!

If you are interested in the PEP725 dataset or in becoming a partner to make your phenological observations available to the scientific and research community, please contact us.

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