

## **Implementation of the PhenoFlex framework for forecasting the start of the main pollen season in the context of climate change**

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Climate change is affecting the flowering seasonality of many plant species, disrupting the dynamics of their life cycles and triggering changes in ecosystems. These changes are not uniform across all species and geographic regions, and local monitoring is required to gauge future phenological shifts and to establish mitigation strategies. In this context, aerobiological sampling has proven to be a valuable tool for monitoring the flowering onset in anemophilous species. The start date of the main pollen season for a certain pollen type in a given location is usually linked to the flowering onset of the taxa that produce it. This has encouraged the development of different models in recent years to estimate the start of the main pollen season. However, some of these models rely on rigid assumptions that may not fit the diversity of the environmental conditions in which the plants grow. In 2021, Luedeling et al. developed the PhenoFlex statistical framework to forecast the flowering onset of tree species based on biological processes. This model accommodates for both overlapping and sequential chilling and forcing periods. It also fits all the model parameters for the targeted taxa, avoiding the arbitrary selection of fixed parameters. To date, this framework has not been used in aerobiological contexts. In this study, we delve into the applicability of this framework to aerobiological data and issue some recommendations for model validation and its use in estimating climate change impacts. As an example of application, PhenoFlex models were fitted to aerobiological data for Cupressaceae and *Platanus* from 8 sampling locations within Malaga Province (southern Spain) with 52 sampling years. The models registered mean absolute errors of 7.7 and 4.5 days, respectively, and were used to generate forecasts according to different future temperature scenarios.