

## **Description TSA:**

**TSA** a tool for time series analysis of unevenly spaced data (period scanning technique).

A time series is a sequence of observations ordered by time. In a spatial series it can be substituted by a sequence of observations in distances. Time series analysis consists of the analysis of trends, periods and autocorrelations in the sequences. First of all the measurements have to be proven on inconsistencies. That is not supported by the program. After that, the trend in the dataset is identified and, if significant, subtracted. This trend analysis is very easy also with unevenly sampled data. The next step of a spectral analysis is normally carried out via Fourier analysis on an evenly sampled data set (Fast Fourier Transformation, FFT). Geological data are rarely sampled evenly. Therefore another, very time consuming method has been developed to find significant periods in time series or spatial series. Based on the correlation coefficients between the measured dataset and a virtual period the most significant cycles are identified and the result of the period scanning technique is shown as a periodogram with the periods on the x-axis and the correlation coefficient on the y-axis. This kind of analysis can only be done with the computer, because it is (in contrast to the FFT) very time consuming. After the subtraction of the trend the time series is normalised by dividing the measurement values by the standard deviation so that the amplitude of the oscillation can be set to 1. The phase shift is found by optimization of the correlation coefficient.

The program itself is given as OpenSource (GPL, actual version) written in C++ so it can be compiled on every platform (preferably with the gcc, under Windows with the DevC++). The Windows version is given also as a compiled .exe (tsa.exe) that runs as a command line tool in a DOS box. It is self-explaining during runtime: The user is asked for the path and filename of input data and several parameters for the calculation. It is planned to integrate it in the future into a bigger analysis tool with a GUI. For Windows users a (not OpenSource but free) version, written in VisualBasic is available under [www.wolfgang-gossel.de](http://www.wolfgang-gossel.de). This tool has a GUI (in German) but it is not suitable for big datasets.

Have some fun with it. Your comments are welcome to [wolfgang.gossel\(at\)geo.uni-halle.de](mailto:wolfgang.gossel(at)geo.uni-halle.de).