



EL PROGRAMA SSA DE LA ESA

EMMET FLETCHER

Responsable del Segmento de Vigilancia y Seguimiento Espacial
Agencia Europea del Espacio

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European Space Agency

The objective of the Space Situational Awareness (SSA) programme is to support the **European independent utilisation** of, and **access to, space** for research or services, through the **provision of timely and quality data**, information, services and knowledge regarding the **space environment**, the **threats** and the sustainable exploitation of the outer space **surrounding our planet Earth.**"

- **ESA Ministerial Council
November 2008**



Tres Segmentos

- Vigilancia y seguimiento espacial
- Meteorología Espacial
- Asteroides



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2009 – 2012 (Periodo 1)

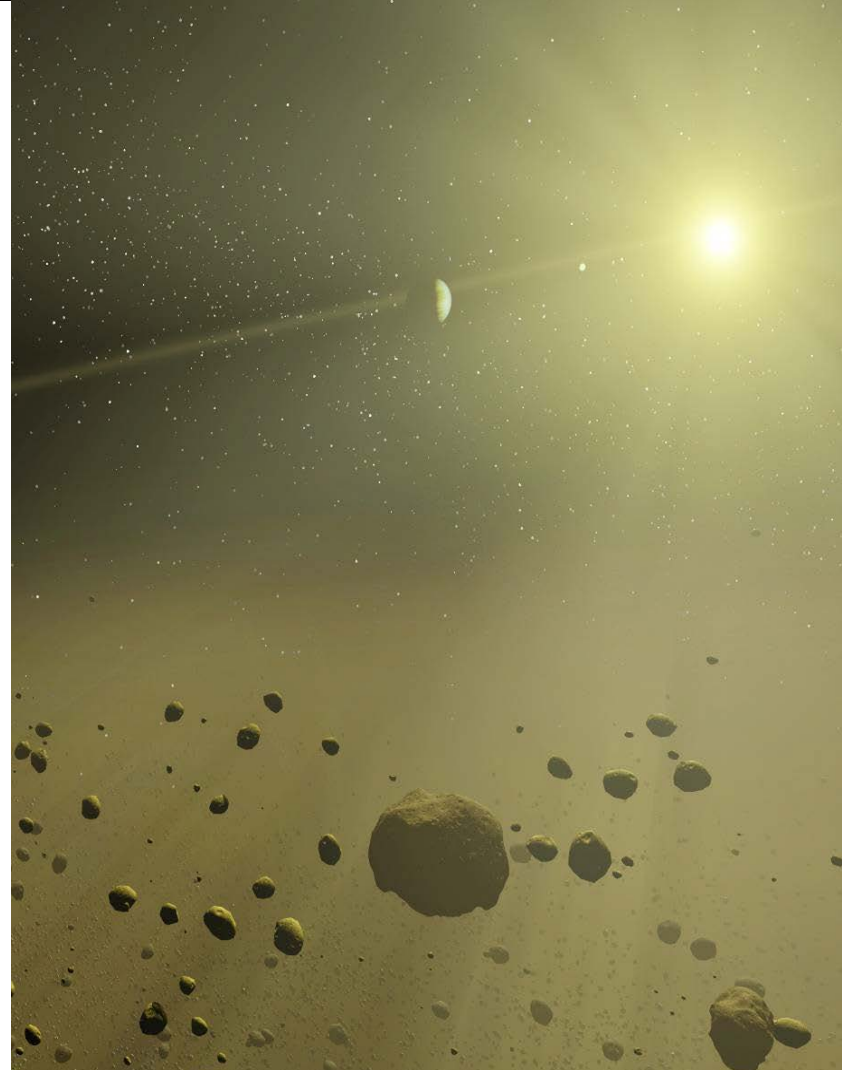
–Programa Preparatorio

- Definición de gobernanza
- Política de datos
- Requisitos del misión, usuarios y sistema
- Arquitectura
- Federación de recursos ya existentes
- Prototipos de servicios
- Prototipos de radares
- Prototipos de centros de datos

2013 – 2016 (Periodo 2)

–Desarrollo, Ensayo & Comprobación

- Desarrollo de componentes esenciales para el arquitectura final
- Integración de recursos (como sensores)
- Ensayo y validación dentro los tres segmentos



Estados Miembros Participando



- Alemania (1, 2) (1) Fase 1 solo
- Austria (1, 2) (2) Fase 2 solo
- Bélgica (1, 2) (1, 2) Fases 1 y 2
- Dinamarca (2)
- España (1)
- Finlandia (1, 2)
- Francia (1)
- Grecia (1)
- Italia (1, 2)
- Luxemburgo (1, 2)
- Noruega (1, 2)
- Polonia (2)
- Portugal (1)
- Reino Unido (1, 2)
- Republica Checa (2)
- Rumania (2)
- Suecia (2)
- Suiza (1, 2)





SEGUIMIENTO ESPACIAL

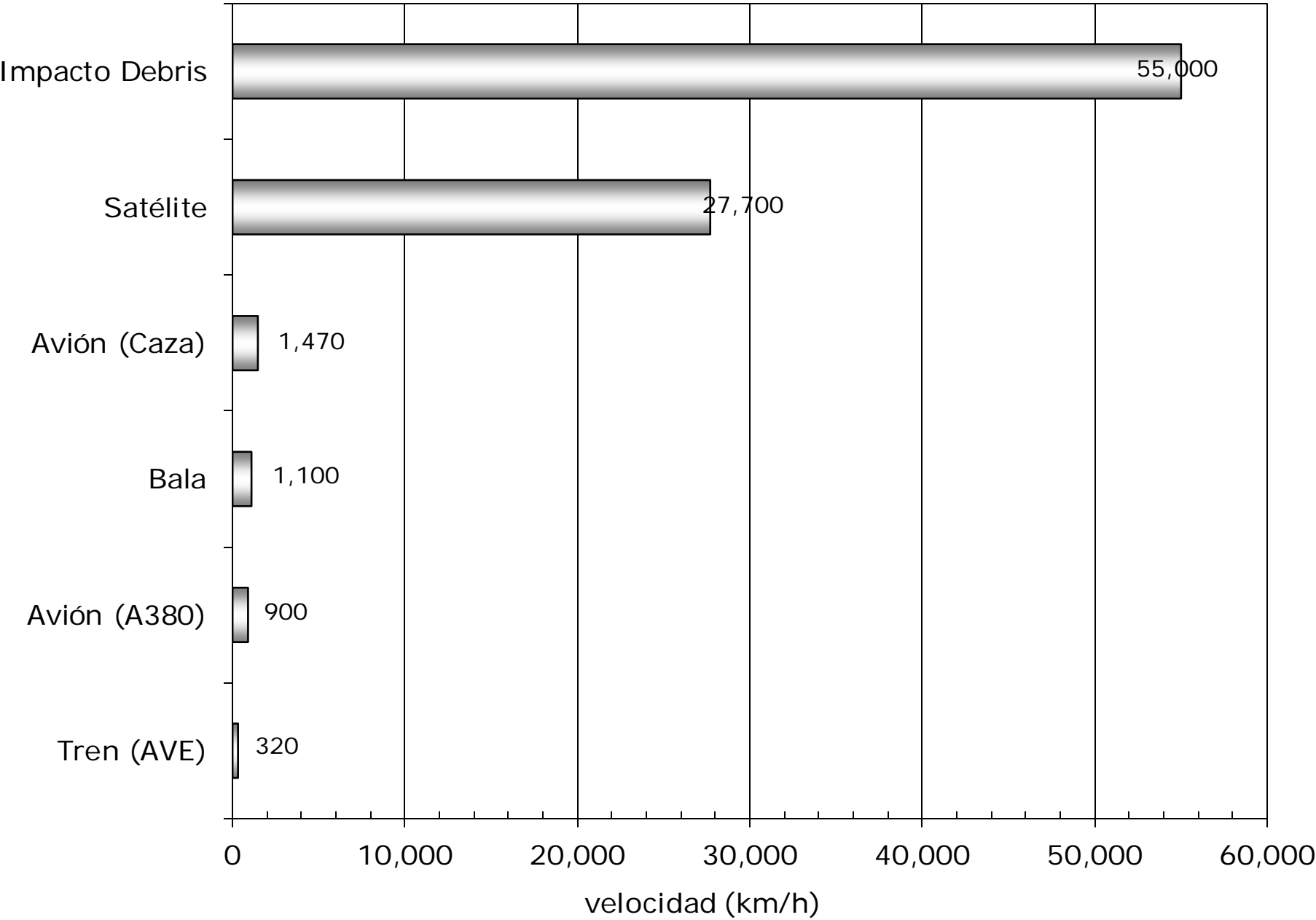


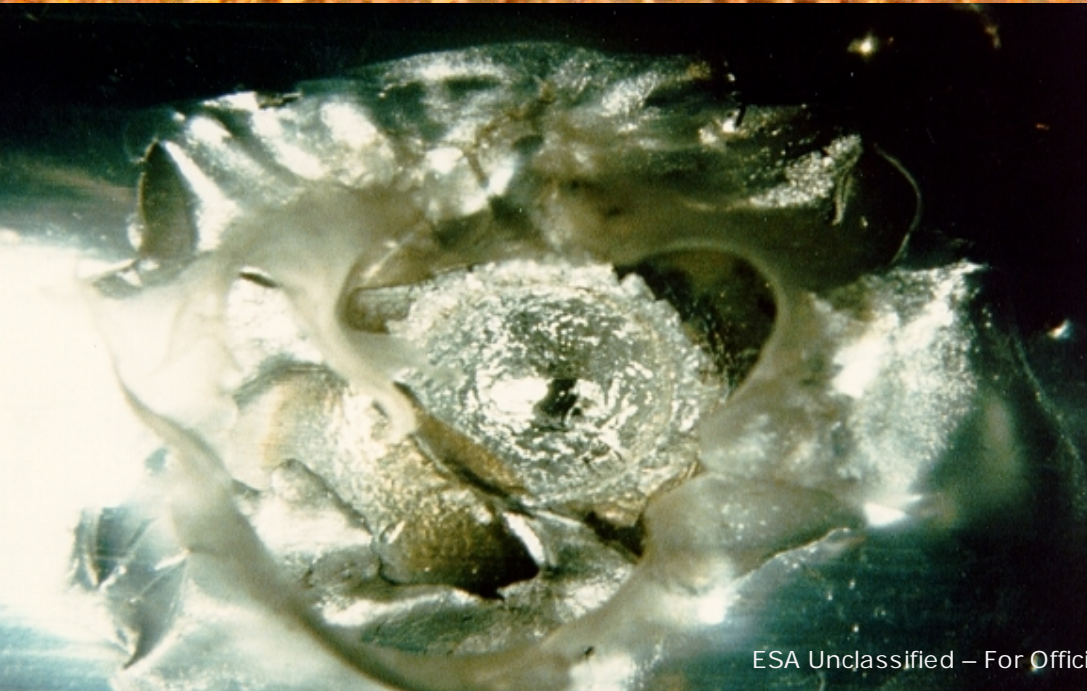
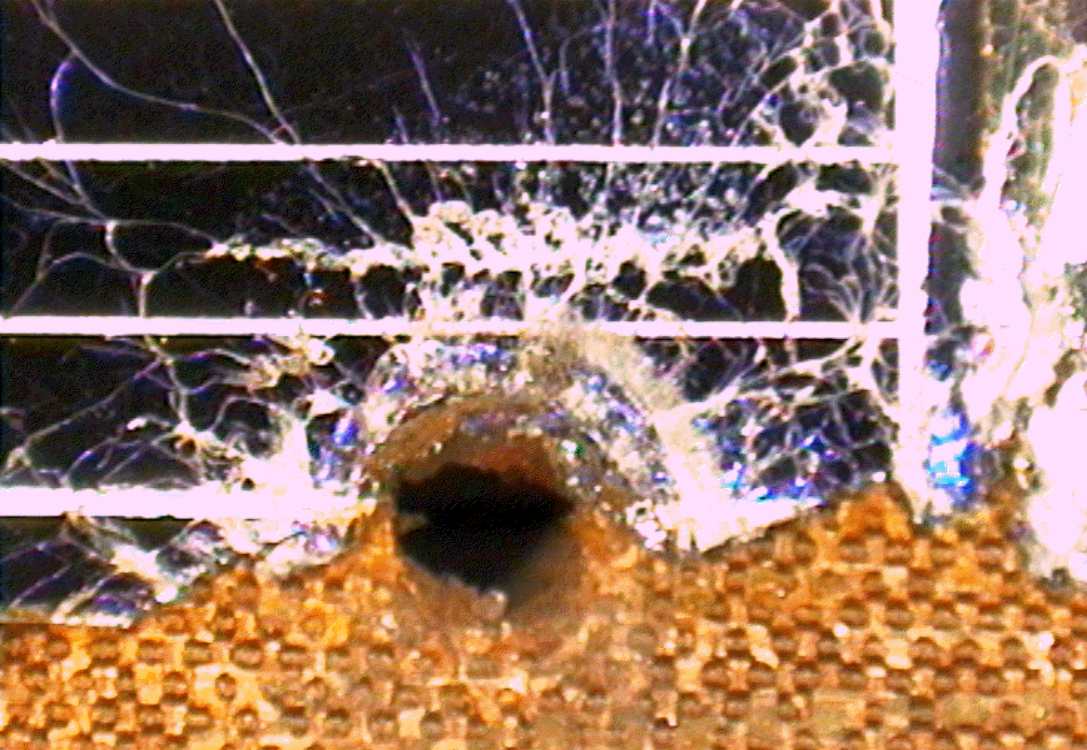
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	tamaño	numero	% masa
	> 10 cm	> 20.000	99,93
	1 – 10 cm	> 600.000	0,035
	< 1 cm	> 35.000.000	0,035
	total	> 35.000.000	> 6.000 toneladas

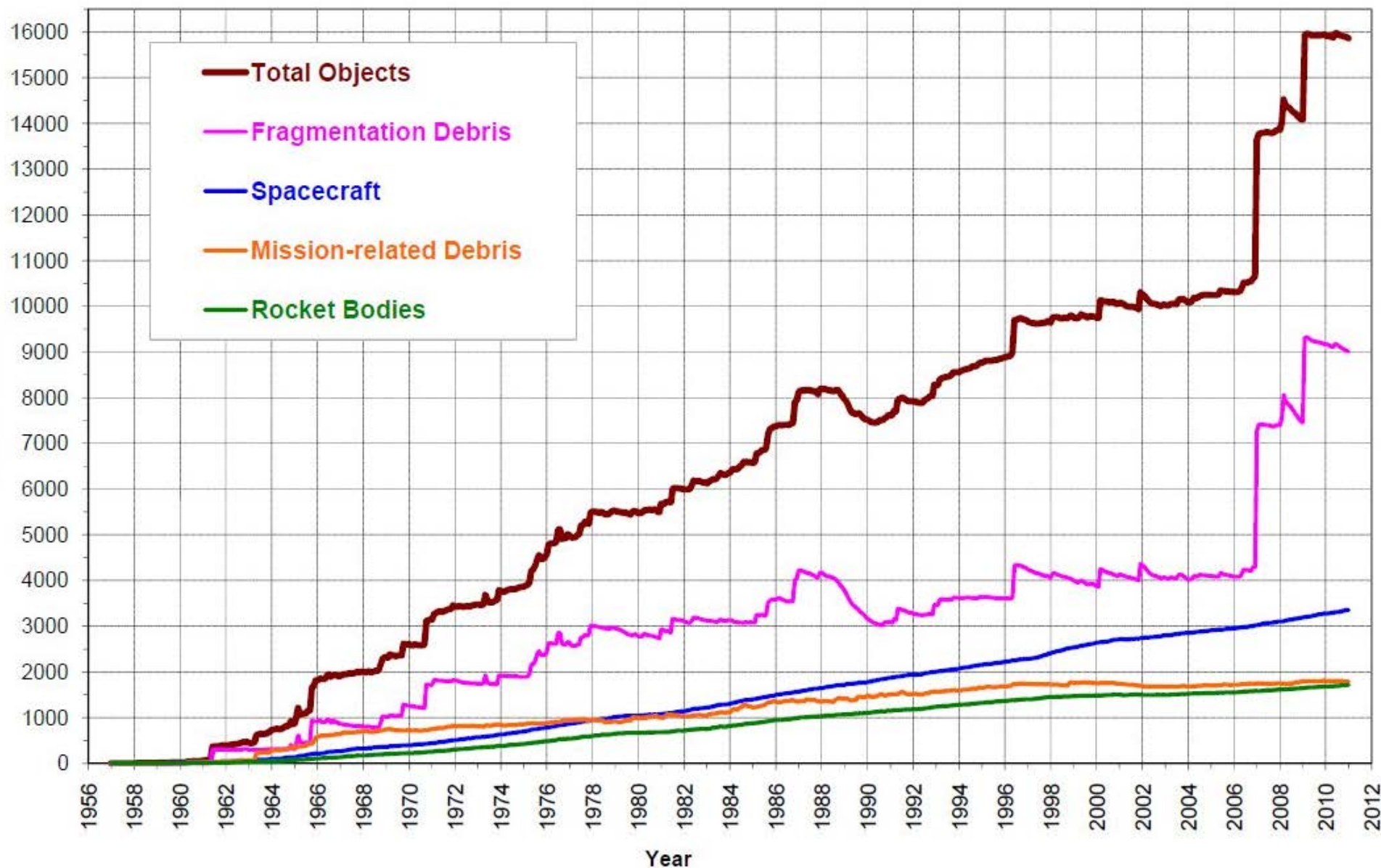






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Monthly Number of Objects in Earth Orbit by Object Type



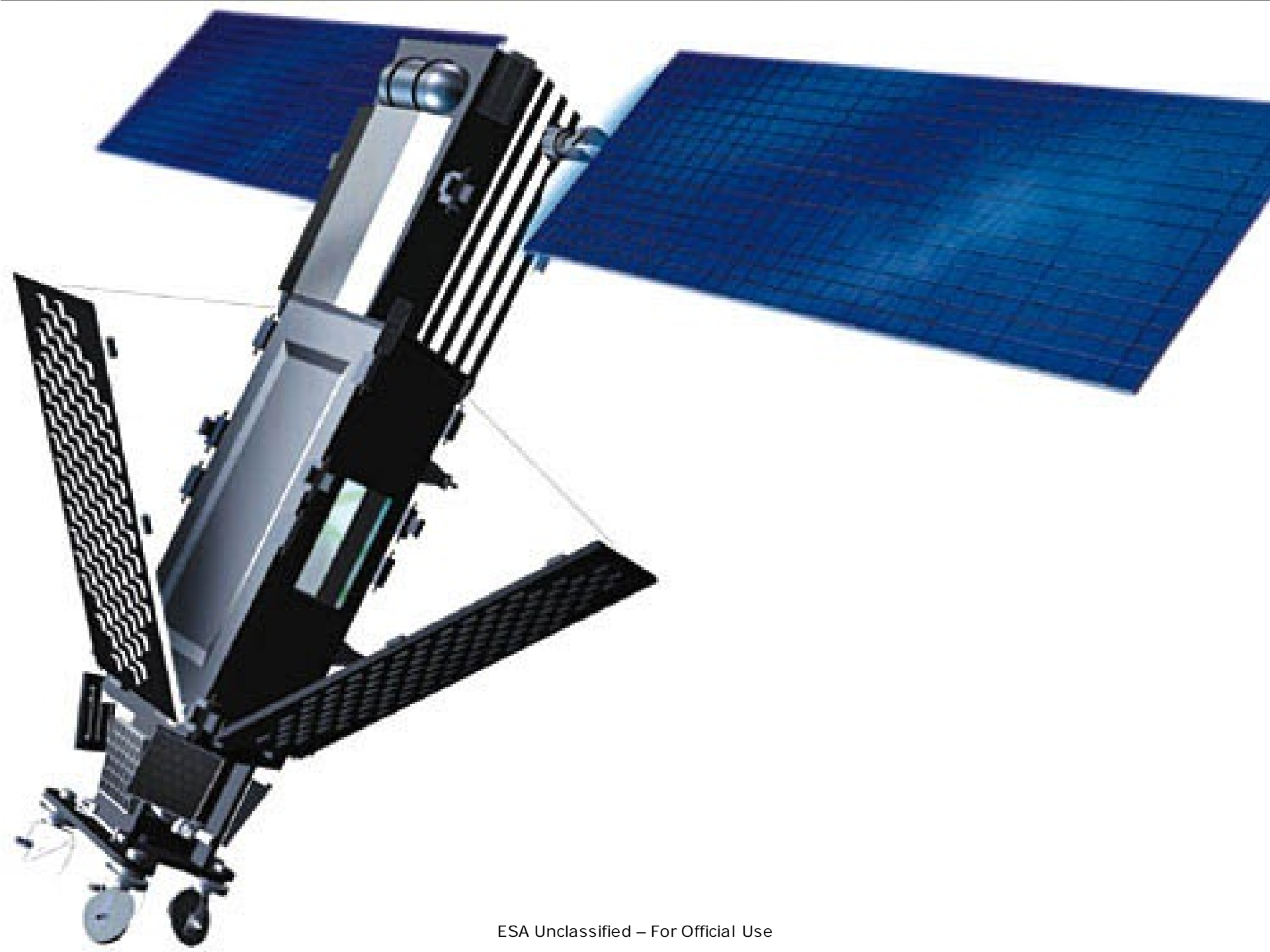
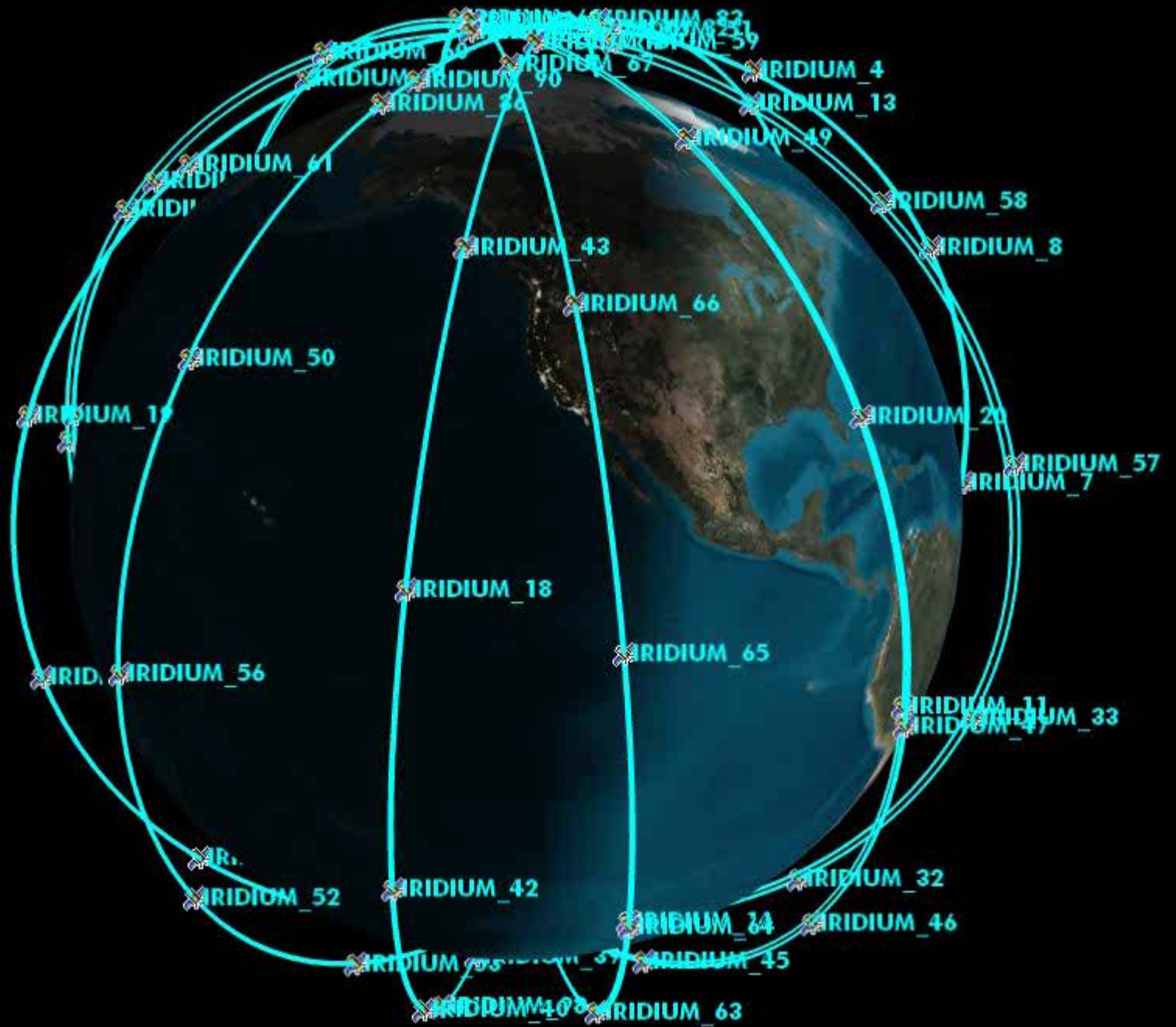


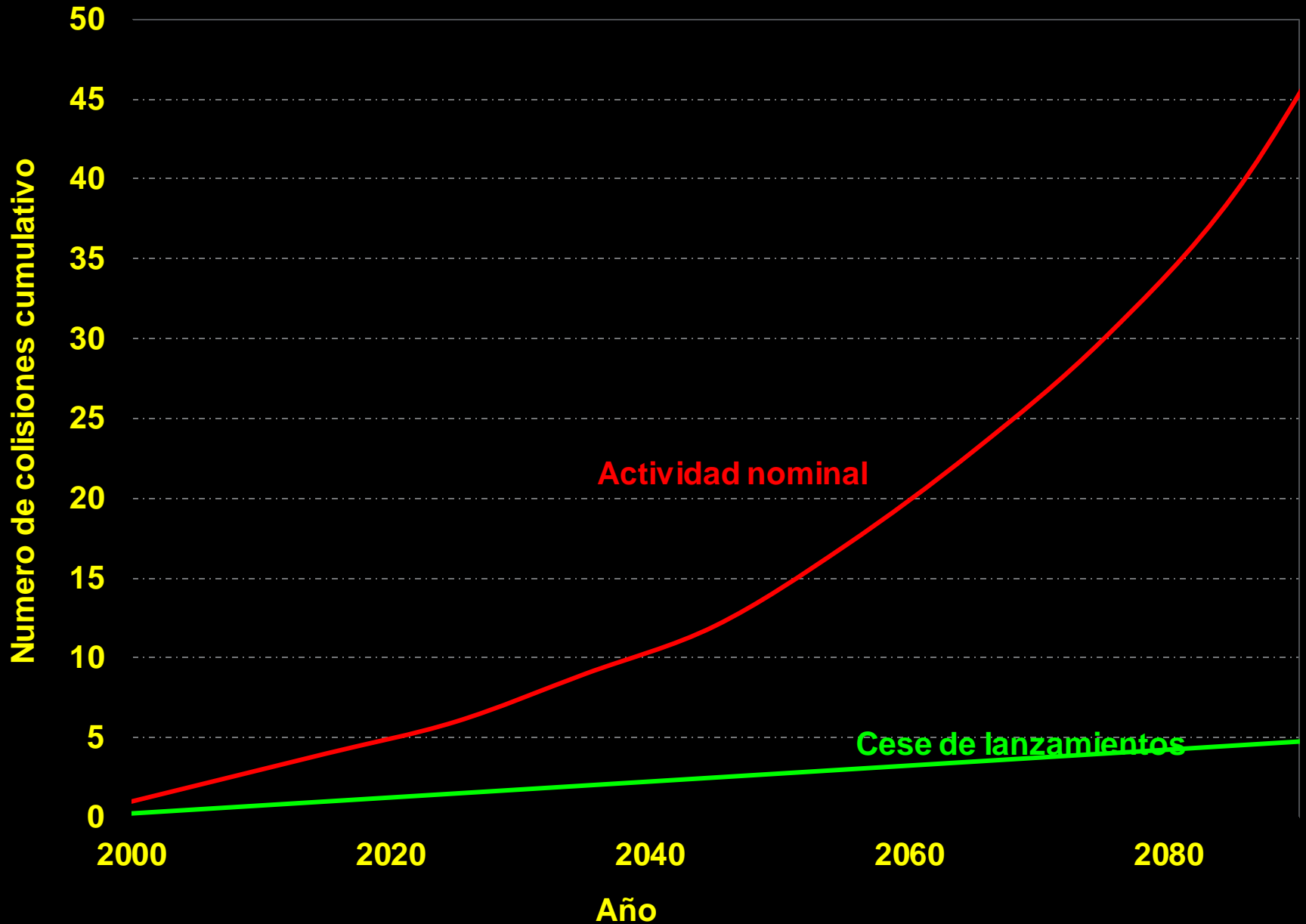


Image: Stefano Tartarotti

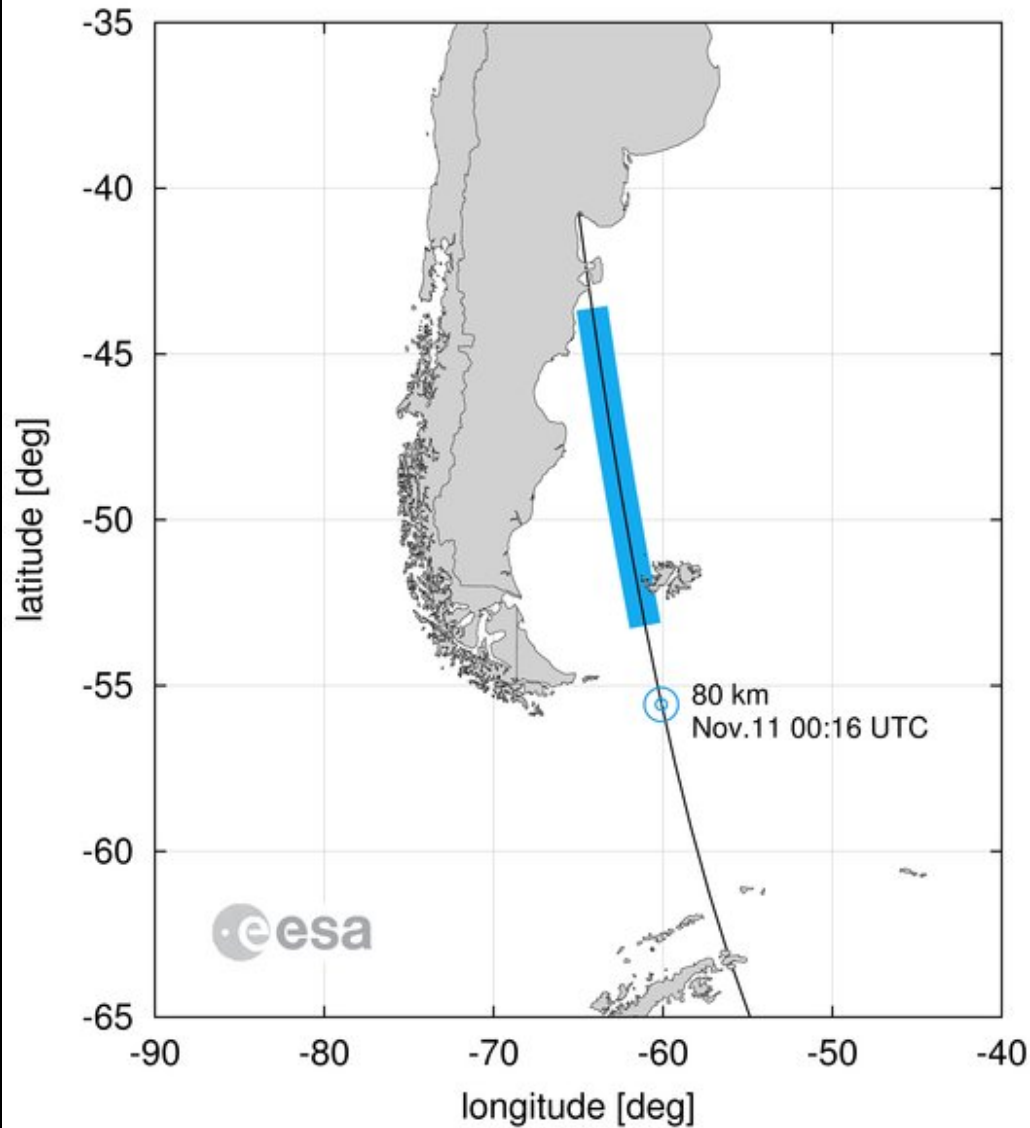
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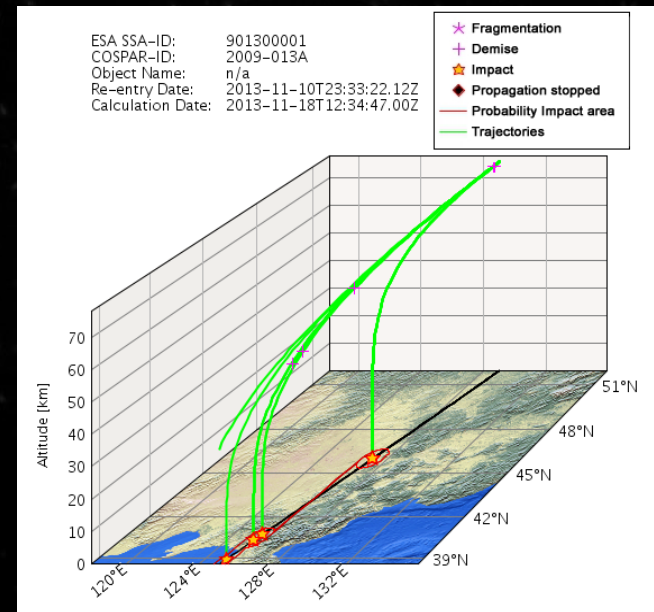
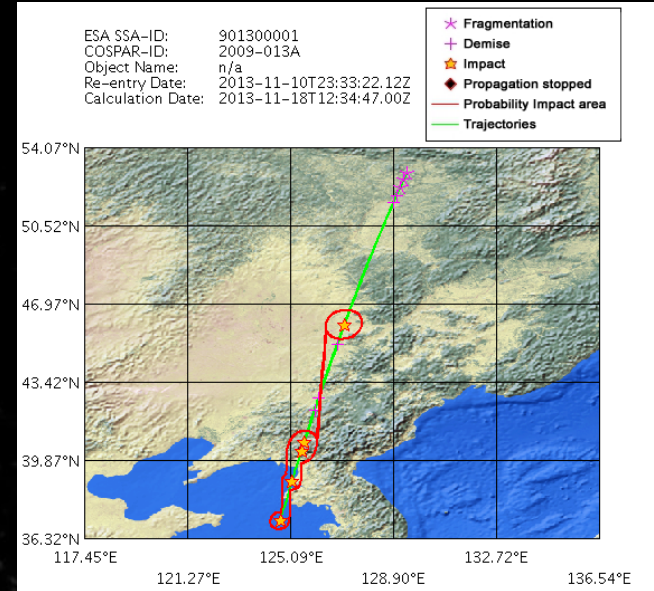
Predicción de colisiones importantes







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Collision Warning
Sensors Network
- Optical Sensors
- Radar Sensors
- Webcams
Analysis Centres

Administration
Objects
Objects
Services
Conjunction prediction analysis
Re-entry prediction analysis scenarios
Maintenance and monitoring
Maintenance and monitoring

Service management
Conjunction prediction service
Alerts
Execute Run
Business process monitoring
Contact

Target and chaser trajectories on Earth map. Please roll the mouse wheel forward/backwards to zoom in/out, double click in the divider to reset zoom

Conjunction at 2013/01/25 03:38:26 of 9801700002, 1998-017B, - and 9205300001, 1992-053A, -

1 before Conjunction

space situational awareness

Space Debris Spacecraft Operations

can check the results that have raised alerts according to the pre...
the report, and click on an alert icon to see the alert messages

Target	Chaser	Result Date
9801700002	9205300001	2013-01-21 15:40:53
9801700002	9205300001	2013-01-21 15:40:53

Item 1..2 of 2

Report 2D Map 2D Graphs 3D Graphs CC

space situational awareness

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ESA SSA SST SWE NEO Space Debris Spacecraft Operations

21-Jan-2013

SST Precursor Services
Collision Warning
Sensors Network
- Optical Sensors
- Radar Sensors
- Webcams
Analysis Centres

Administration
Objects
Objects
Services
Conjunction prediction analysis
Re-entry prediction analysis scenarios
Maintenance and monitoring
Maintenance and monitoring

Service management
Conjunction prediction service
Alerts
Execute Run
Business process monitoring

3D Orbit Track and Foot Print

Object ID: 2
Re-entry Date: 2012-08-14T02:13:7.14Z
Calculation Date: 2013-01-18T15:31:43.00Z

Altitude [10⁴ m]

25°W 0° 25°E 50°E 75°E

36°N
24°N
12°N
0°

Download Plot as PNG Download Plot as JPG

SST PREC Client - Server: 12.65.523 - User: service (Phone)

File Edit View Help

Re-entry Prediction Service / Conjunction Prediction Service

Business Process Monitoring

Request list:

Request id	Request time	Start time	Result time	Priority	User name
5191	2013/01/21-15:40:14.845	2013/01/21-15:42:59.000	2013/01/21-15:42:59.000	1	

Output

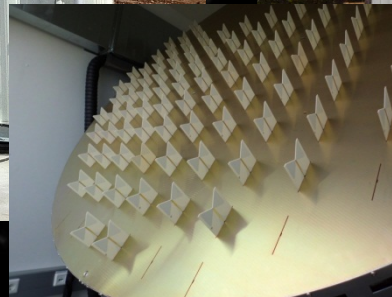
[Analysis result] Results [State vector] State vectors [Object] Objects [Re-entry result] Altitude evolution versus time

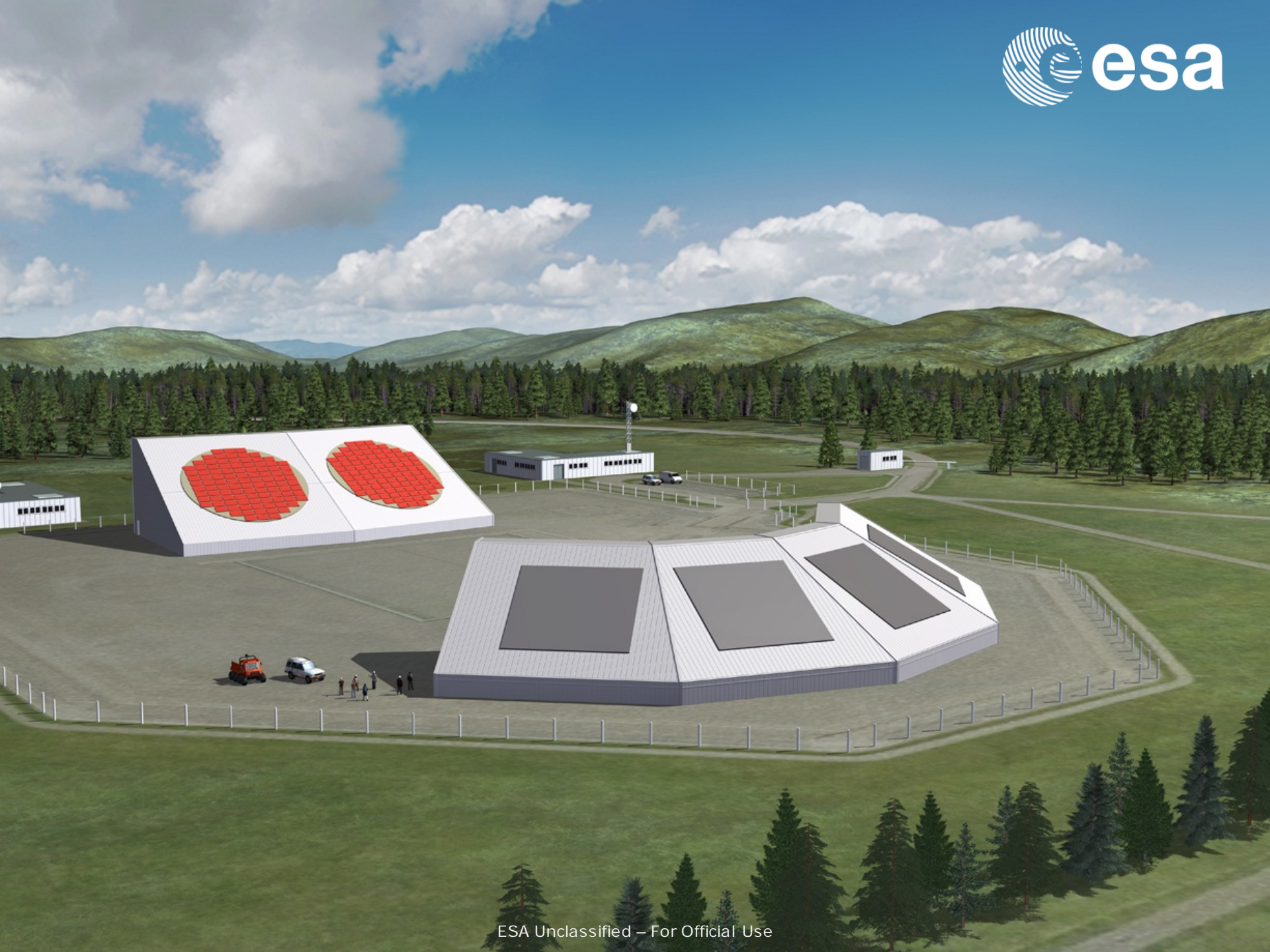
Calculation (SSTP - 2013-01-18T15:31:43.00Z)

Altitude [m]

Time [Seconds]

Disconnected 13:02:26.043/25.15.45.26



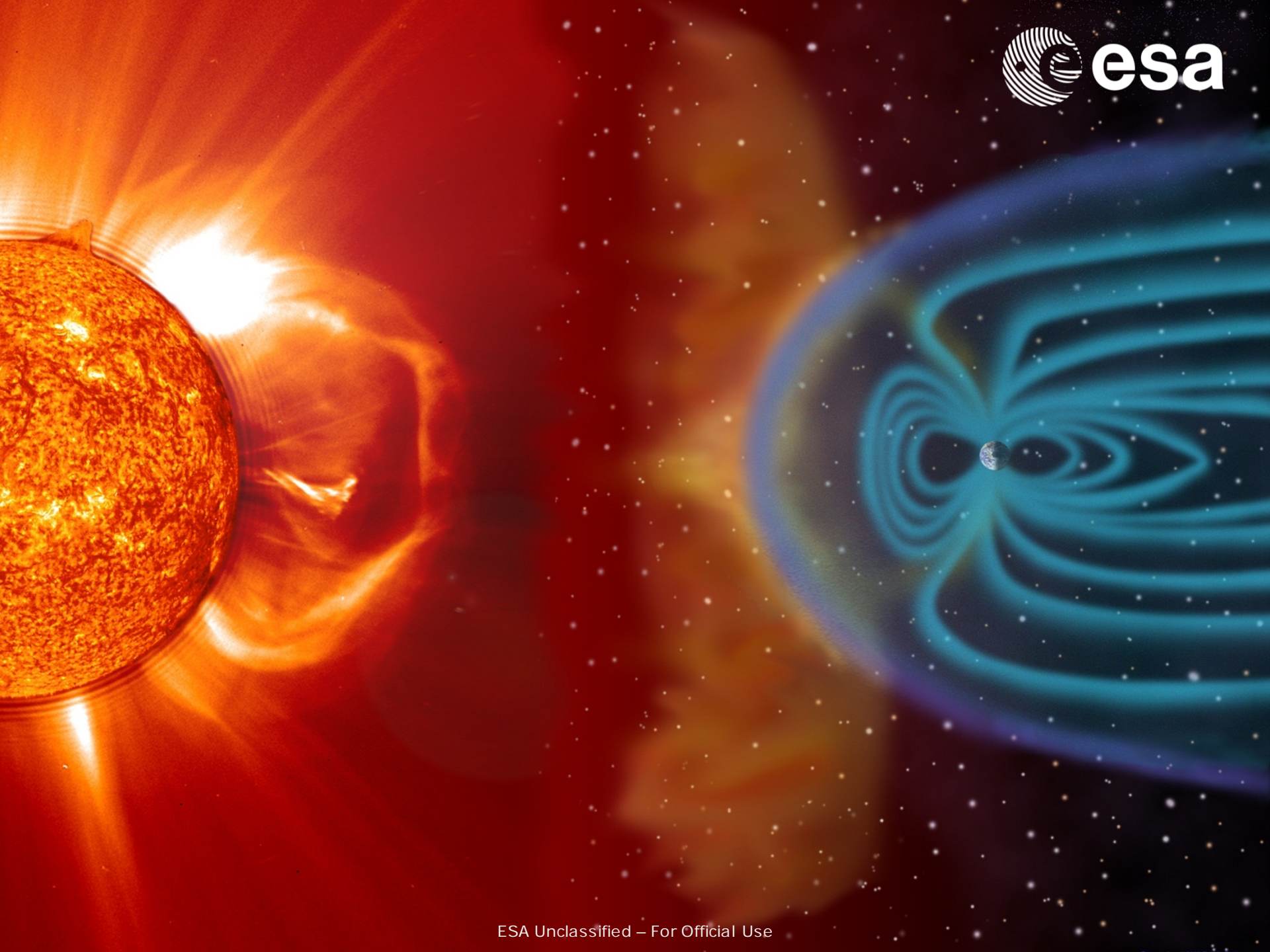


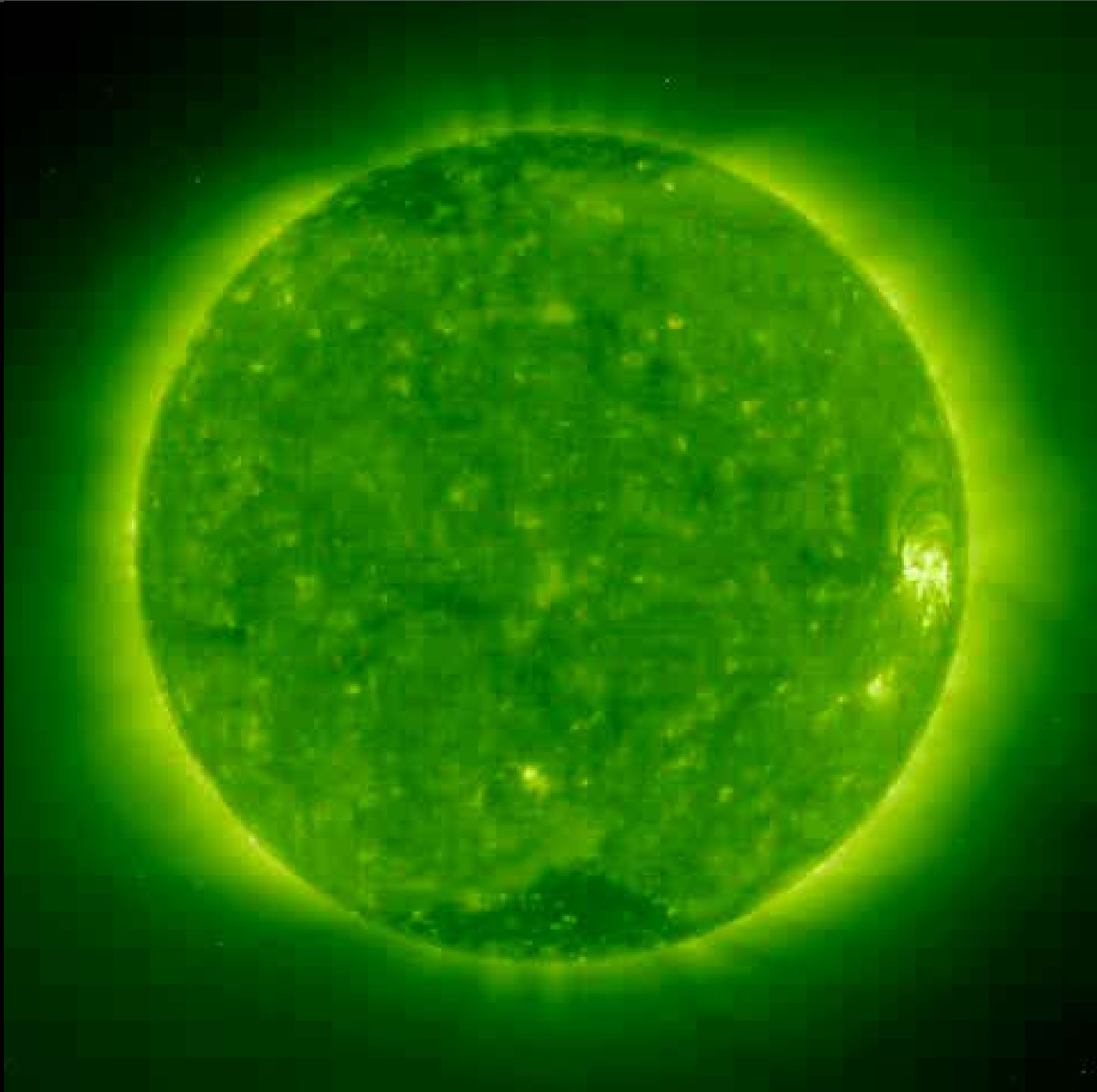


METEOROLOGICA ESPACIAL

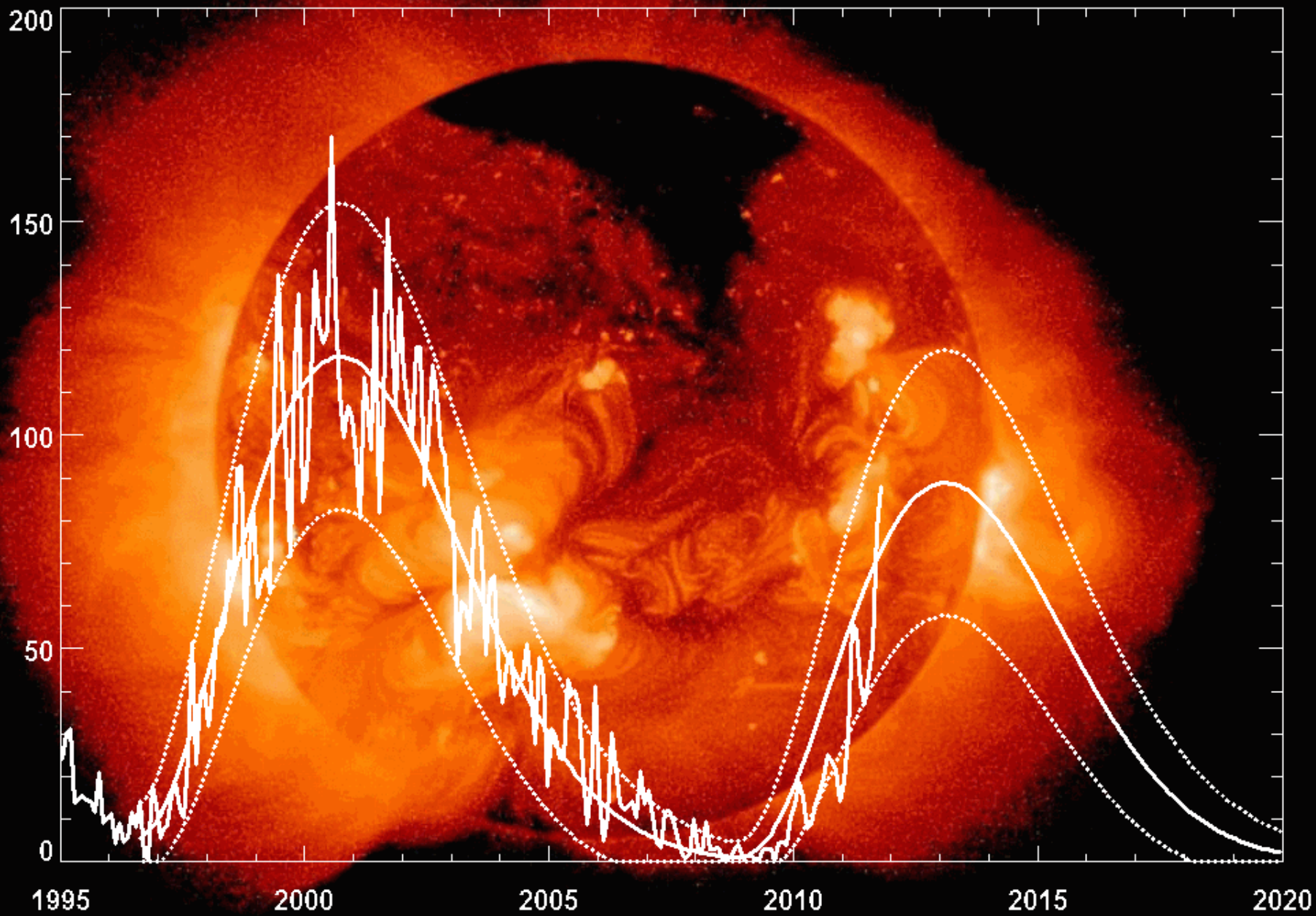
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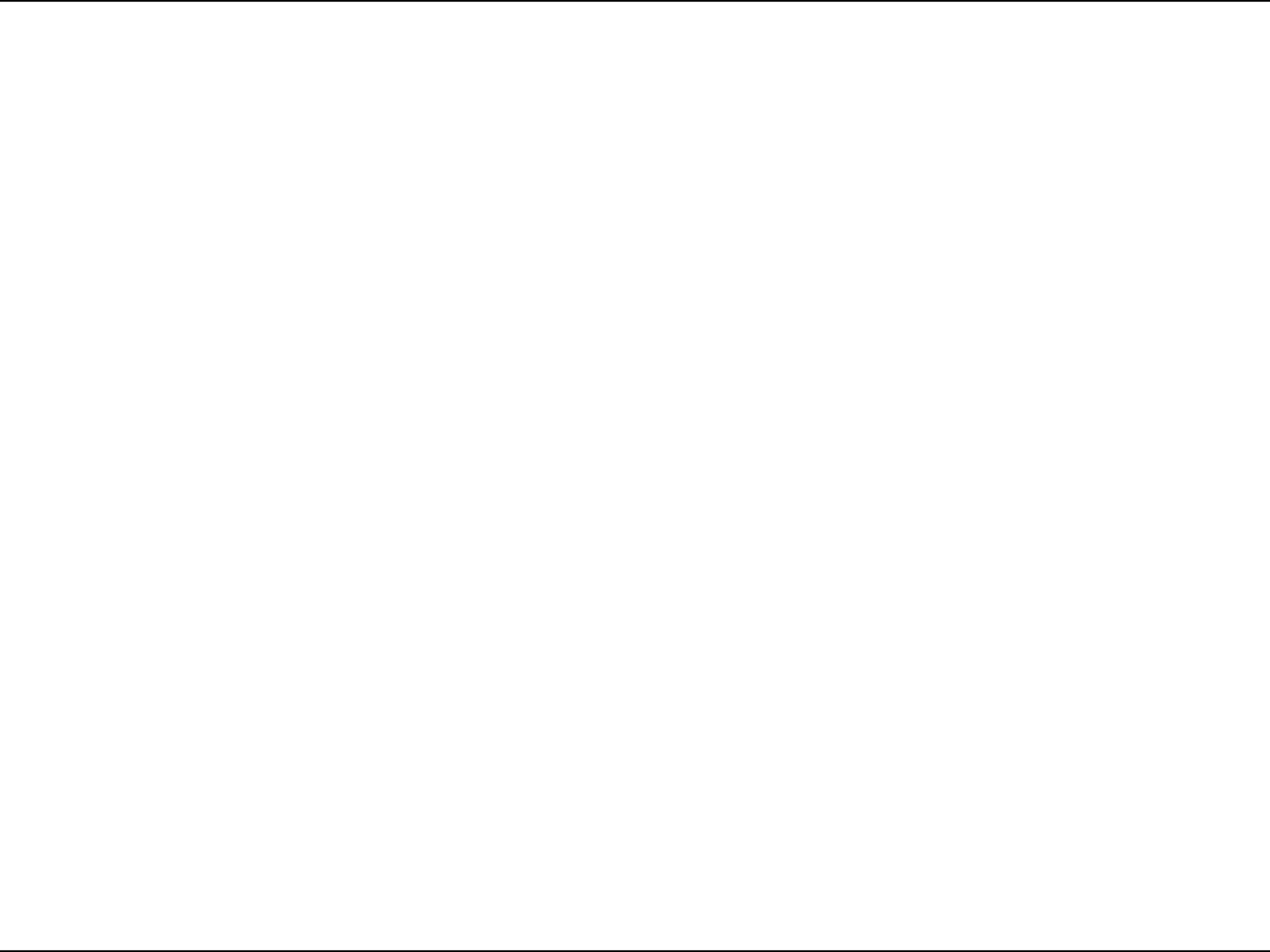




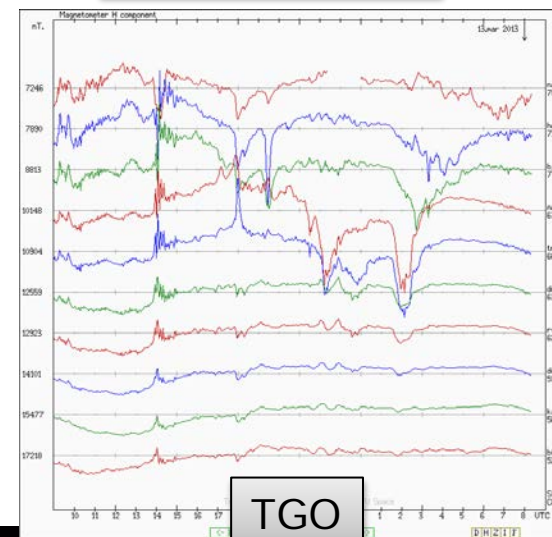
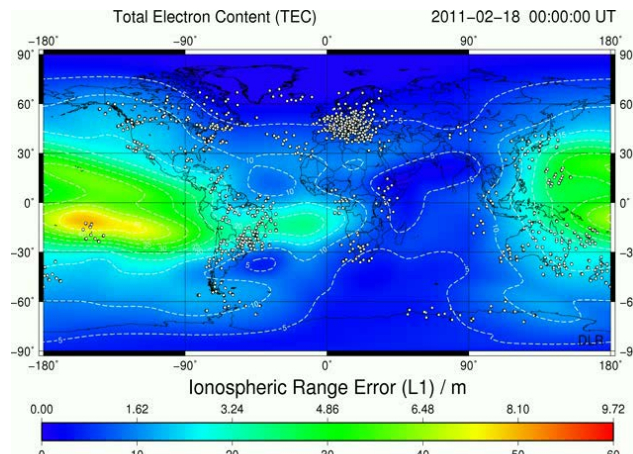
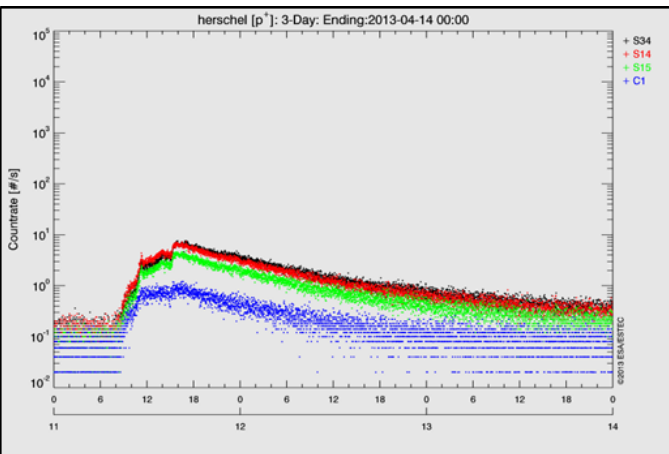
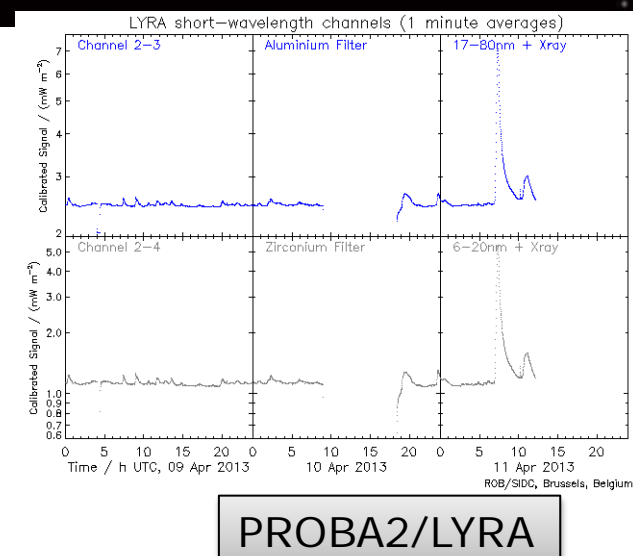
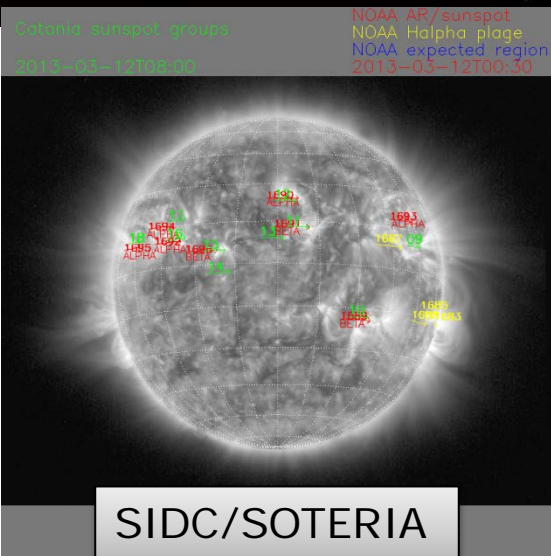
Cycle 24 Sunspot Number Prediction (November 2011)







El ambiente espacial por la ESA



- SSA Centro de Coordinación del Ambiente Espacial (SSCC) estaba implantado por el programa SSA
- Centro inaugurado en abril 2013
- **SSA SWE Coordination Centre**
- Space Pole
Avenue Circulaire, 3 - Ringlaan
1180 Uccle - Ukkel (Brussels)
BELGIUM
- Tel: +32-2-7903-913
Email: helpdesk.swe@ssa.esa.int





OBJECTOS PROXIMOS A LA TIERRA

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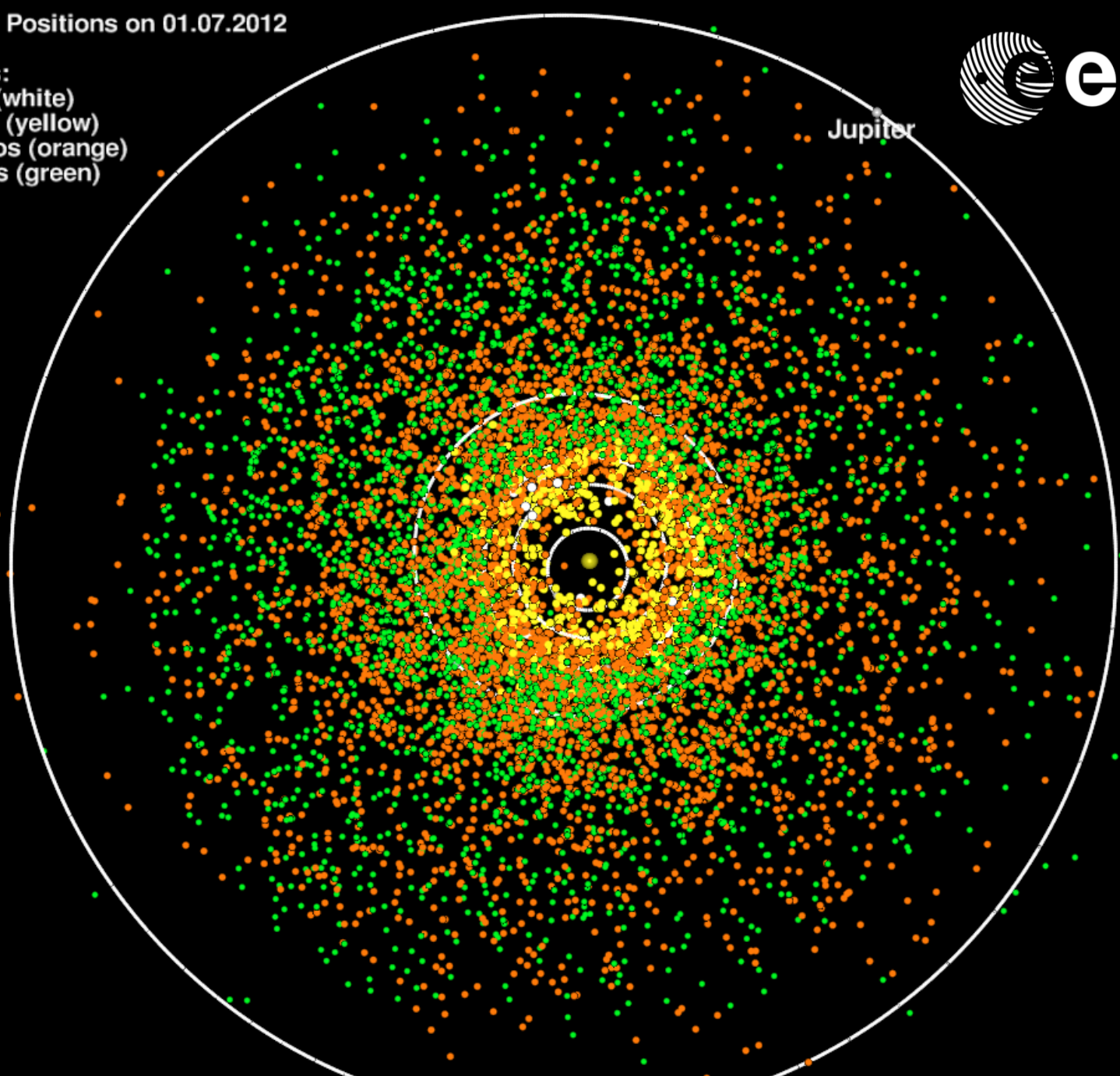
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NEO - Positions on 01.07.2012

Types:
IEOs (white)
Atens (yellow)
Apollos (orange)
Amors (green)



Jupiter



- **Identificación y clasificación de NEOs**
- **Análisis del riesgo de colisión con la Tierra**
- **Seguimiento: determinación de la órbita y los parámetros físicos**
- **Alertas y apoyo a la mitigación**

- **Analizar objetos naturales en órbitas cercanas a las de la Tierra:**
 - a. **Asteroides cercanos**
 - b. **Cometas cercanos**
 - c. **Meteoroides de gran tamaño**





Carancas, Peru

15 septiembre 2007

13m en diámetro



cráter Barringer, Arizona, EE.UU

impacto hace 49.000 años

asteroide de níquel / hierro



Tunguska, Siberia

1908, asteroide solido

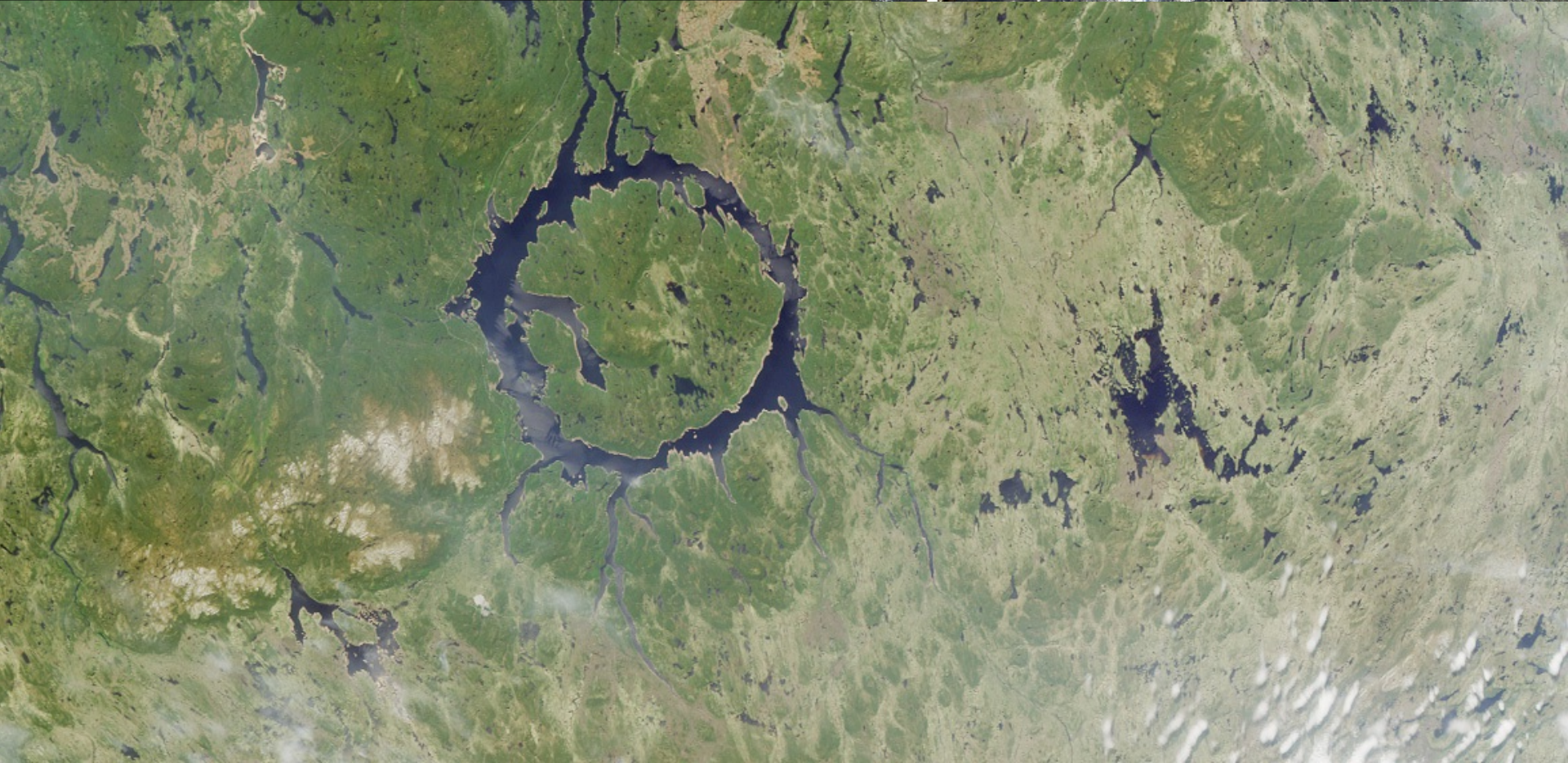
2000km² de bosque destruido



Manicouagan, Quebec

hace 212 millones de años

asteroide de 5km



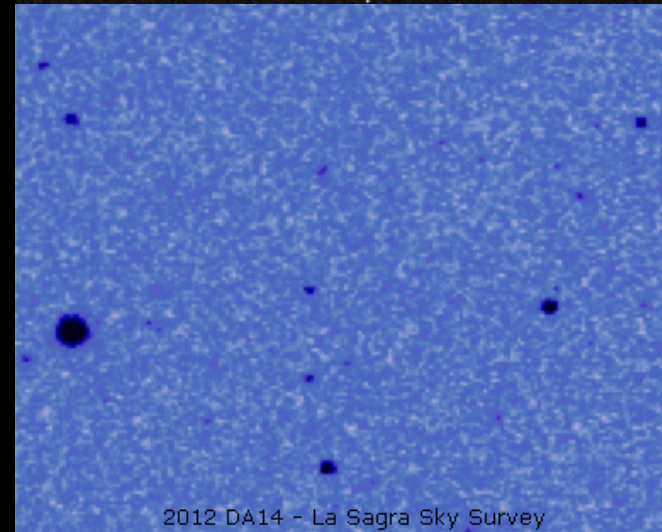
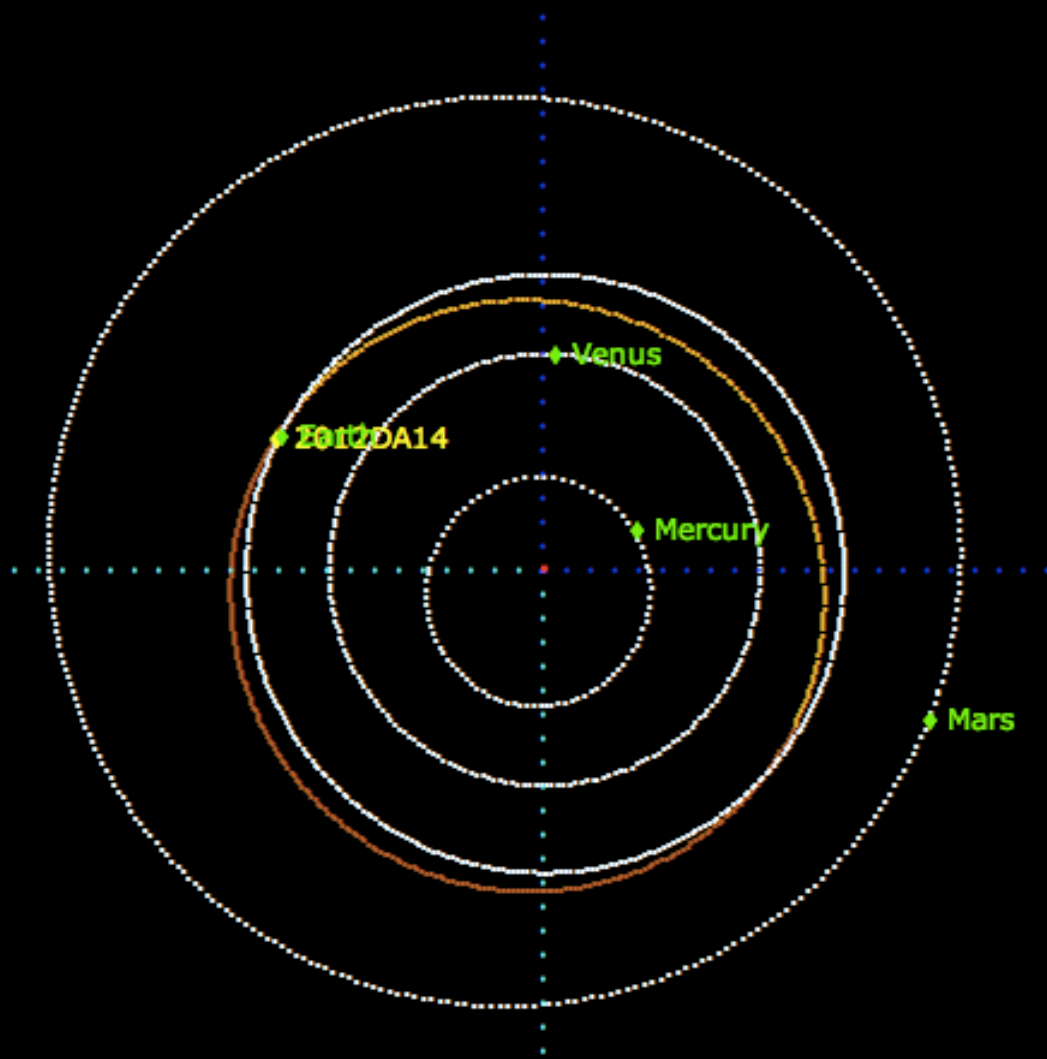
Evento en Chelyabinsk





Time of impact: 03:20:26 UT on 15-FEB-2013
Entry angle: 20 degree from surface
Entry velocity: below 20 km/s
Trajectory direction: North to South
Asteroid diameter before entry in the atmosphere: about 15 m
Kinetic energy: 500kt TNT equivalent
Explosion altitude: 15-25 km

© photos.cyberborean.org

Asteroide 2012 DA 14



	diámetro (m)	potencia (Mt)	frecuencia (años)
	75	10 – 100	1.000
	350	1.000 – 10.000	16.000
	3.000	1.000.000 – 10.000.000	1.000.000



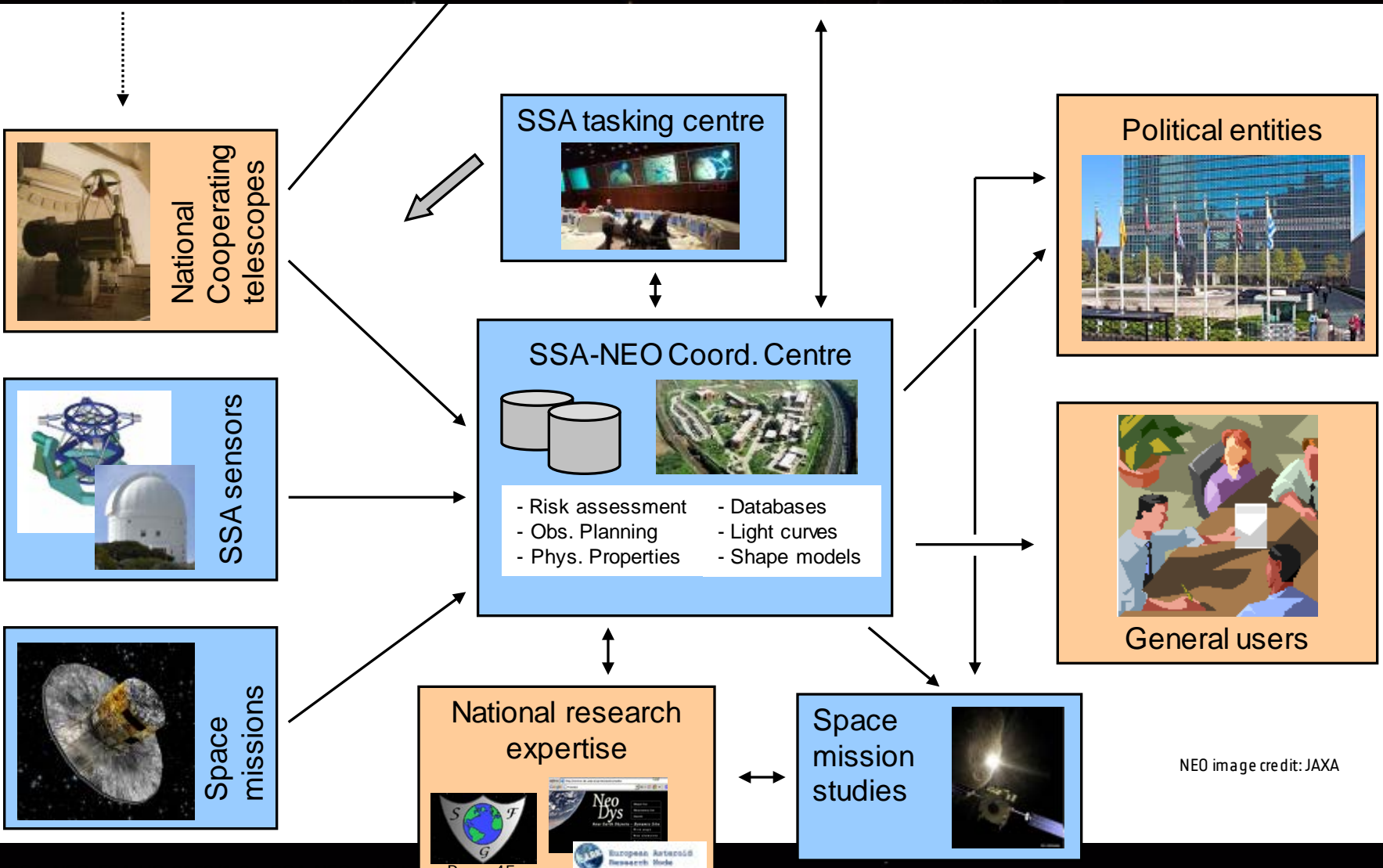
= 15 kt
= 0.015 Mt



NEOs

Minor Planet Center (US)

System overview



NEO image credit: JAXA

NEO Centro de coordinación – ESRLN, Italy



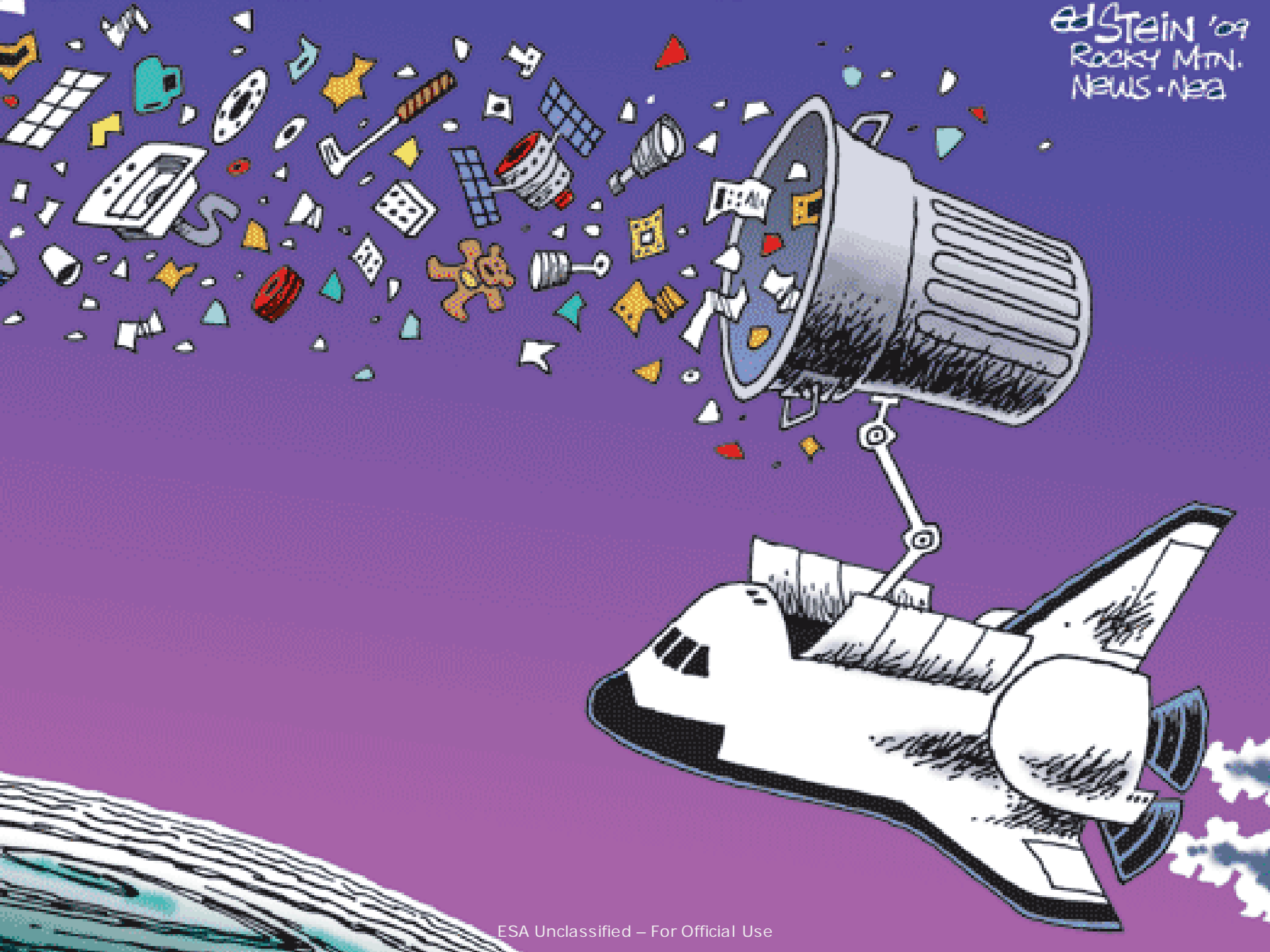
SSA-NEO Coordination
Centre - inaugurated 22
May 2013

Image © 2011 GeoEye,
© 2011 Tele Atlas
Image © 2011 DigitalGlobe
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
41°50'27.03"N 12°35'09.14"E elev. 77 m
Google
Eye alt. 65.98 km



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ed Stein '09
Rocky Mtn.
NEWS-NEA





Gracias

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programa: www.esa.int/ssa
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