Introduction

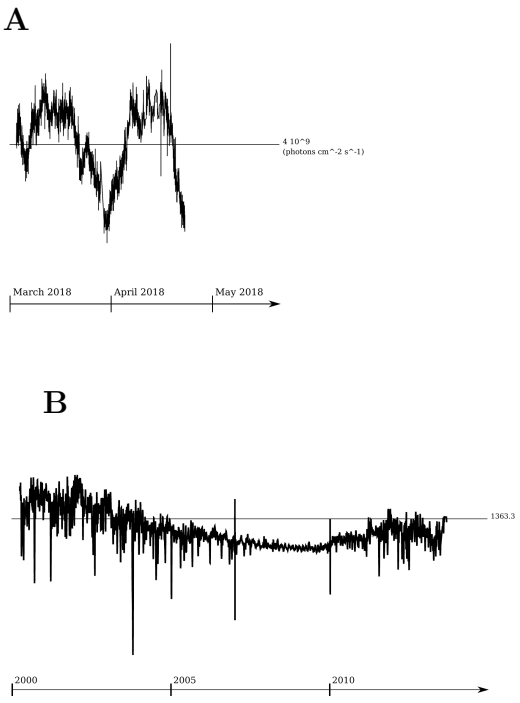


Figure 1 *(A) Extracts form satellite data records of photon flux deposited in Univ. of South Carolina site, radiation of Sun in 2018; (B) Radiation of Sun from 2000 to 2013 recorded by "ACRIM3" satellite.*

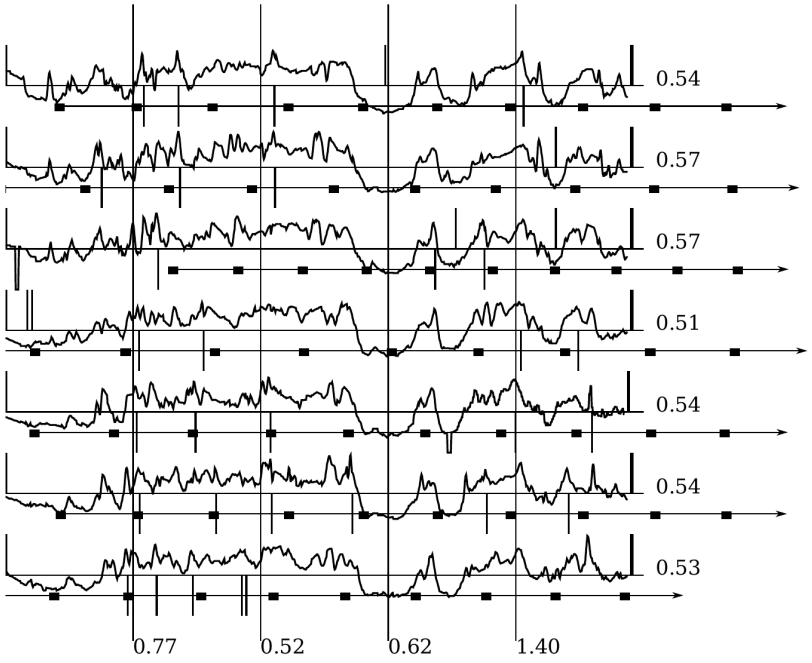
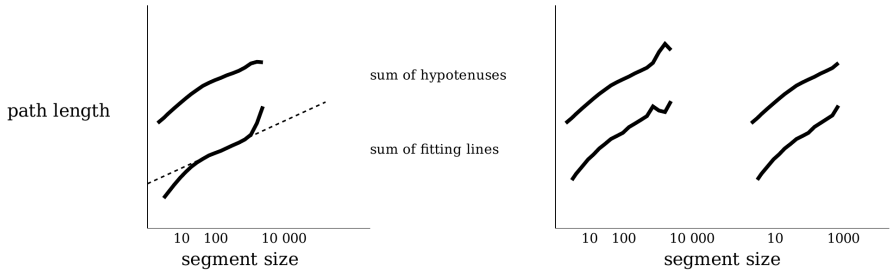


Figure 2 *Snapshot from video record of sun flaming 15.06.2002, deposited by Swedish physicists. Digits in column - Higuchi fractal dimension for spatial axis, digits in row - approximation of fractal dimension for time axis.*

Methods

A



B

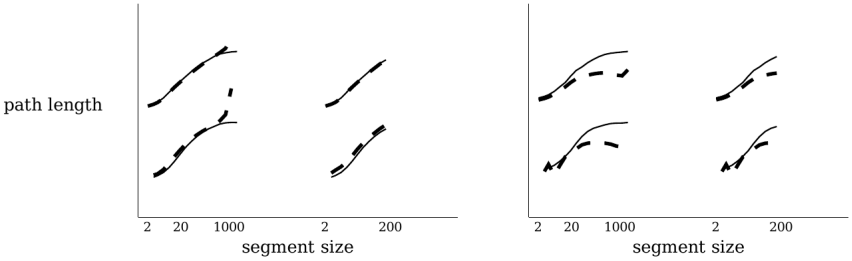


Figure 3 *Illustrations of attempts to guess a presence of the log-periodic dependency (A) Uniform distribution - chart in fig. 1A (B) Periodic bursts - chart in fig 1B, two talils in separate.*

Table 1 *Supplement to figure 3 - results of fitting of log-periodicity in log-log distributions*

	usc_18		acrim3-1		acrim3-2	
	method 1	method 2				
plain:						
dimension	0.577973	0.579382	0.691307	0.747027	0.598869	0.645797
correlation	-0.983925	-0.969044	-0.984111	-0.97212	-0.974277	-0.959029
fit in full:						
direction	decc.	decc.	accel.	accel.	accel.	accel.
critical time	-711	-141	+318	+474	+6	+8
dimension	0.686096	0.880372	0.858975	1.07331	0.881265	0.788433
correlation	-0.992609	-0.996231	-0.998645	-0.998409	-0.998075	-0.979409
fit in part:						
direction	accel.	decc.	decc.	accel.	accel.	accel.
critical time	+2	-141	-474	+2	+63	+3
dimension	0.677549	0.949008	0.822429	0.949565	0.599305	0.974975
correlation	-0.992127	0.996914	-0.996929	-0.99992	-0.995057	-0.999909

Results

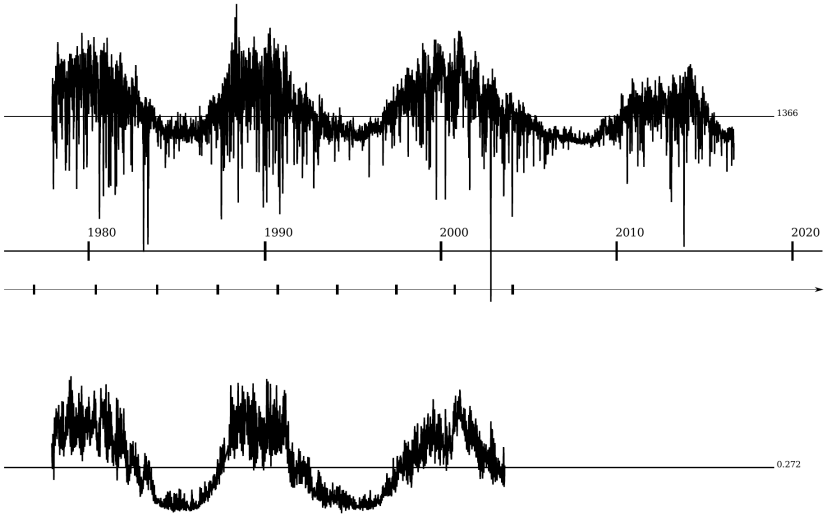


Figure 4 *Radiation of Sun in period from November 1978 to September 2017; in bottom - radiation at MgII frequency.*

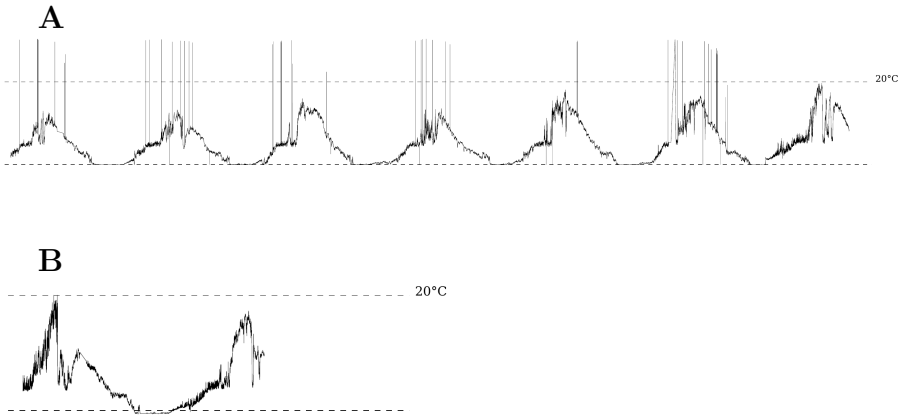


Figure 5 *Temperature of water in Baikal (A) series from May 2010 to October 2016; (B) series from May 2017 to September 2018.*

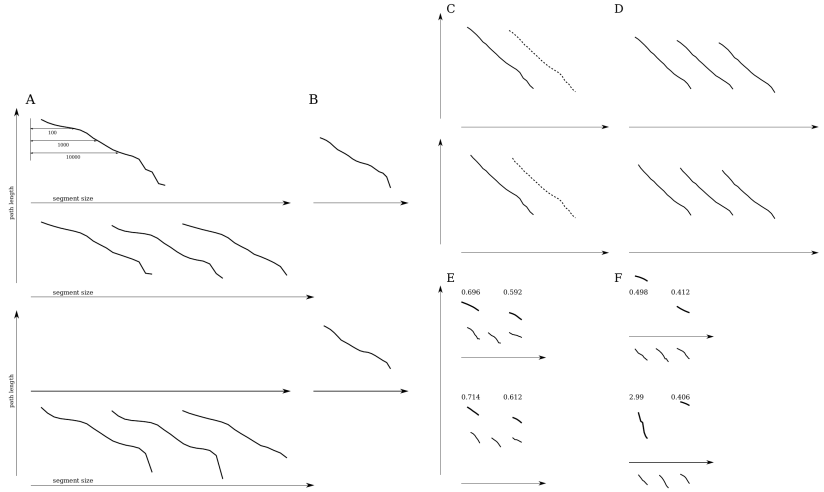


Figure 6 *Log-log dependencies, for the two types of method. A,B: temperature fn Baikal, A - 2010-2016, B - 2017-2018 period, C,D: solar activity, 1978-2017, E,F - fragments of auxiliary records on solar irradiation*

In A,D, three separate lines are the distributions for beginning, middle and ending parts of a period. Dashed lines in C, for a comparison - path lengths are estimated by the modified approach, suitable to fitting of log-perodicity. In E,F, - time series are of 15.06.2002 as in fig.2, and of 01.04.2018 as in fig1B, at average and in a few randomly choosed parts. Appropriate fragments from the long-time series, shown in fig 4 and here in C,D, are added for a comparison; numerical labels are estimated least-square slopes of regression lines.

Table 2

	method 1 dimension	correlation	*method 2* dimension	correlation
Solar activity, *total*, 1-10 t.p.				
period 1, at a whole	0.600865	-0.983845	0.597535	-0.993015
period 1, split to 10 parts	0.603019 ± 0.0681101		0.610272 ± 0.105999	
period 2, at a whole	0.580363	-0.983685	0.597535	-0.991654
period 2, split to 10 parts	0.568418 ± 0.0552829		0.573676 ± 0.0685691	
period 3, at a whole	0.562857	-0.983647	0.556838	-0.991774
period 3, split to 10 parts	0.543297 ± 0.0622227		0.544673 ± 0.0601166	
Mn line, 1-10 t.p.				
at a whole	0.349931	-0.975307	0.439804	-0.942881
split to 10 parts	0.345247 ± 0.102797		0.35548 ± 0.195736	
Temperature in Baikal *long series*; 1-10 t.p.				
period 1, at a whole	0.570939	-0.992162	0.812175	-0.995154
period 1, split to 10 parts	0.613501 ± 0.126926		0.868055 ± 0.177196	
period 2, at a whole	0.532256	-0.991045	0.739015	-0.994156
period 2, split to 10 parts	0.633994 ± 0.217527		0.876311 ± 0.29755	
period 3, at a whole	0.303322	-0.99865	0.385959	-0.995293
period 3, split to 10 parts	0.364181 ± 0.227035		0.467551 ± 0.320929	
short series				
1 - 80 t.p., at a whole	0.606348	-0.995202	0.662082	-0.988346
1 - 80 t.p., split to 10 parts	0.564113 ± 0.164664		0.628443 ± 0.215225	
40 - 80 t.p., at a whole	0.508056	-0.981986	0.507846	-0.99867
40 - 80 t.p, split to 10 parts	0.425593 ± 0.28323		0.444415 ± 0.282211	

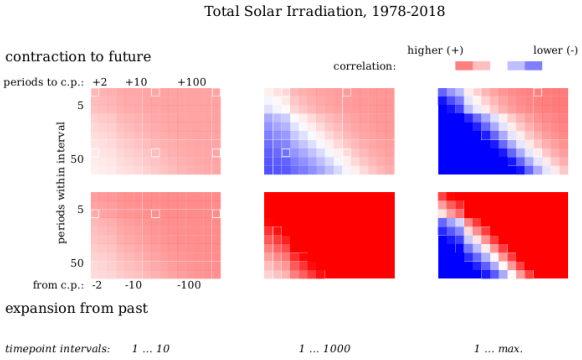


Figure 7 *Fitting of log-periodicity. Explanation.*

Figure 8 *Fitting of log-periodicity. Accordingly to table 2.*

References

1. Nottale, L., Scale relativity and fractal space-time: theory and applications, *arxiv.org*, 2008

2. Feranchuk, S., Belkova, N., et al. *Limnology and Freshwater Biology*, 2018,

Appendix A

```
 cat usc_18.txt | awk -v i=0 -v b1=2458119.5 -v b13=7 '{ if ( i == 100 && substr(
$13, 1, 1 ) != "0" ) { s = s "," 10 * ( $1 - b1 ) "," 500 * (substr($13,1,7)
- b13 ); i = 0; }; i = i+1; } END { print substr( s, 2 ) }' | ./fractal_dimension
-d_xy
```