



An operational monitoring and display system for phenological observations

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Some national weather services operate a special web interface, where citizens can enter their phenological observations. Such a system opens the opportunity to immediately display the current state of the seasonal vegetation development. Here a few simple tools are introduced to evaluate and display near real time phenological observations with respect to the interannual variability and trends over the last decades. For many phenological phases continuous time series since 1946 are available in Austria, which is a time period sufficiently long to study the climate impact on phenology.

Phenological observations can be entered in near real time via the ZAMG web – portal or be digitised after the season from the observer sheets with a considerable time lag. About 30% to 50% of the total phenological data stem from the near real time system, which can be used for near real time monitoring of the phenological season. The minimum number of observations, which must be available for inclusion in the procedure has arbitrarily been set to 12 in order to allow a reasonable height regression. The system installed at the ZAMG produces a nightly update of the statistical analysis and figures, which can then for instance be summarised for a news release. At the moment there is no spatial differentiation possible. All conclusions and figures are based on phenological entry dates over all Austrian observations, which have been standardised to an arbitrary station elevation of 200 m above sea level via height regression.

The 2012 Austrian phenological season in relation to 1946 - 2011

The cold period from end of January to beginning of February 2012 in Austria has also left its marks on the phenological season. The early phases like beginning of flowering of snow drop, hazel or willow are to be found in the median position of rank 32 of 67 years since 1946. The remainder of the 2012 season generally shows rather early entry dates. On average the phenological entry dates range at rank 11 of the 67 years since 1946. In other words, the 2012 season belongs to the 15 earliest of the last 67 years. The entry dates have remained at about the same early level during the last decade. Long continuous time series of autumn phases are available only from apple at the moment. Beginning of leaf colouring ranges at rank 45 of 63 years and begin of leaf fall at 60 of 63 years (both since 1950), which is rather late to very late.

For trend calculations all phases are included, which possess a complete time series from 1946 to 2012. All 20 selected phases show a trend towards earlier entry dates, 14 of them a significant trend (at the 90% level according to Mann – Kendall). The mean trend over all 20 phenological phases is -4.1 days/decade. During the last 5 to 15 years the trend has remained constant in case of most phases.

The cold spring of 2013 and phenology

The cold period in spring 2013 had started in Austria at about mid March and lasted until beginning of April. Here are a few first observations, how this cold period affected plant phenology in Austria:

- Early phases (Snow drop beginning of flowering or Hazel beginning of flowering for instance) are relatively late (Fig. 2 top). The entry dates range around the 75% percentile.
- Phases, which occur during March and April are going to be late, maybe beyond the 90% percentile. The cold period significantly reduced the temperature sums, which are to be achieved for the phase to occur.
- Because of the high year to year variability of the phenological entry dates during March and first half of April we speculate that no record lateness is to be expected.