

Instruction for Time-Dependent-Intrinsic-Correlation (TDIC)

Dr. Yongxiang HUANG

Shanghai Institute of Applied Mathematics and Mechanics, Shanghai University,
Shanghai 200072 China

Abstract

This document provides a brief introduction of how to use the Matlab code to perform the TDIC analysis. The code is based on a Fortran code provided by Prof. X.Y. Chen and N.E. Huang. If you apply this package in your research, please cite the following two papers:

1 X.Y. Chen and Z.H. Wu and N. E. Huang, The time-dependent intrinsic correlation based on the empirical mode decomposition, *Advances in Adaptive Data Analysis*, 2010, 2:233-265

2 Y.X. Huang and F.G. Schmitt, Time dependent intrinsic correlation analysis of temperature and dissolved oxygen time series using empirical mode decompositions, *Journal of Marine Systems* 2014, 130:90-100

The idea of TDIC is to perform a scale-based moving cross correlation between two variables to see their local relation. The technique detail can be found in the Ref. 1 listed above.

main function

1 tdic.m

```
[c,p,tx,scale]=tdic(x,y,pp);
```

Input

x is the IMF from the first variable

y is the IMF from the second variable

x and y should have the same mean time period. Otherwise, the output correlation matrix is almost zero

pp is the local time period provided by the zero-crossing method

Output

c is the correlation matrix

p is the indicator matrix for statistical test (student-test)

tx is the time axis

scale is the corresponding size of the moving window

To show the result

```
surf(tx,scale,(c.*p),'edgecolor','none')
```

```
axis xy;view(0,90)
```

```
colorbar
```

2 pp=maxlocalperiod(x,y);

Input

x is the IMF from the first variable
y is the IMF from the second variable
x and y should have the same mean time period. Otherwise, the output correlation matrix is almost zero

Output

pp is the local time period provided by the zero-crossing method

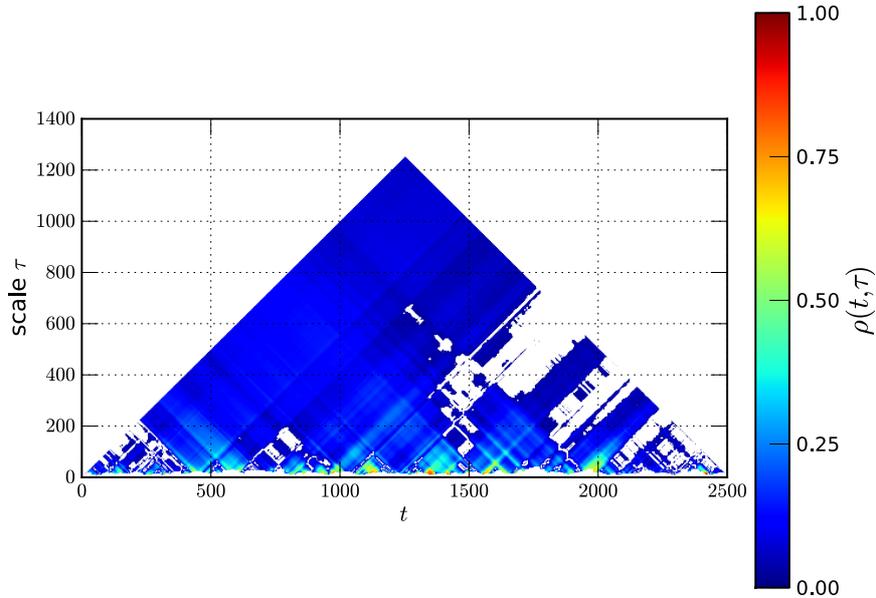


Fig. 1 TDIC for fractional Brownian motion. Note that there is no correlation as expected. The hole indicates the region cannot pass the student-test.

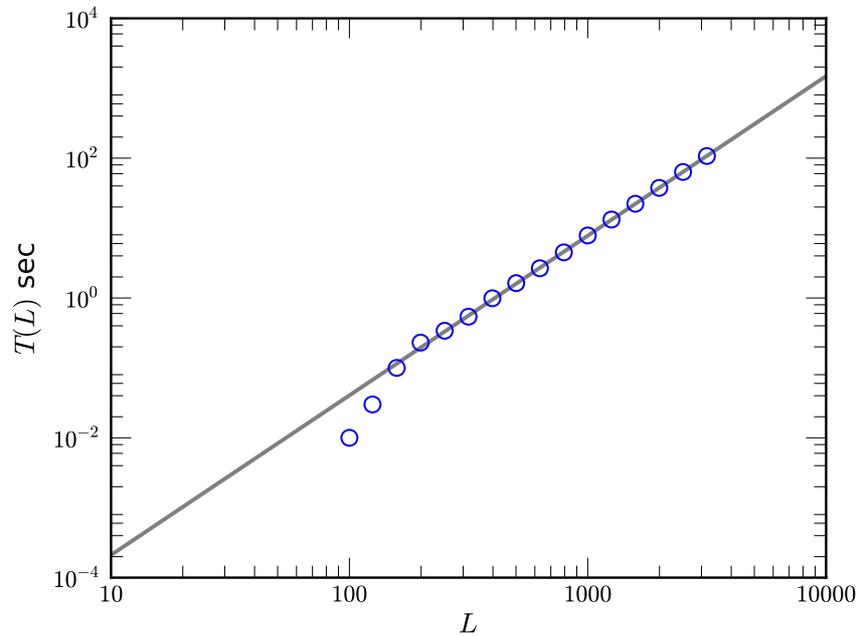


Fig.2 Performance test (computation time). A power law with a scaling exponent 2.2 is observed, which is slight larger than the theoretical value 2.

