Actual Situation in the Geostationary Orbit

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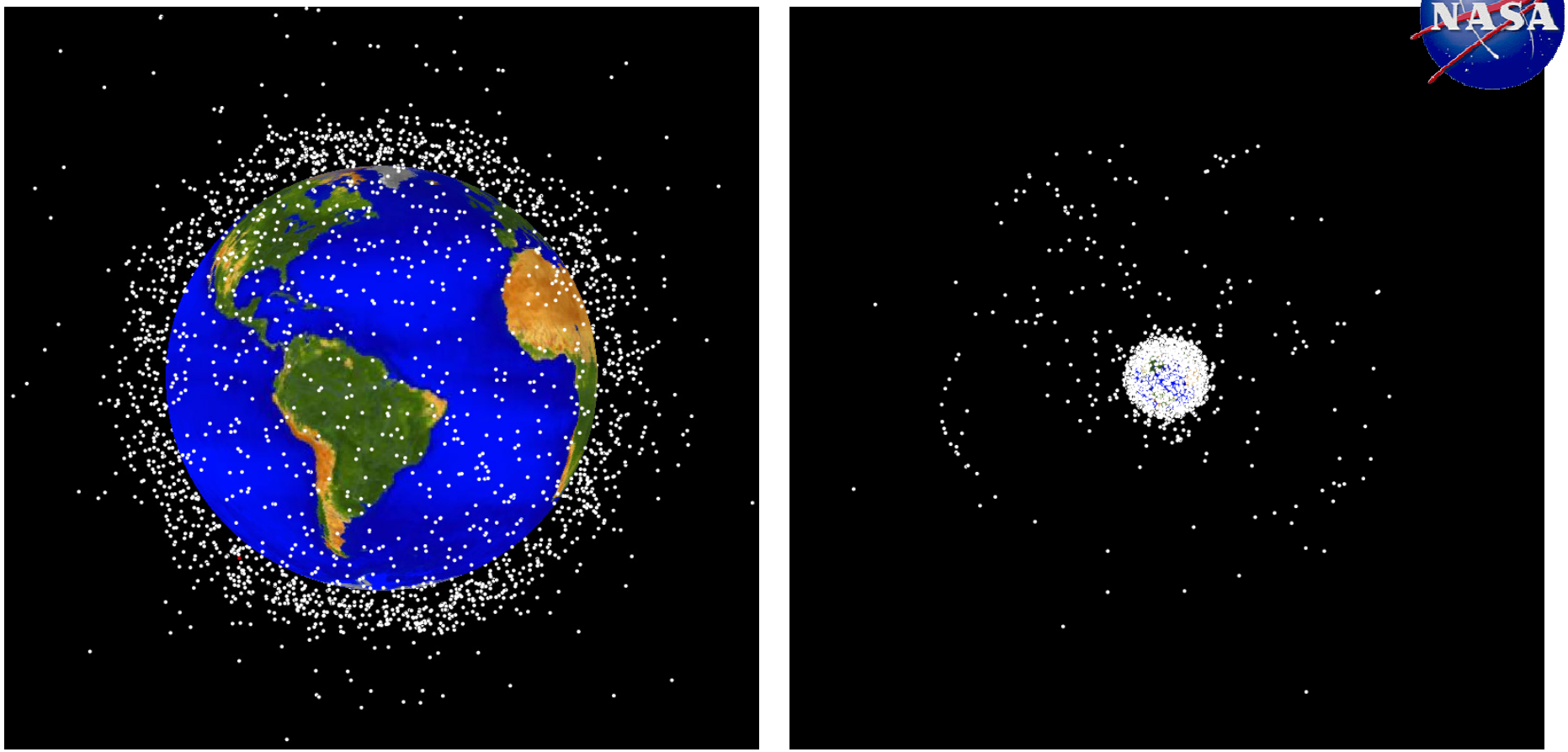
Basic Facts on the Geostationary Orbit

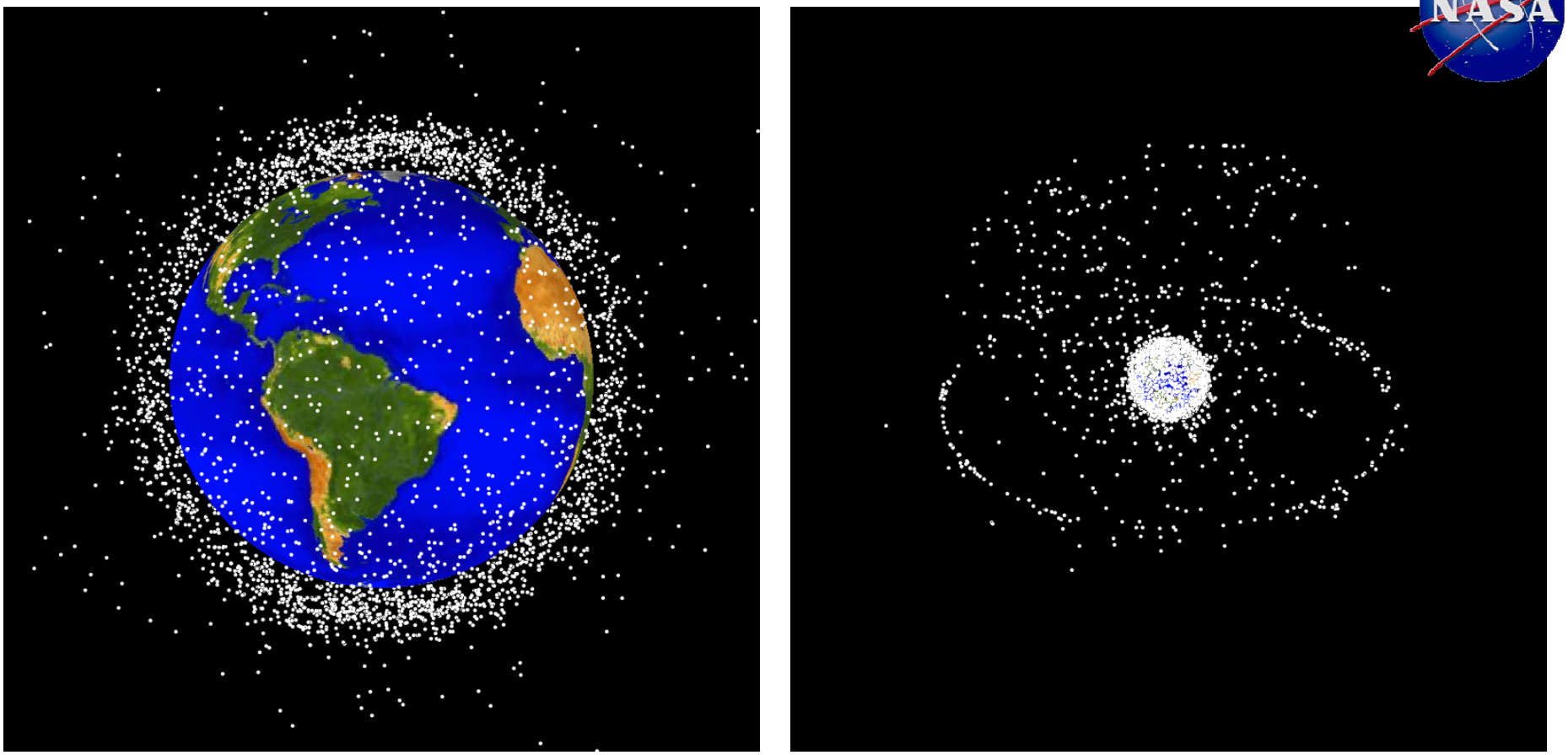
- The GEO is a circular orbit in the equatorial plane at a distance of 42.165 km from the centre of the Earth, i.e. at an approximate altitude of 35.780 km of its subsatellite point.
- A GEO satellite is acted upon by the attraction of the entire body of the Earth and by perturbations of the Moon and the Sun. It has to be maintained at or near its nominal position by station-keeping. Its radio transmissions can be received by a fixed antenna.
- Upon a discussion of two working papers submitted by the Czech delegation in 1998 and 2000, the COPUOS adopted a statement that the GEO , characterized by its special properties, is an integral part of outer space.

1975



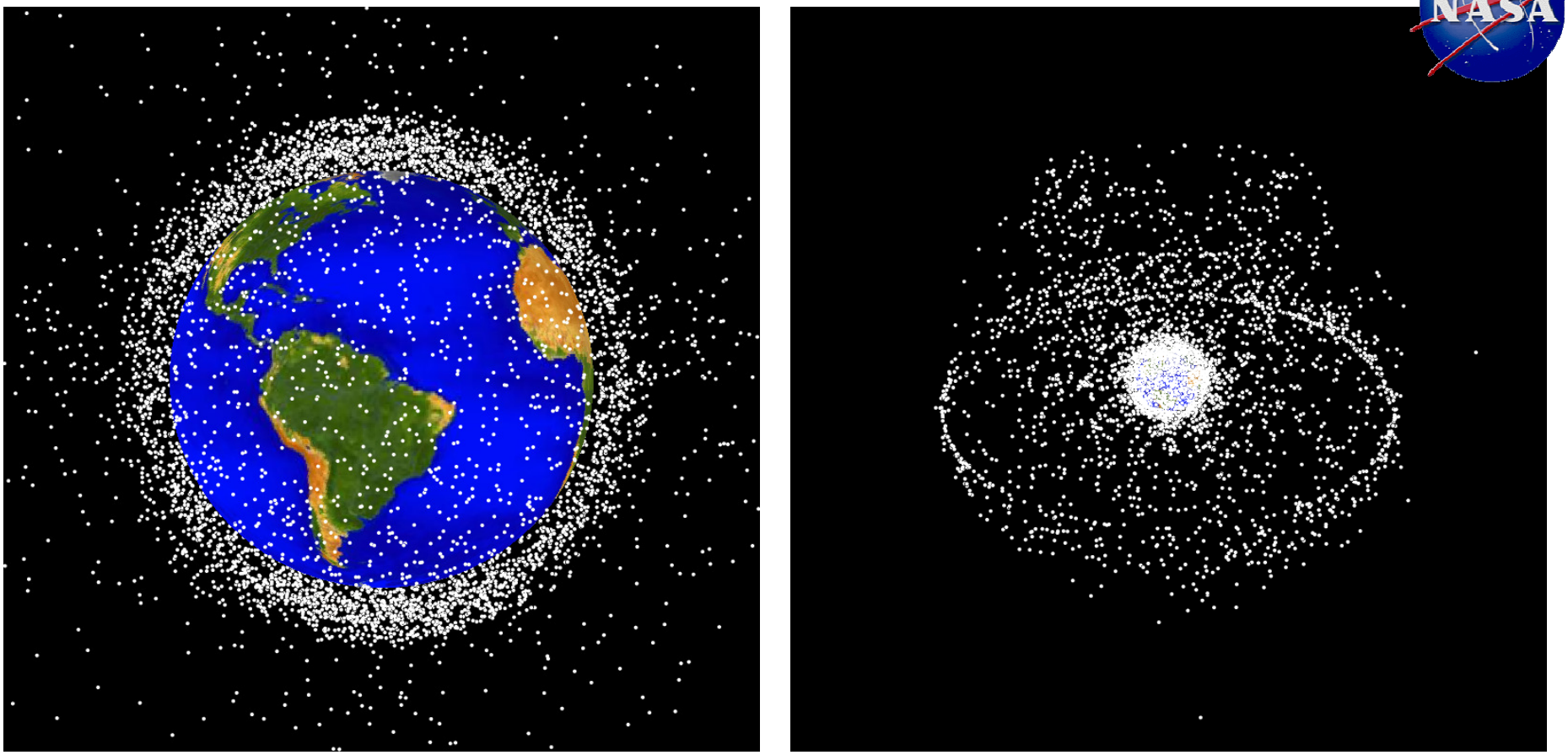
Cataloged objects >10 cm diameter

1985



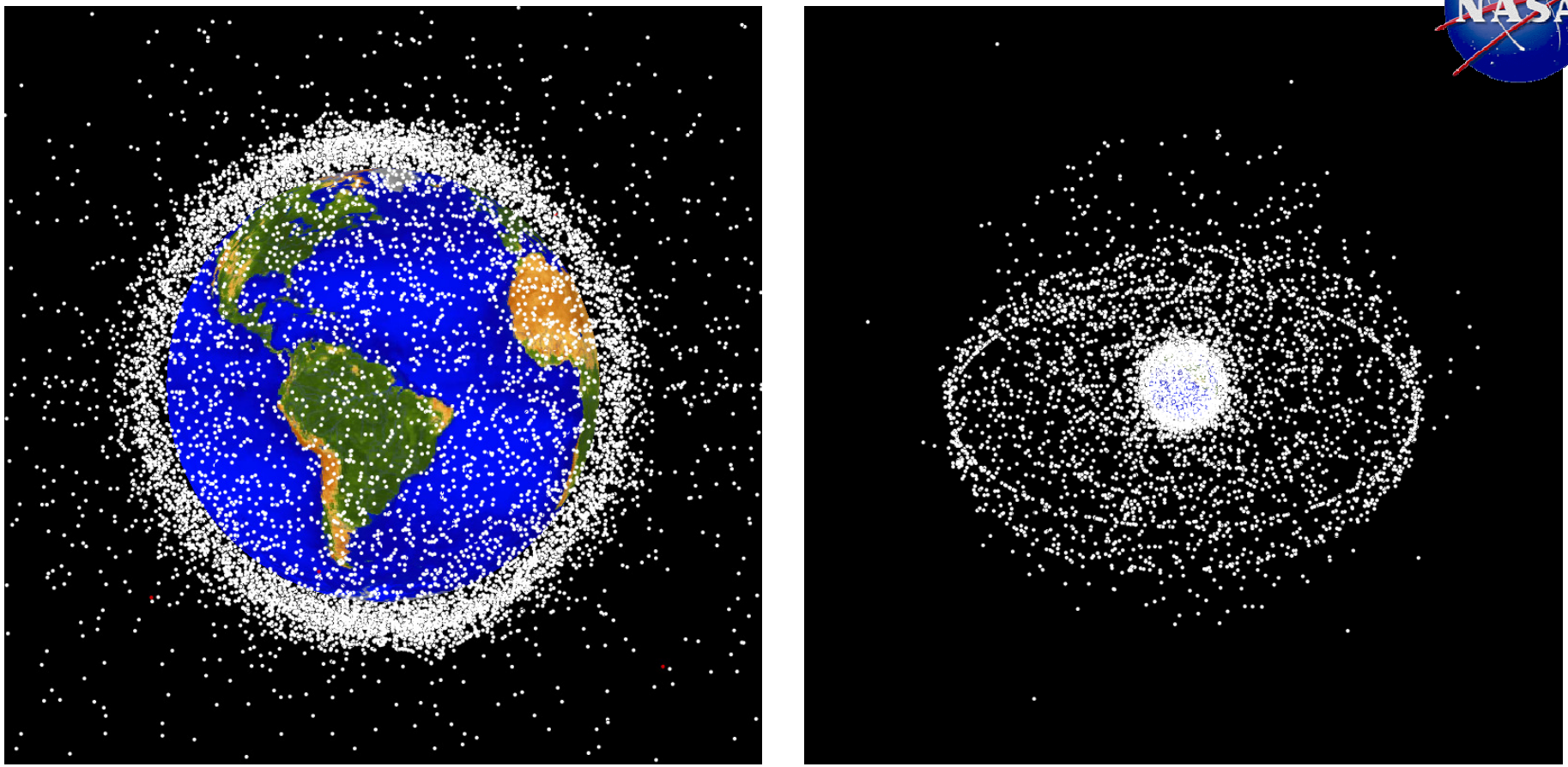
Cataloged objects >10 cm diameter

1995



Cataloged objects >10 cm diameter

April 2008



Cataloged objects >10 cm diameter

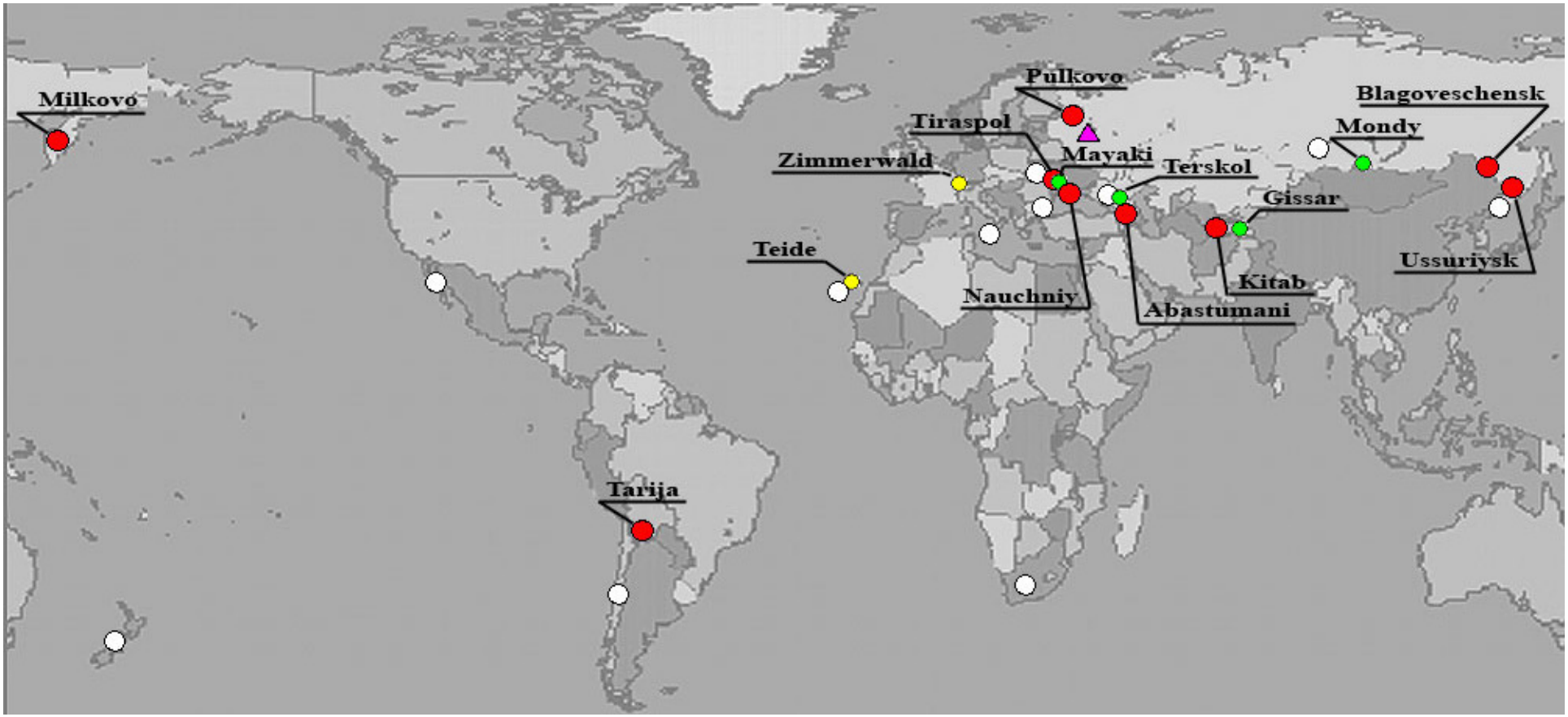
Satellites in the GEO

- As of the end of 2011, there were 406 active satellites in the GEO. In the course of 2011, 24 new satellites have been launched. 23 left their nominal orbital positions and started drifting, leaving the total number almost unaffected.
- Out of the 406 active, 270 are controlled in longitude and inclination, some 130 controlled in longitude only.
- There are some 900 catalogued inactive objects, drifting in the GEO or in libration orbits. Moreover, there is a number of uncatalogued debris.
- Positions of active satellites are observed by the US Space Surveillance Network and published by NORAD in Two Line Elements.
- Another source of positions is the International Scientific Optical Network operated by the Keldysh Institute of Applied Mathematics in Moscow
- Processed positions appear in "Classification of Geosynchronous Objects" published by ESOC and distributed at this session.

Space Surveillance Network

Worldwide Network of 20 Optical and Radar (Mechanical & Phased Array) Sensor Sites

I S O N
International Scientific Optical Network



The role of the International Telecommunication Union

- The ITU maintains efficient procedures of coordinating telecommunication operations with a view to ensure optimal, fair and rational use of the radio frequency spectrum. In addition, the ITU can propose a nominal orbital position suitable for the case in hand.
- The ITU notified in its Master International Frequency Register the frequencies and orbital positions of space radio networks in the GEO which consequently enjoy international recognition and protection against harmful interference (see: Annual Space Report to the STS-12 on the use of the GEO ... up to 31.12.2011):
  - 2011 total number of networks 3371, notified 1021
  - 2010 3133 1032
  - 2009 3166 1014
  - 2008 3126 860

Space networks versus satellites

- Nominal orbital positions and frequencies of transmissions of individual beams are published by the ITU in the Space Network List on the website www.itu.int.com. The column showing the identity of the space network has been denoted "sat_name". It has to be understood that the symbol means identity of the satellite network or space network which is a document listing frequencies of radio transmissions. It does not refer to the identity of the satellite which is a vehicle carrying the respective radio station on board. This distinction is essential.
- There are thus two extensive and detailed data systems, one on satellites maintained by the OOSA, one on space networks, maintained by the ITU.
- Both systems deal with the same phenomenon, radio transmissions from the GEO.
- The two data systems deserve to be correlated.
- That correlation or comparison is presented here. It is one of the important facts on the GEO.

Comparison of "Space Networks" with "GEO Satellites" (see Annex I)

- In most cases one or more space networks refer to an orbital position occupied by one or more satellites and the transmissions proceed as intended.
- In some cases, however, the satellite has been launched by an agency of a different "administration" (the ITU term for a country or state) than that of the space networks. There may be an agreement of cooperation between the two countries but we cannot be sure without a more detailed study.
- There is a third group of cases when no satellite appears at the orbital position. In those cases, no radio transmission is possible.
- There are several possible reasons for the absence of satellites at a specific orbital position. The satellite may have come to an end of its activities, may have failed, or may have been repositioned to another position. Or, a new satellite has not yet taken up its intended services.
- An absence of one year, or perhaps two years, is possible. An absence of 3 to 5 years may raise questions of efficiency.

Counting Positions with Absences of satellites of 3 to 5 years – see Annex II

- Examining the situation over years, 2008 to 2012, we found
  - 95 nominal orbital positions with
  - 145 networks which have had no satellite at the relevant nominal position for 3-5 years,
  - 34 networks which have had no satellite for up to 2 years.
- With regard to 1021 space networks, 15% and 3% respectively, are not in working condition. The percentages may be larger if account could have been taken of cases where operators of a satellite have no agreement with a network at the relevant orbital position.
- Space networks with no satellites concern 20 different Administrations, i.e. a significant fraction of launching countries.

Possible Explanation

- Present technology does not permit a faster replacement of satellites,
- Notified space networks are kept by administrations even if operation is not feasible for a long period of time,

Possible solutions

- Not using "paper" networks in computing harmful interference.
- When feasible, prefer renting transponders on active satellites to launching satellites.

Conclusion

- Making a comparison between radio space networks and satellites which carry these radios on board is relatively simple and inexpensive. It leads to the detection of facts which might otherwise escape attention.
- The Latin proverb “EX FACTO SEQUITUR LEX” suggests that knowledge of important facts may be useful for correctly formulating laws or for making efficient decisions. The present contribution is offered in that spirit.
- Comparative Tables should be maintained and updated by an organization, not by an individual because they deal with the efficient use of the GEO.
- As always, laws and decisions are in the hands of sovereign nations.

- Thank you!