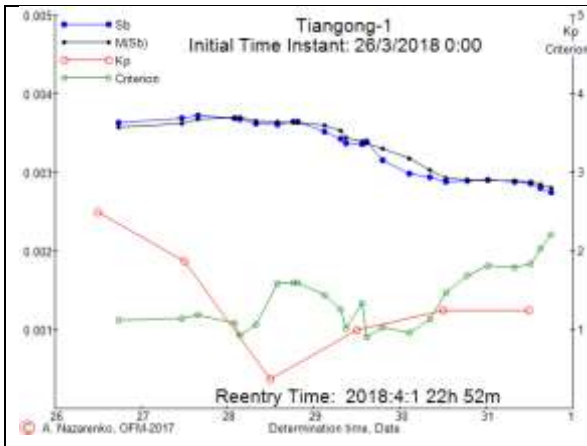


XIX. Decay Epoch of the "Tiangong-1" Spacecraft. March 31, 2018

Andrey I. Nazarenko, Professor, retired

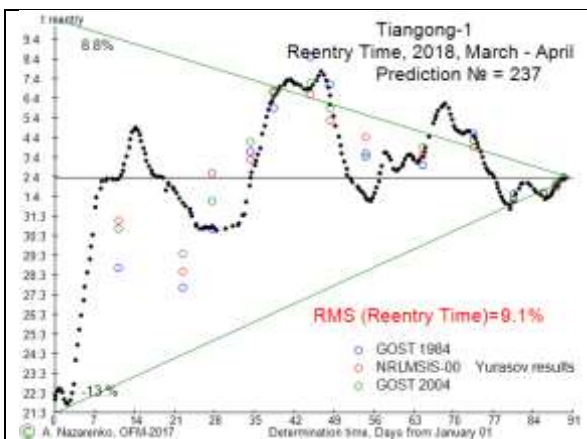
1. The results for evening March 31, 2018

The materials presented below represent a continuation of the text under the same name, posted on the “satmotion.ru” site from November 2017 to March 31 2018.



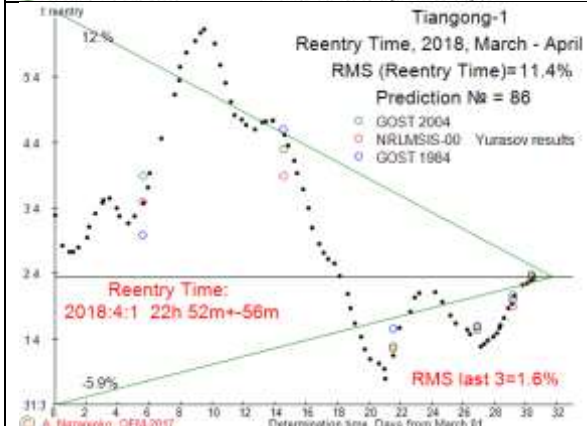
This figure presents the ballistic coefficient estimates, the values of the geomagnetic disturbance index (Kp) and the minimized criterion for all preceding time instants of orbital parameters updating in interval from March 26 to March 31. The estimates of ballistic coefficient (S_b) have changed within the range from 0.00369 to 0.00276 m^2/kg , i.e. 1.34 times. The highest drag variations have been observed after March 28, which is the consequence of reduction of geomagnetic activity

The black line marks the S_b estimates averaged over some preceding time interval (the sliding average). The last smoothed ballistic coefficient value (0.00281 m^2/kg) was used as a constant value in the prediction of SC motion until its entering the dense layers of the atmosphere.



For SC Tiangong-1, the results of all 237 reentry time determinations after January 1, 2018 are presented here.

According to this results, RMS from the last value (April 1, 22^h) equals 9.1% of the remaining lifetime.



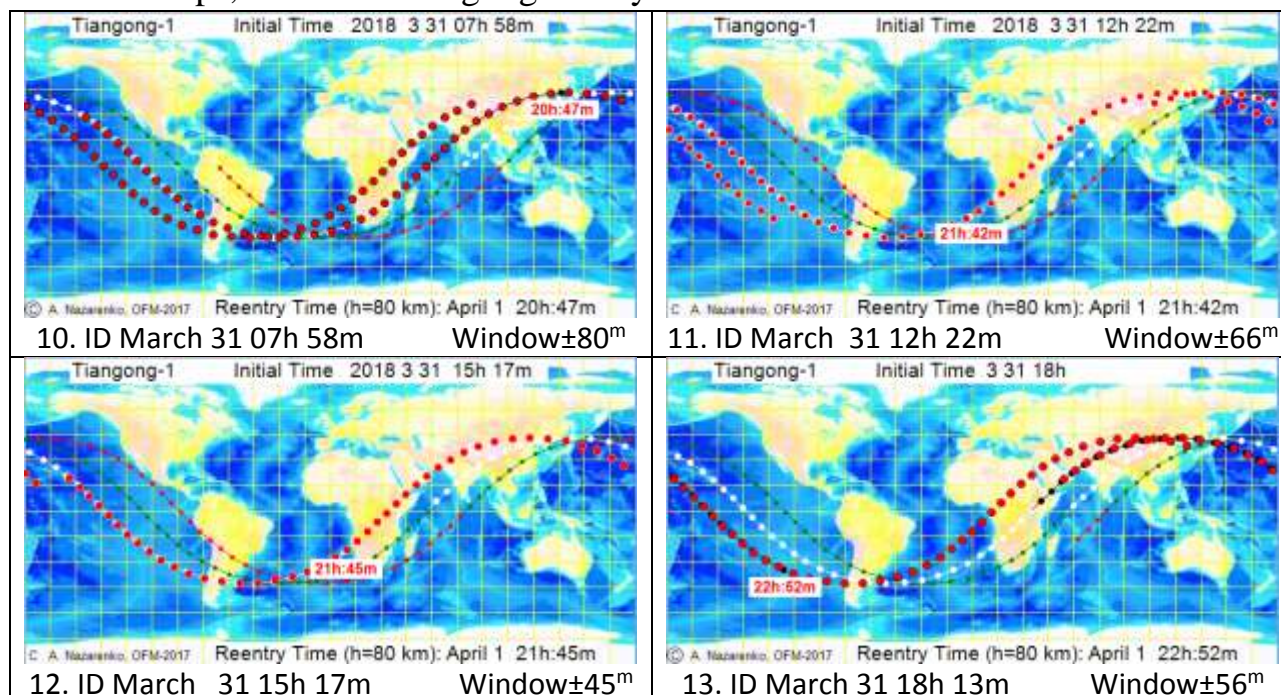
The results of all 86 reentry time determinations after March 1, 2018 are presented here.

According to the results of the last 3 determinations, RMS from the average value equals 1.6% of lifetime.

Reentry time:
April 1 2018 22^h 52^m ± 56^m

Initial data for March 31, 2018
Reentry prediction. Spread in reentry time (UTC):
from April 01 20^h 47^m to April 1 22^h 52^m

On these maps, the window highlighted by red circles.



2. Recent publication of other authors

a) NORD TIP_msg

MSG_EPOCH	INSERT_EPOCH	DECAY_EPOCH	WINDOW	LAT	LON
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

b) Aerospace Corporation

Tiangong-1 is currently predicted to reenter the Earth's atmosphere around

April 1st, 2018 23:30 UTC ± 7 hours.

This prediction was performed by The Aerospace Corporation on 2018 March 31.

c) ESA data:

Update 11:00 CET, 31 March 2018

The team now are forecasting a window centred around 23:25 UTC on 1 April (01:25 CEST 2 April), and running from the **afternoon of 1 April to the early morning on 2 April**. This remains highly variable.

Latest reentry forecast provided by ESA's Space Debris Office, ESOC, Darmstadt. [Update 30 March 2018](#). The current estimated reentry window runs from **the night of 31 March to the late evening of 1 April** (in UTC time); this is highly variable.

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).