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Trends of phenological phases and their relation to climate variability in Austria

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A problem, which has not been satisfactorily solved yet for phenological time series, concerns the quantitative description of the time series behaviour with respect to its trends. The linear trend over the totally available time period has in many respects proven insufficient, because any number of time series may fit a certain linear trend value. The matrix representation of all possible temporal subsections of a time series overcomes that problem, but the graph is difficult to read and no further quantitative information can be extracted. Another method for instance plots the trend values over a large range of time series sub-periods as function of time and time period length, which suffers from the same disadvantages as the previous method. The Bayesian change-point model represents a progress in trend analysis, as it is able to identify time sections of changes in trend behaviour and their statistical significance. In this work we develop an alternative idea, which graphically dissolves the time series into a limited number of trend sub-periods and allows a statistical assessment of the significance of the sub-period mean and trend values.

The shift of Central European phenological observations to earlier entry dates after 1989 has been well recognised. Here we will try to answer the following questions with the above mentioned method of time series description: How unique was this shift of entry dates after 1989? How exceptional has the level of entry dates been since then? How well can this shift be explained in terms of temperature variability?