



## **Extraction of climate trends and radiation exchange data from time series**

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A frequently asked question in public discussions about the climatic future is: Is it possible to detect a recent trend? The determination of a trend from a time series normally is based on filtering processes. The most used filtering method is the application of sliding averages. But this method leads to more and more uncertainty and to artefacts at the boundaries of the time series because there are less and less points to average. Using the trend function to extract climate trends from harmonic oscillations this effect is very unpleasant because the last few decades are the point of most interest.

Our method uses a Monte-Carlo-method to fit optimized regressions to the data points at the boundaries. This regressions are used to predict more points for the sliding averaging. But this regressions have to be optimized; this optimization needs a criterion. To extract a convincing criterion it is more successful to use the frequency regime after Fourier transformation because the frequency regime represents the structure of the time domain. The Fourier transformation (power spectrum or cosine transformation) of the original data, the corrected data (temperature variations) and the trend function is calculated. The result of the Fourier transformation gives the criterion of optimization. Because it is very hard to calculate Fourier transformations with a relative small number of data points a special apodization function is necessary.

The performance of the method will be demonstrated using simulated climate trend functions. The method will be applied at real climate series of 34 stations. The results in temperature trends are compared with respect to the latitude. Using the temperature trend the change of net radiation energy input is calculated and discussed with respect to the latitude.