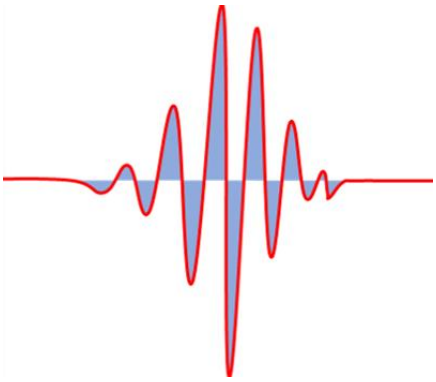

GeoTA

Version 2.0

Time-series analysis software for Geological Record

User’s Guide

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October.24，2021

目录

1.introduction

GeoTA is the Time-series analysis software for geological record current, integrating many advanced non-stationary time series analysis methods, including Local Singularity Analysis, Wavelet Frequency Analysis and Wavelet Cross-correlation Analysis methods. GeoTA runs as a stand-alone application on Windows.

System Requirements

This software was developed in MatLab version 2018b. It was tested in the Windows 10. If your computer has MatLab version 2018b Runtime environment (Warning: Other versions of MatLab Runtime may not work!), you can directly run GeoTA.exe to use the software. Otherwise, you need to use the online installer to install the MatLab2018b Runtime environment or directly download the software containing the MatLab2018b Runtime environment. The download link of each file is in the download section

1. Run directly

Click GeoTA.exe directly to run the software.

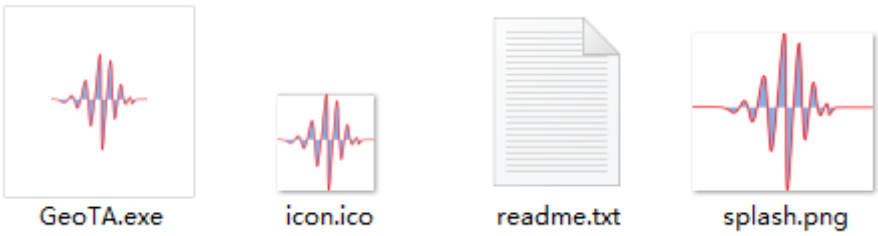


Figure 1- 1 Software catalog

2.Online install

Click GeoTAInstaller_web.exe directly to configure the matlab2018b runtime environment.

图 1- 2 runtime online installer

After entering the installation program, follow the prompts to install matlab2018b runtime.

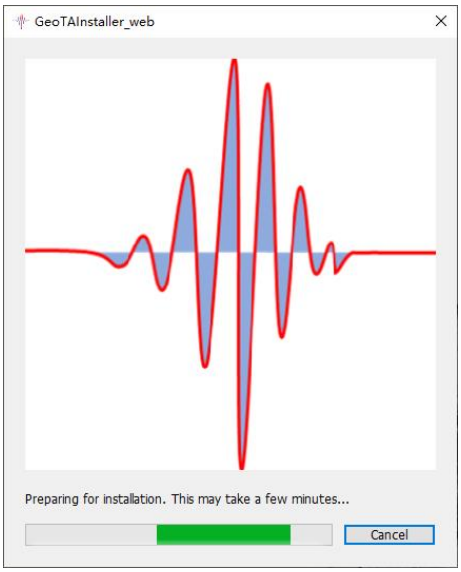


Figure 1- 3 Installation process

After the installation is completed, refer to **Run directly** to run GeoTA software.

3.Full download

You can download and install the runtime environment offline directly through our link.

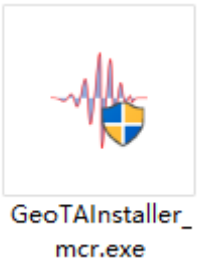


Figure 1- 4 Offline installer

Follow the prompts to install the matlab2018b runtime environment offline. After the installation is complete, refer to **Run directly** to run GeoTA software.

2. Example

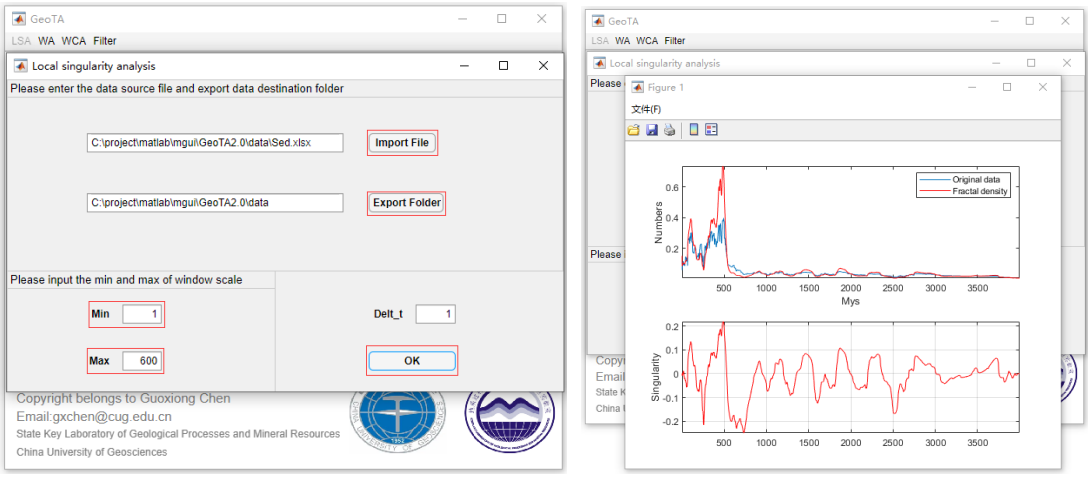
GeoTA menu

Figure 2- 1 GeoTA Graphical User Interface (GUI)

2.1 Local Singularity Analysis(LSA)

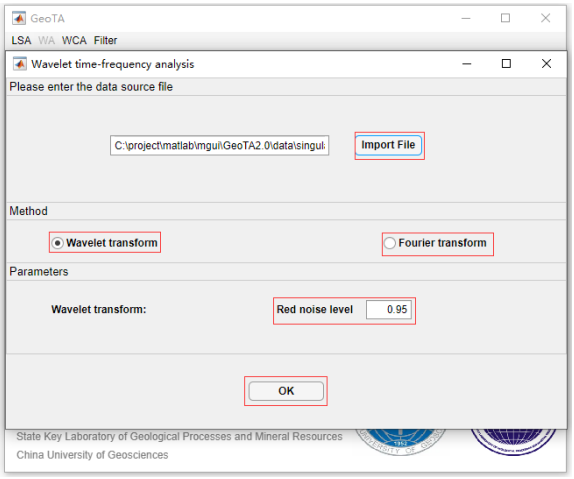
Local Singularity Analysis (LSA) is a new nonlinear filtering method for usage in time-series analysis of complex signal with scale-free, nonstationary and singularity natures. As a high-pass filter, LSA removes the nonlinear trends from a time-series signal, while simultaneously allows the high frequency components to pass through the scaling filtering (Cheng, 2017). When implementing the LSA, the users only need to provide the input time-series data and the range of window-size for scaling analysis. Note that the frequency response of LSA filter depends on the window-size, which resembles the frequency threshold used in

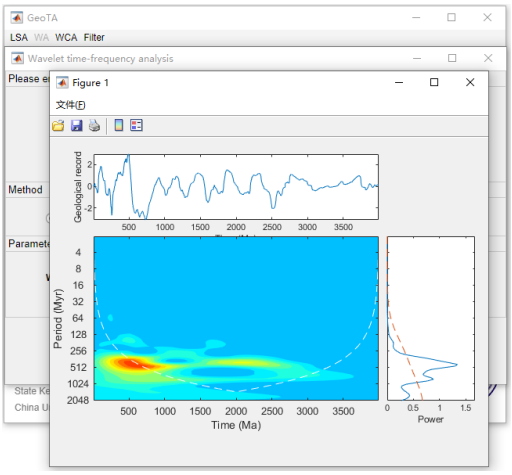
Fourier analysis. Then the user automatically receives the transformed time-series – local singularity sequence – as the output.



2.2 Wavelet time-frequency Analysis(WA)

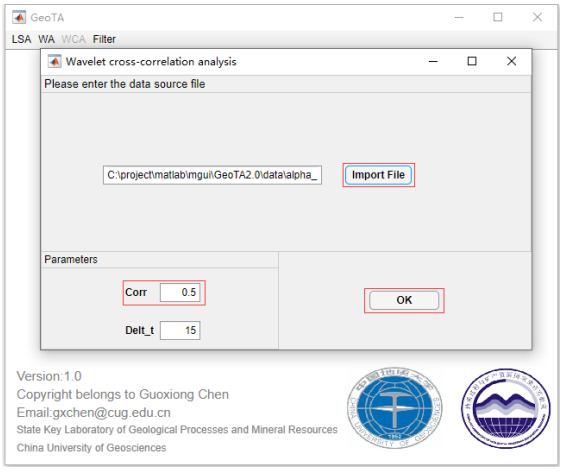
Wavelet analysis is widely used for estimating the local or global periodicity of time series signals in both time and frequency space (Campagne et al., 2015; Chen and Cheng, 2018; Torrence and Compo, 1997). When implementing wavelet time-frequency analysis (using Morlet wavelet and Monte Carlo methods), the users only need to provide the input time-series data without any parameter setting and receives wavelet scalograms and global wavelet power spectrum. The resultant wavelet scalograms illustrate heat maps of the relative significance of periodicity in local time intervals, while global wavelet power spectrum provides "hard numbers" of the dominant periodicities (with 95% confidence level) for the entire interval.

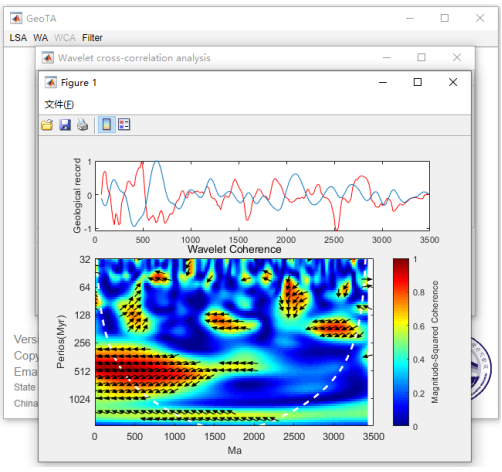




2.3 Wavelet Cross-correlation Analysis(WCA)

Wavelet cross-correlation analysis is a method for quantifying the localized correlation between two non-stationary series in time and frequency space by utilizing wavelet transform (Torrence and Compo, 1997). When implementing wavelet cross-correlation analysis (using Morlet wavelet), the users only need to provide two input time-series data without any parameter settings, and automatically receives their common power and relative phase in time–frequency space of the two signals.





2.4 Filter

Implementing timer series data filtering by Discrete Fourier Transform and Discrete Wavelet Transform.

3.Download

Data download

链接

Software download

链接

Matlab2018b runtime download

链接

4.Citations and acknowledgments

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Please cite

Chen G.*, Zhang H., Wavelets in Geosciences. Earth Science Series. Encyclopedia of Mathematical Geosciences (edited by B. S. Daya Sagar et al). In publication. 2021.

Read more

12. Chen G., Cheng Q*. Cyclicity and Persistence of Earth' s Evolution Over Time Wavelet and Fractal Analysis. Geophysical Research Letters. 2018. 45: 8223-8230.

Mallat, S., 1999. A wavelet tour of signal processing. Academic Press, San Diego, CA.

Torrence, C., Compo, G.P., 1997. A practical guide to wavelet analysis. B Am Meteorol Soc 79, 61-78.