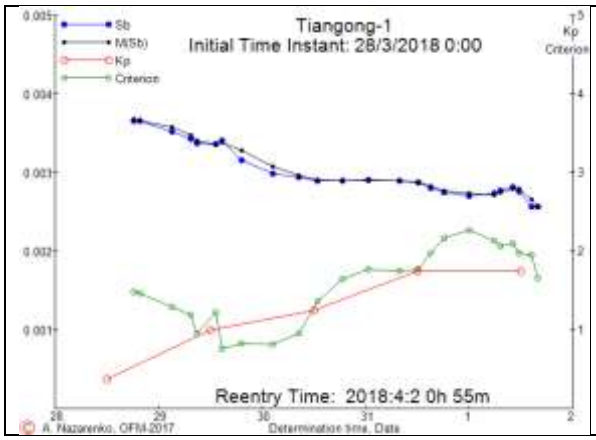
XXI. Decay Epoch of the "Tiangong-1" Spacecraft. Total data

Andrey I. Nazarenko, Professor, retired

1. The last results for April 2, 2018

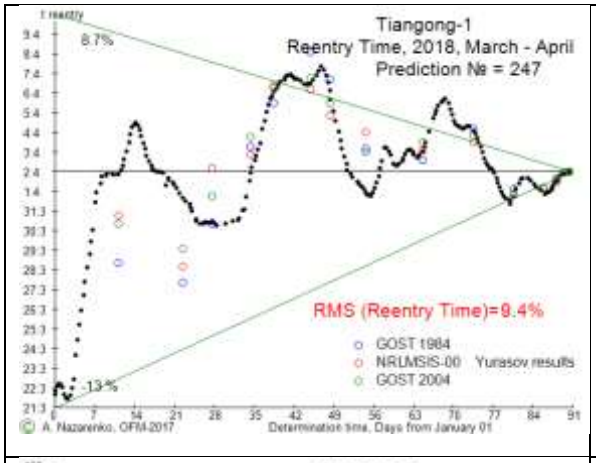
The materials presented below represent a continuation of the text under the same name, posted on the “satmotion.ru” site from November 2017 to April 1, 2018.



This figure presents the ballistic coefficient estimates, the values of the geomagnetic disturbance index (*Kp*) and the minimized criterion for all preceding time instants of orbital parameters updating in interval from March 26 to April 1.

The estimates of ballistic coefficient (Sb) have changed within the range from 0.00369 to 0.00257 m^2/kg, i.e. 1.4 times..

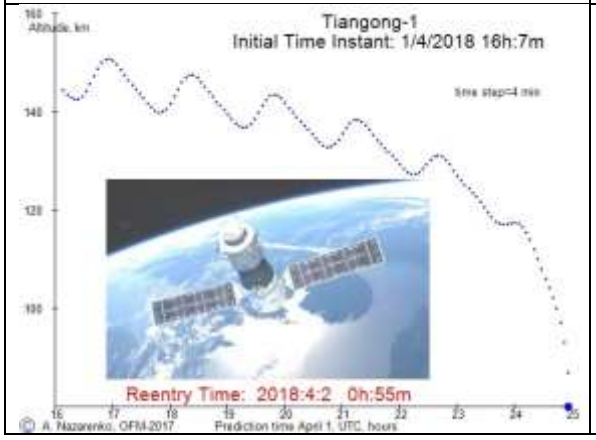
The black line marks the Sb estimates averaged over some preceding time interval (the sliding average). The last ballistic coefficient value (0.00257 m^2/kg) was used as a constant value in the prediction of SC motion until its entering the dense layers of the atmosphere.



The results of all 247 reentry time determinations after January 1, 2018 are presented here.

Based on the results of all determinations, the deviation from average values do not exceed ± 15% of the remaining lifetime. Most reentry forecast:

April 2 2018 $00^h\,55^m \pm 33^m$.



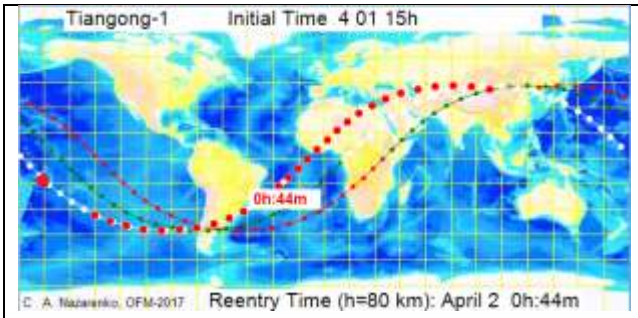
The change of SC altitude in the forecast interval from the moment of the last TLE until instant of reaching the altitude of 80 km is presented here.

Most reentry forecast:

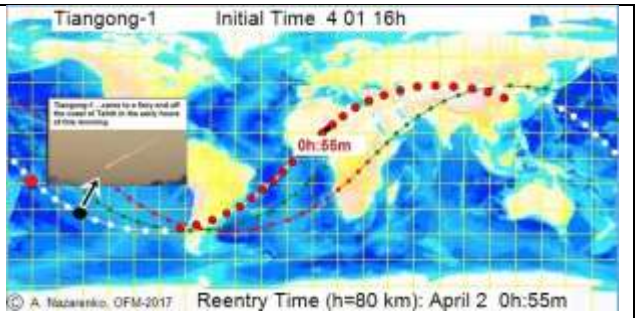
April 2 2018 $00^h\,55^m \pm 33^m$.

The last two options for source data for April 1, 2018.
Spread in the reentry time (UTC):
from 00^{h} 44^{m} until to 00^{h} 55^{m} April 2

On these maps, the window highlighted by red circles.



17. Reentry: April 2 00h 44m Window±29^{m}



18. Reentry: April 2 00h 55m Window±33^{m}

NORAD announced reentry place shows by large red circle. Relative deviation of the estimated reentry time from the NORAD data are as follows: 5.4% for the left Figure, and 6.2% for the right ones.

There is the photo of the Tiangong-1 reentry made in French Polynesia (FNTalk.com).

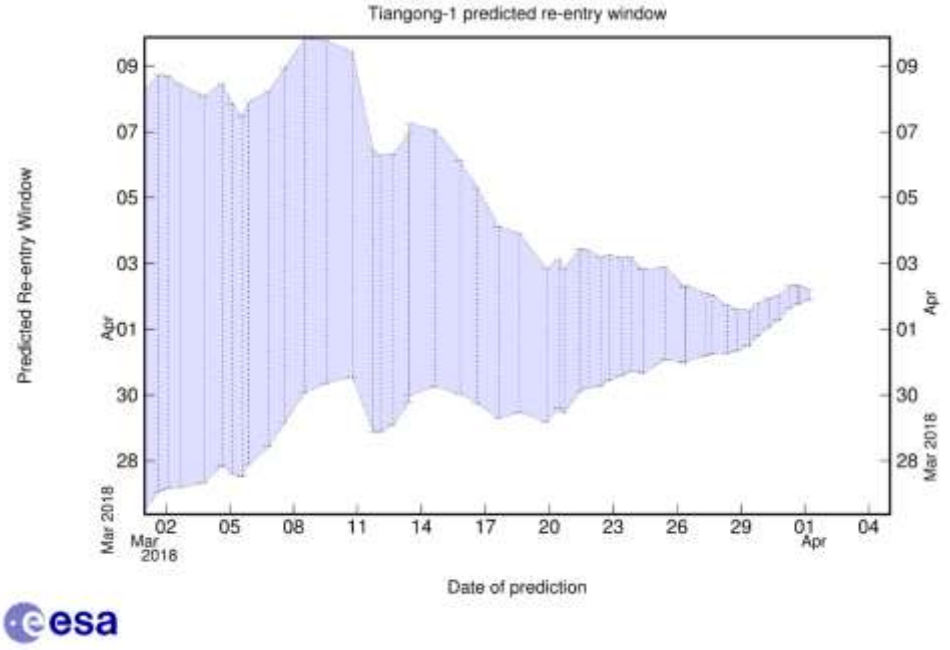
2. Recent publication of other authors

a) NORD TIP_msg

MSG_ EPOCH	INSERT_ EPOCH	DECAY EPOCH	WINDOW	LAT	LON
2018-04-02 00:59:00	**2018-04-02 01:07:44**	**2018-04-02 00:16:00**	**1**	-13.6	195.7
2018-04-01 22:53:00	**2018-04-01 23:03:28**	**2018-04-02 00:49:00**	120	-8.9	341.9
2018-04-01 18:18:00	2018-04-01 18:35:42	2018-04-02 00:48:00	120	-9.9	341
2018-04-01 12:18:00	2018-04-01 12:25:23	2018-04-02 00:47:00	180	-13.6	337.1
2018-03-31 23:56:00	2018-04-01 00:07:38	2018-04-02 00:15:00	360	-18.5	201.6
2018-03-30 21:02:00	2018-03-30 21:10:37	2018-04-01 21:29:00	600	-37.9	279.9
2018-03-29 01:42:00	2018-03-29 01:49:44	2018-04-01 00:52:00	900	-25.7	209.8
2018-03-28 04:43:00	2018-03-28 04:50:52	2018-04-01 01:57:00	1140	33.8	115.8

б) Aerospace Corporation
Tiangong-1 is currently predicted to reenter the Earth's atmosphere around
April 2nd, 2018 00:30 UTC ± 1.7 hours.
This prediction was performed by The Aerospace Corporation on 2018 April 1.

c) ESA data: Update 1 April 2018
With the latest available orbital data and space weather forecasts, the re-entry prediction window stabilised and shrunk further to a time frame running from the **night of 1 April to the early morning of 2 April (in UTC time).**



References

1. A.I. Nazarenko, V.S. Yurasov, S.V. Tikhomirova. Determination of the satellite reentry time with allowance for random variations of atmospheric drag. ESOC, Reentry Workshop 2018, Darmstadt.
2. A.I. Nazarenko. Stochastic astrodynamics tasks. Mathematical methods and algorithms for solving. Moscow, URSS, 2017, 352 (p).