

The use of ASPOS OKP System in the interests of ensuring the safety of space operations and increasing awareness about the situation in high orbits

Committee on the Peaceful Uses of Outer Space
61st session, 20-29 June 2018
Vienna

Automated Warning System on Hazardous Situations in Outer Space (ASPOS OKP)

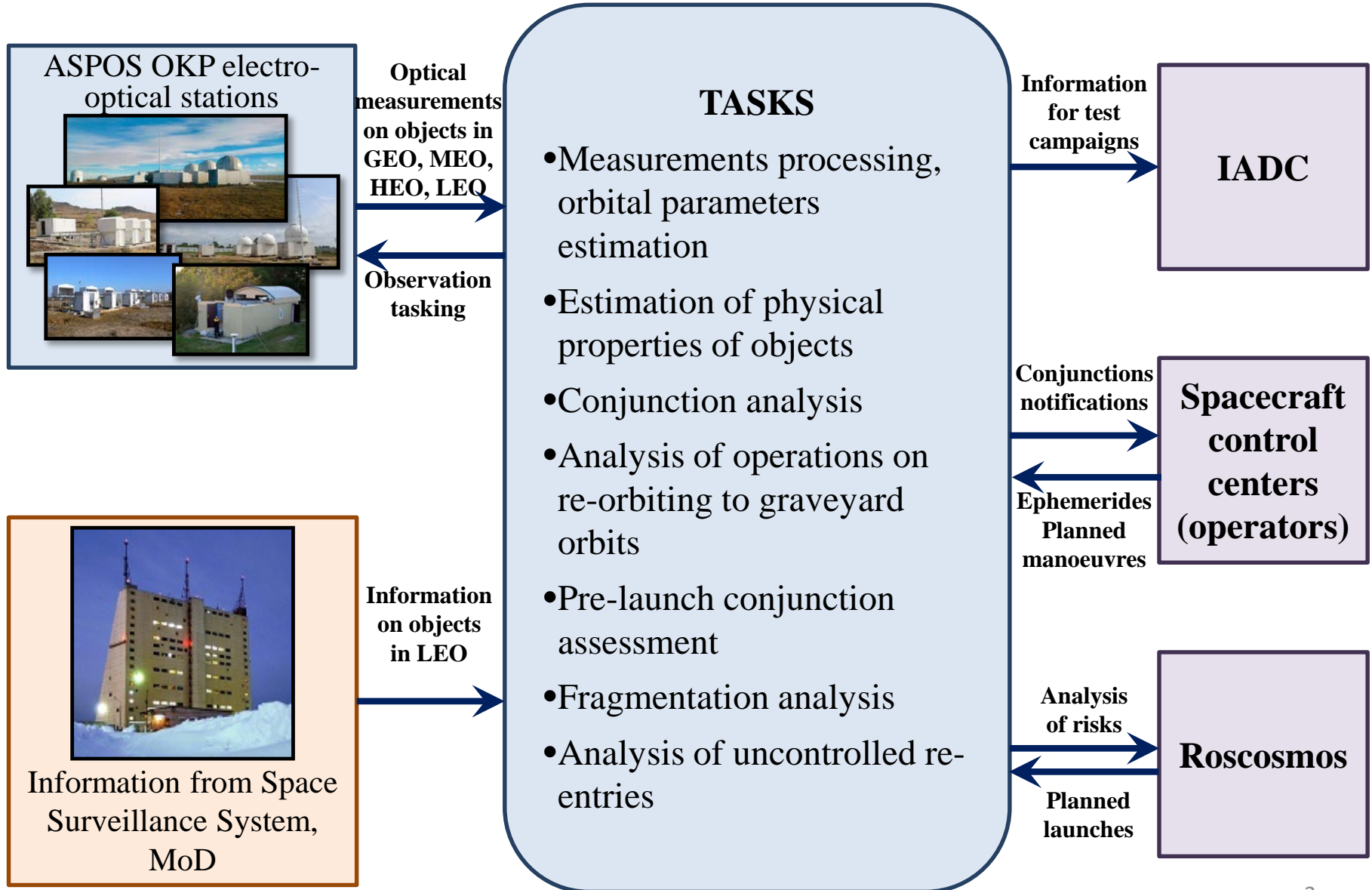
Regular operation started on Jan 1, 2016



- Main information and analysis center (GIATs) at the premises of the MCC, operated by *TsNIIMash*
- Detachments at KIAM RAS and IZMIRAN RAS
- Network of dedicated electro-optical facilities (KSOES) with facilities operated by *Astronomical Scientific Center (ASC), JSC and RPC "Precision Systems and Instruments", JSC*

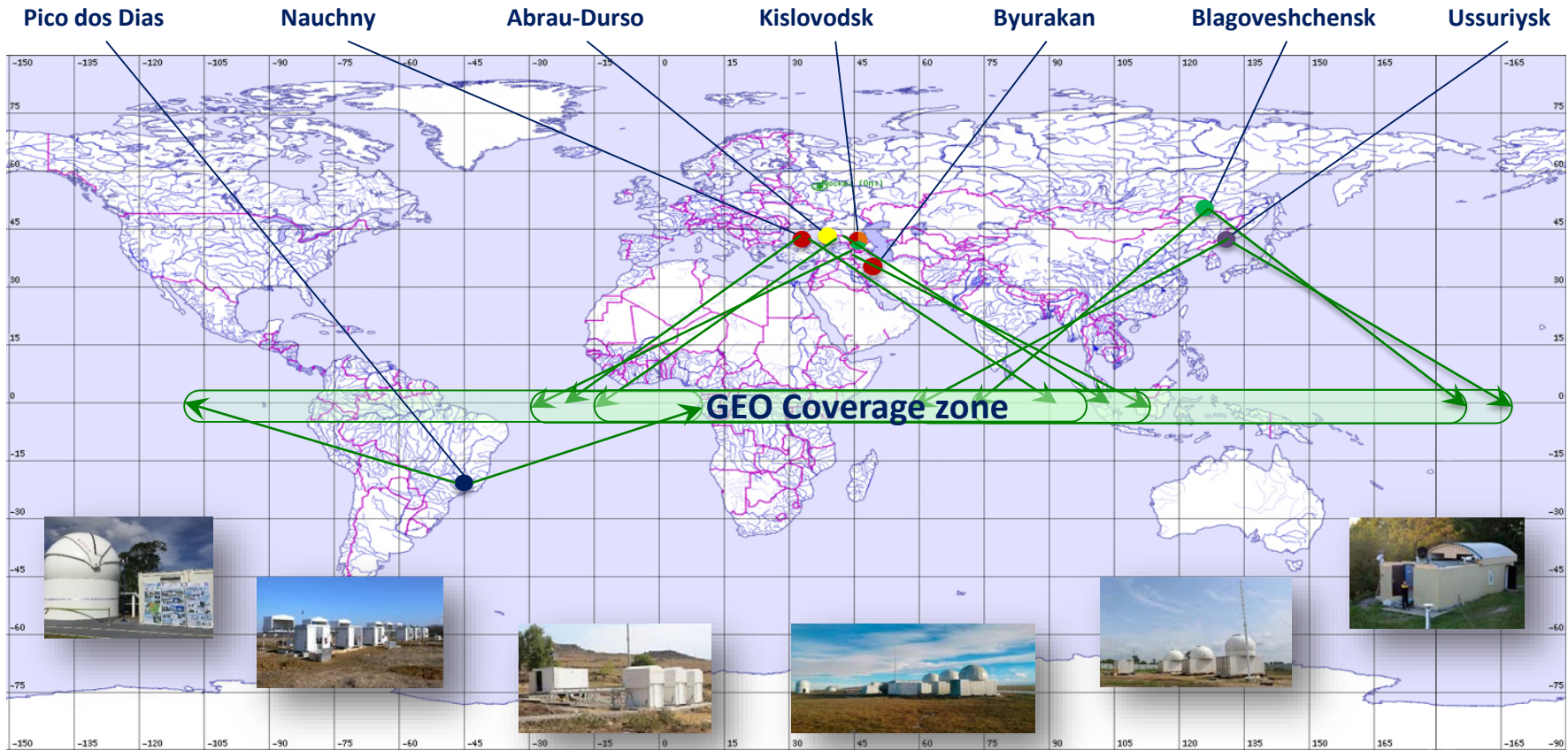
Overall system's operation is supervised by ASC under the contract with Roscosmos

ASPOS OKP – Key Tasks



System operates in 24/7/365 mode

Operational network of electro-optical facilities of ASPOS OKP



EOP-1 (4 facilities)
 Each facility includes
 2 telescopes with 19 cm aperture
 1 telescope with 25 cm aperture
 1 telescope with 40 cm aperture

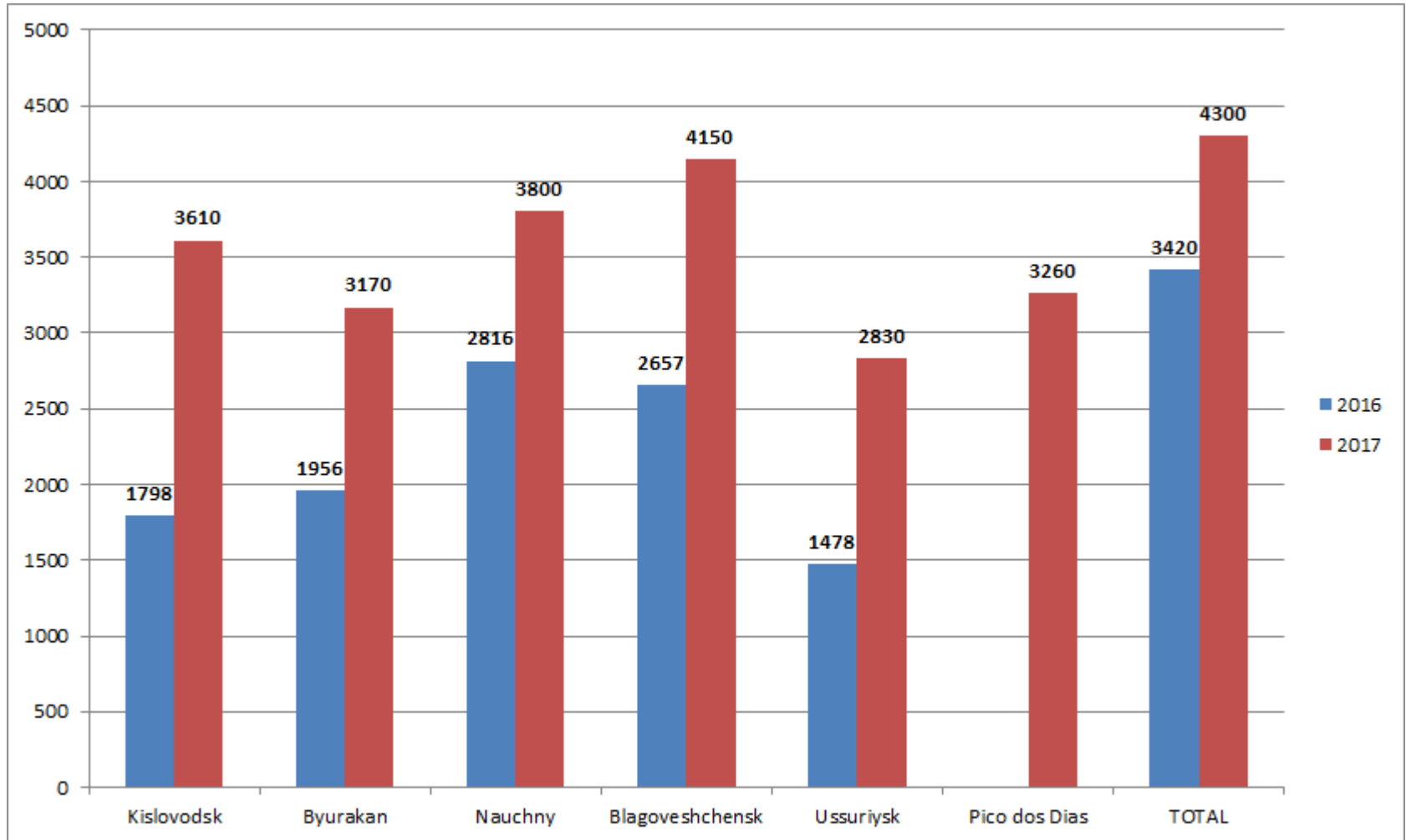
EOP-2 (2 facilities)
 Each facility includes
 4 telescopes with 19 cm aperture
 1 telescope with 40 cm aperture
 1 telescope with 65 cm aperture

SDD OEC
 2 telescopes with 5 cm aperture
 2 telescopes with 25 cm aperture
 1 telescopes with 75 cm aperture

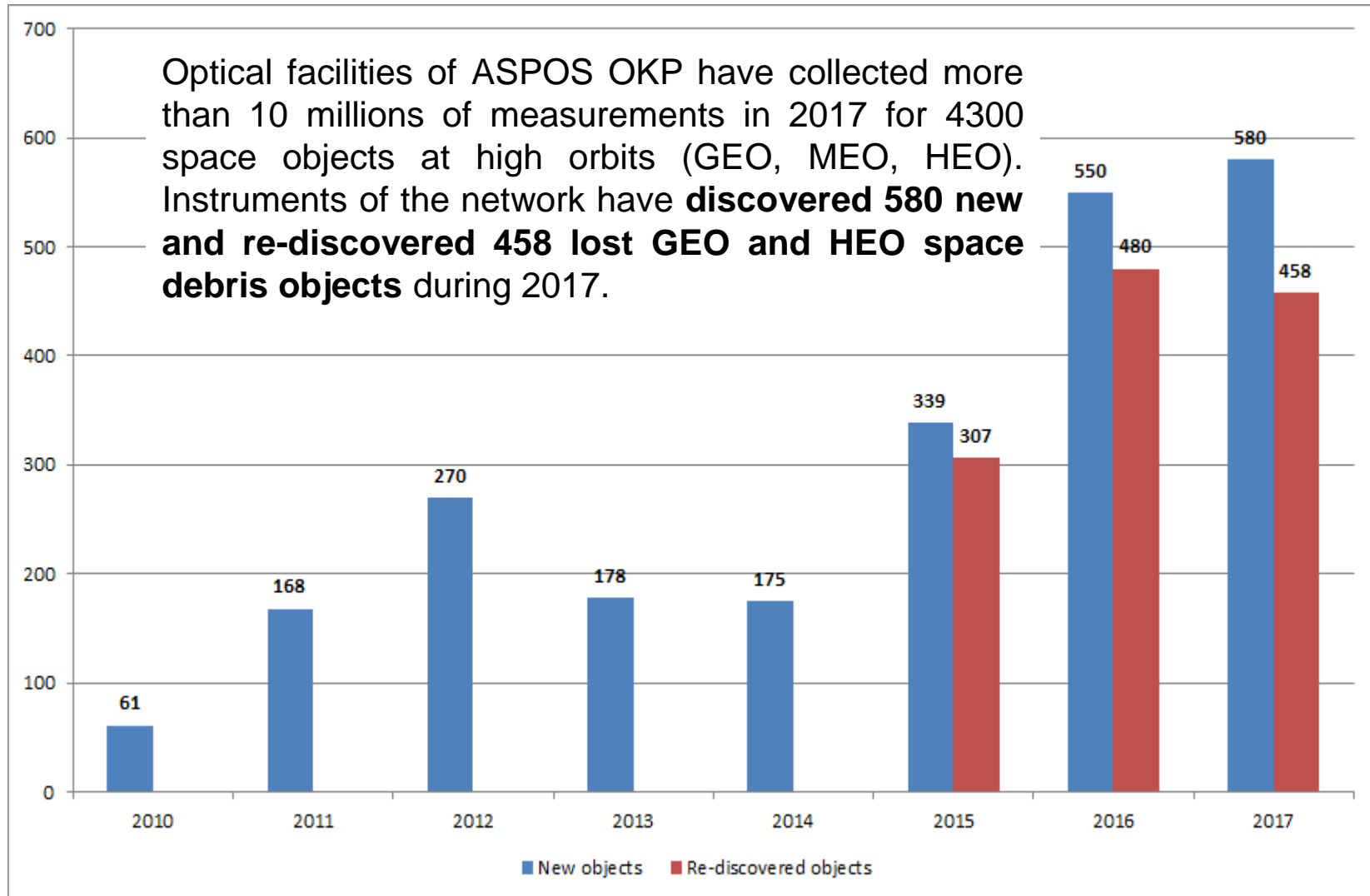
OES-50
OES-65
RKS 25 cm

Total: 22 telescopes/36 optical modules

Number of high orbit objects observed by individual ASPOS OKP optical sites in 2016-2017

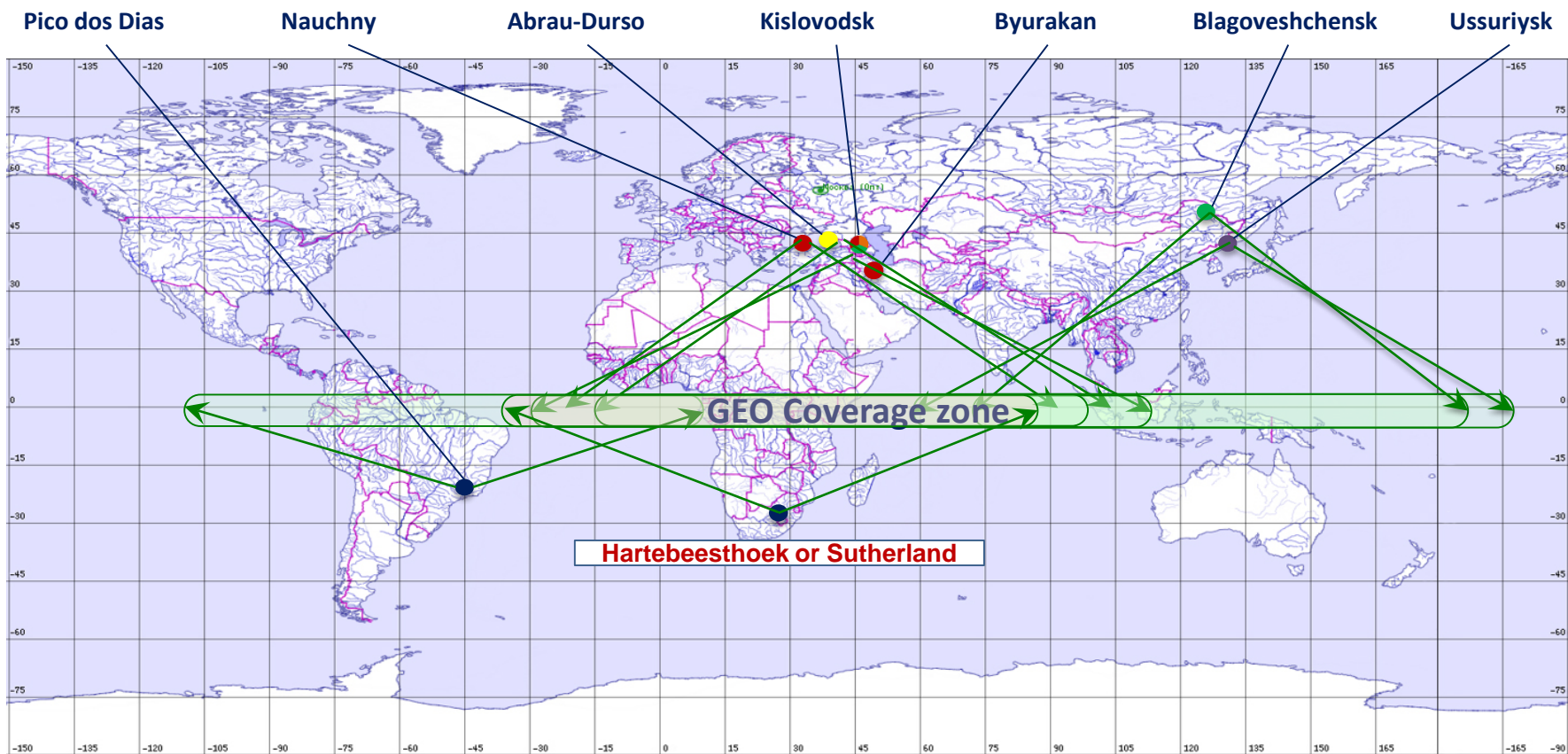


Cumulative GEO and HEO objects discovery statistics



At present ASPOS OKP provides for more than 90% of discoveries of new objects at high orbits discovered by Russian organizations

Planned expansion of the network of optical facilities of ASPOS OKP



EOP-1(4 facilities)

Each facility includes

- 2 telescopes with 19 cm aperture
- 1 telescope with 25 cm aperture
- 1 telescope with 40 cm aperture



EOP-2 (2 facilities)

Each facility includes

- 4 telescopes with 19 cm aperture
- 1 telescope with 40 cm aperture
- 1 telescope with 65 cm aperture



SDD OEC (2 facilities)

- 2 telescopes with 5 cm aperture
- 2 telescopes with 25 cm aperture
- 1 telescopes with 75 cm aperture



OES-50



OES-65



RKS 25 cm

Total: 23 telescopes/41 optical modules

Major fragmentation in GEO on Feb 28, 2018

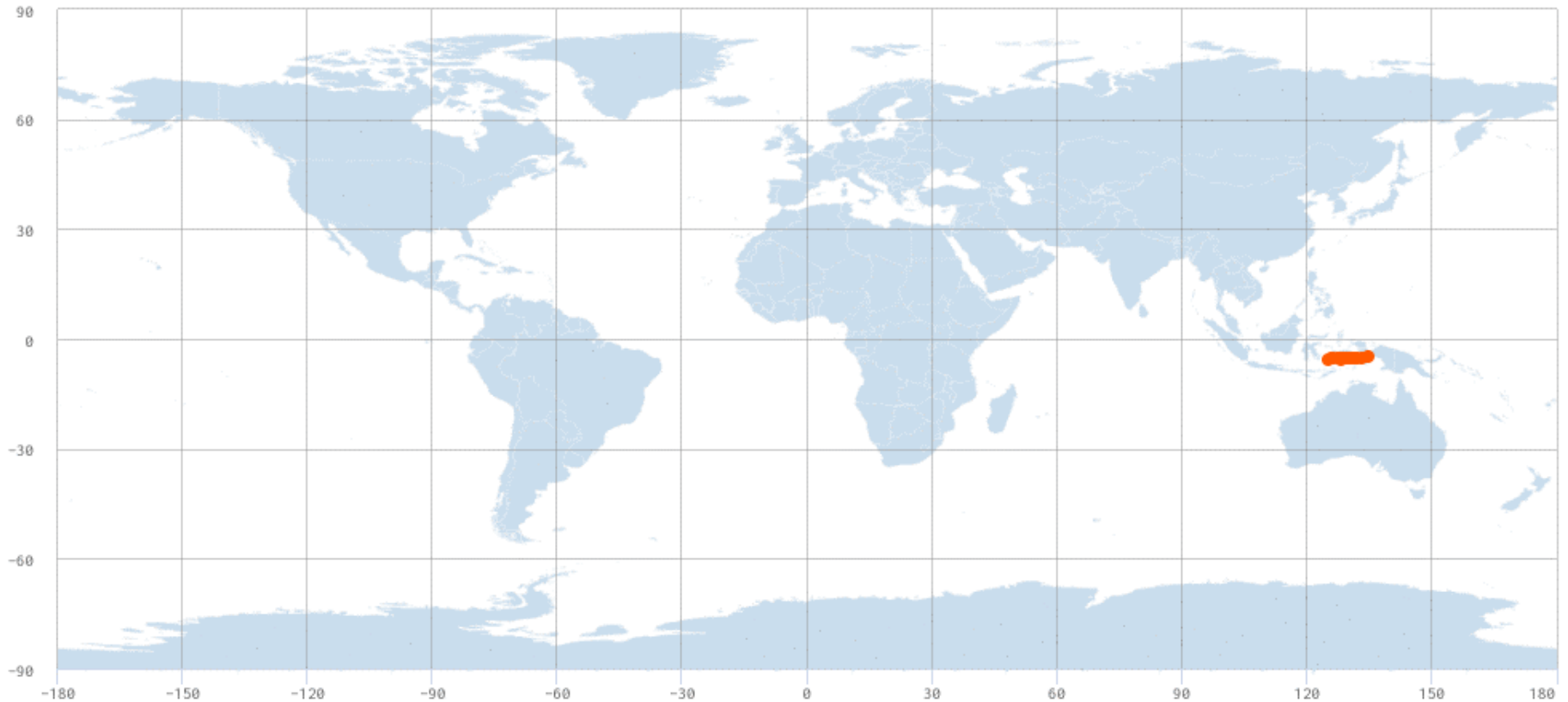
- Upper stage Transtage 17 (1969-013B, SSN #3692) have experienced a **major break-up on 28 Feb 2018 at around 21:00 UTC**. Coordinates: 5.28 S, 129.96 E. Altitude: 37242 km
- Transtage 17 was used by the United States as an upper stage in a launch on Feb 9, 1969 to place TACSAT satellite in GEO
- First breakup reported to have occurred on 4 June 2014



Images credit: NASA

Quick dispersion of tracked fragments of Transtage 17 along the GEO belt

2018-02-28 21:00:00

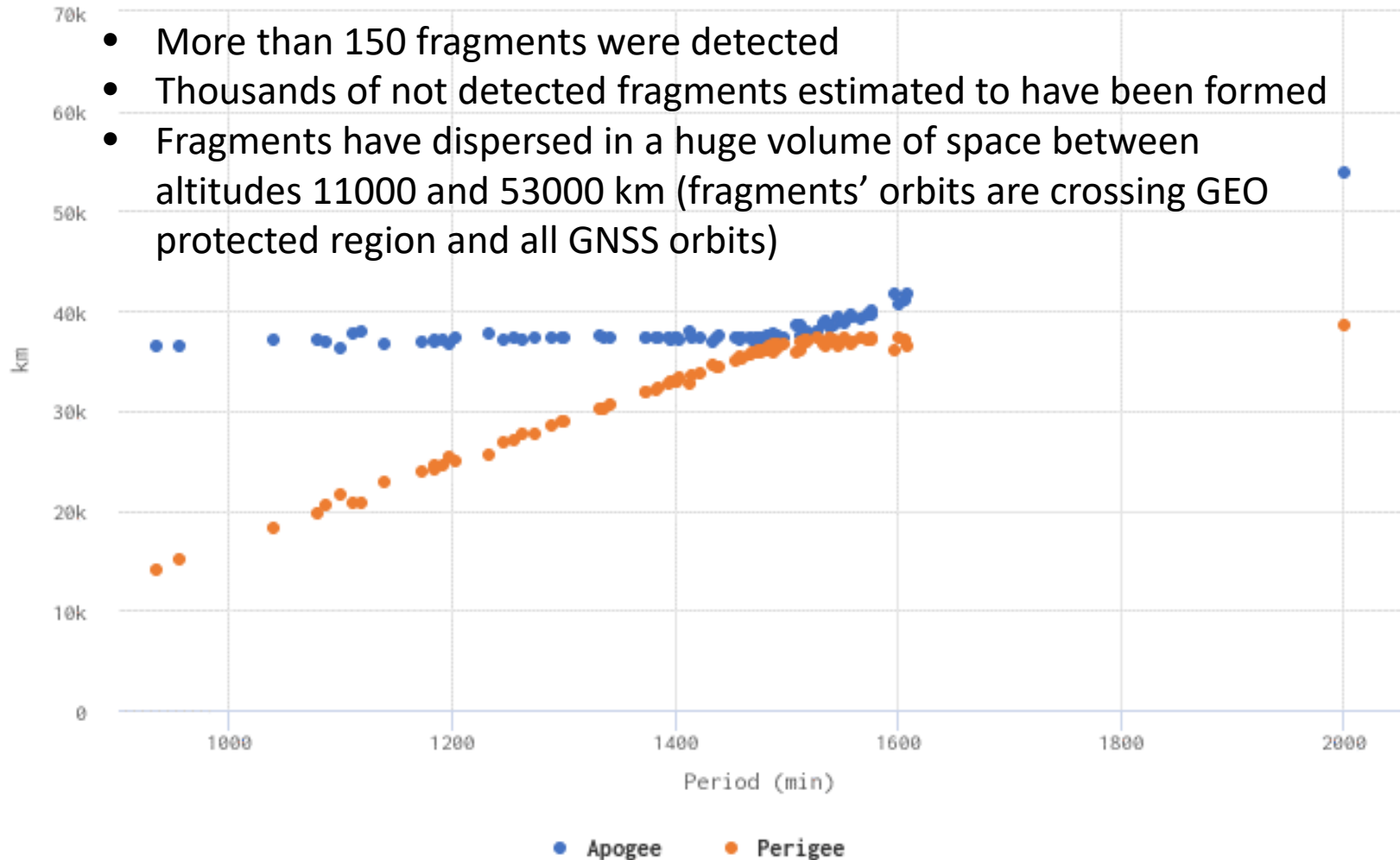


Debris of the fragmentation have quickly (less than in 3 days) dispersed across entire GEO belt due to significant difference in orbital period and eccentricity

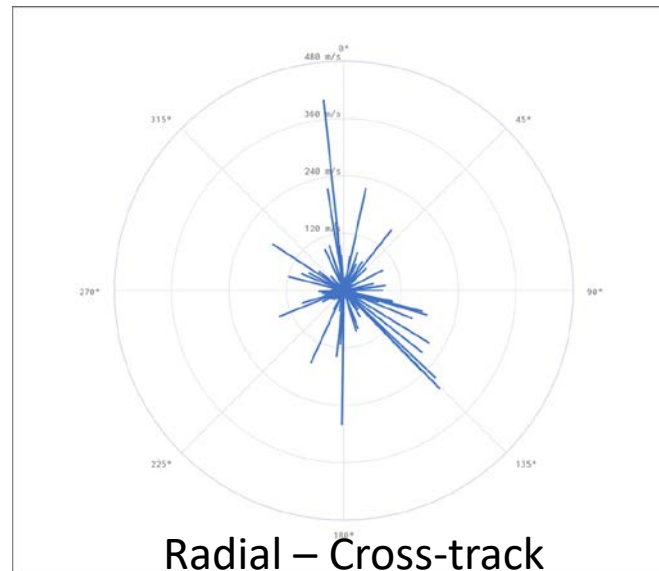
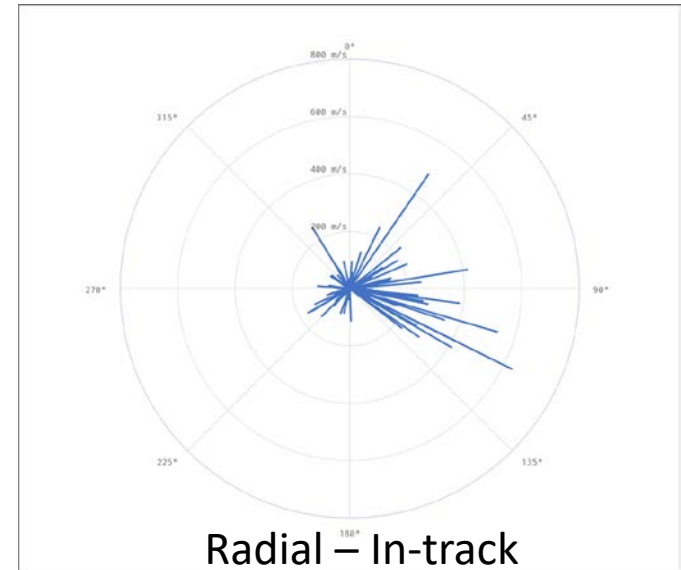
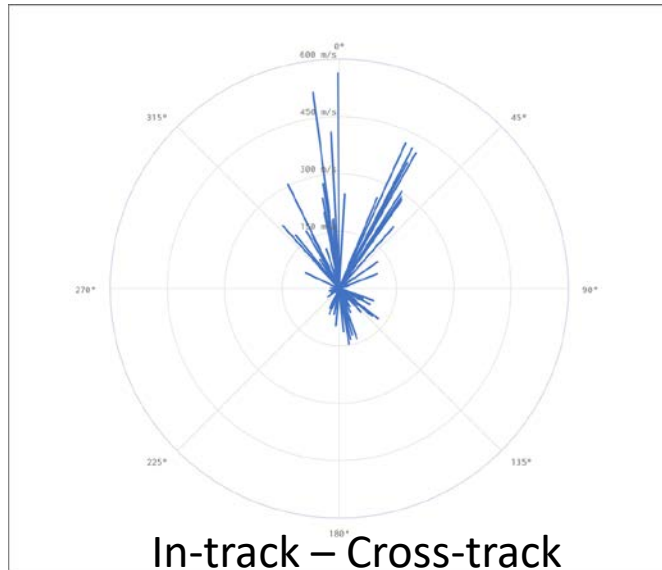
Gabbard diagram evolution

Gabbard diagram

2018-02-28



Estimated direction of ejection and relative velocity of fragments



Characterization of fragmentation of Transtage 17

- Relative velocity dV of fragments is varying between 6 and 630 m/s
- The largest detected fragment has estimated effective cross-section area equal to 4.7sq.m, the smallest one – 0.04 sq.m
- The lightest detected fragment has estimated mass around 7 g, the heaviest one – around 184 kg
- For the first time quite detailed information sufficient for operational analysis and characterization of significant quantity of fragments related to a break-up in GEO is collected shortly after the event thanks to coordinated effort of instruments operated by ASPOS OKP, Astronomical Scientific Center, ISON, ISTP RAS and other Russian scientific and research organizations

Detailed information on the break-up of Transtage 17 was presented by Roscosmos at the IADC meeting in Tsukuba on 5-8 Jun 2018

- Data have collecting continuously by ASPOS OKP are used effectively for conjunction assessment and analysis of situation in critically important regions of the near-Earth outer space such as GEO, HEO (including GTO) and MEO (including GNSS) orbits for the purposes of providing safety of space operations
- Due to importance for spacecraft operators to have accurate orbital information on space objects for conjunction assessments Roscosmos is preparing to start operation of a dedicated open information service to share space monitoring data collected by ASPOS OKP with international community
- The service will provide access to the ephemerides for GEO, HEO and MEO objects supplemented by covariance matrices estimations

Thank you for your attention!