European space assets of potential interest to the GDC STDT

Matt Taylor, ESA/ESTEC

- Very brief overview of ESA related assets in next few years in magnetosphere...

Mission Summary

Planned Launch: Feb 2020

Cruise Phase: 1.8 years (for Feb 2020)

Nominal Mission: 4 years

Extended Mission: 3.5 years

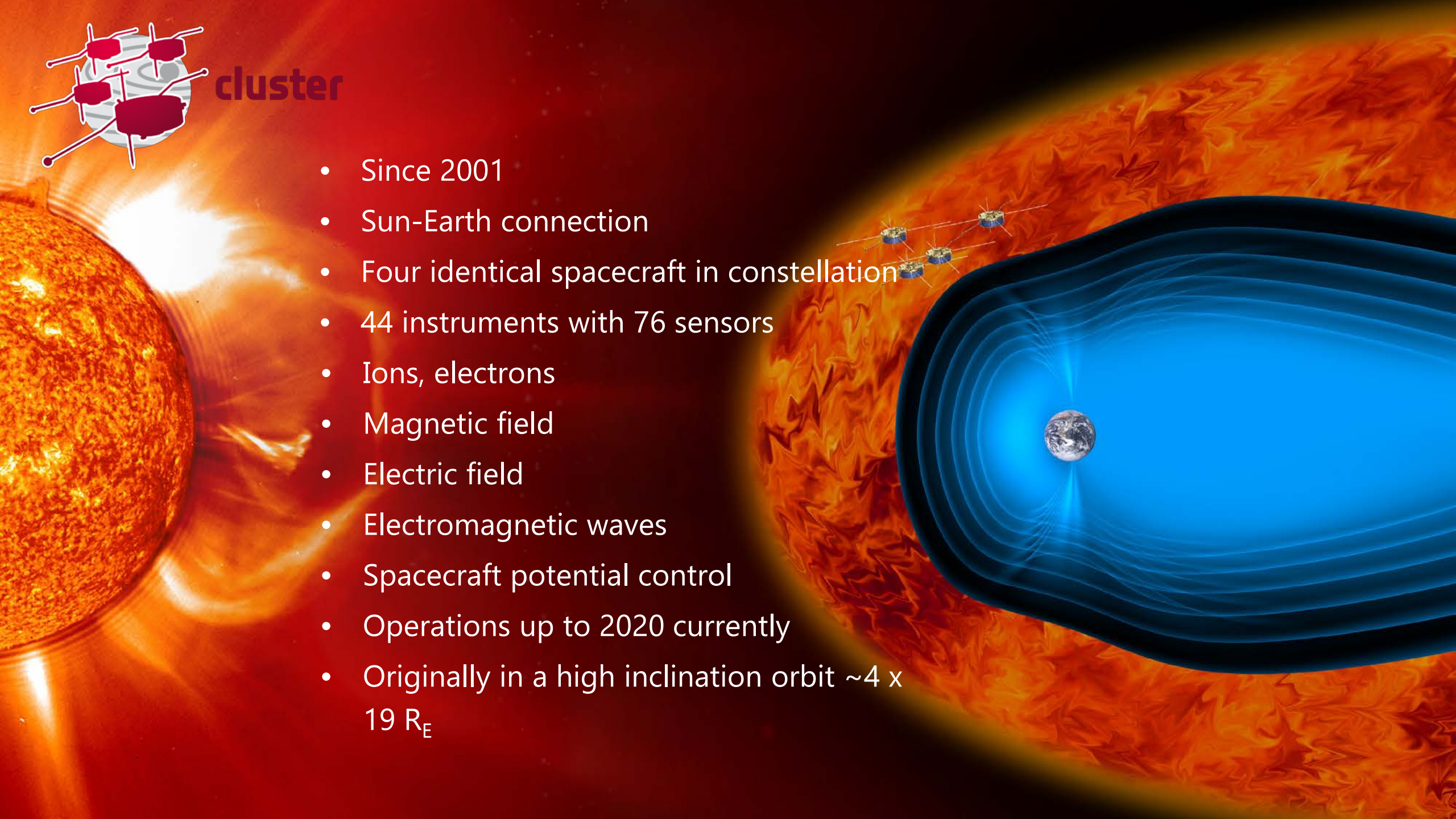
Orbit: 0.28–0.91 AU (P=150-180 days)

Out-of-Ecliptic View:
Multiple gravity assists with Venus to increase inclination out of the ecliptic to >24° (nominal mission),
>33° (extended mission)

Reduced relative rotation:
Observations of evolving structures on solar surface & in heliosphere for almost a complete solar rotation

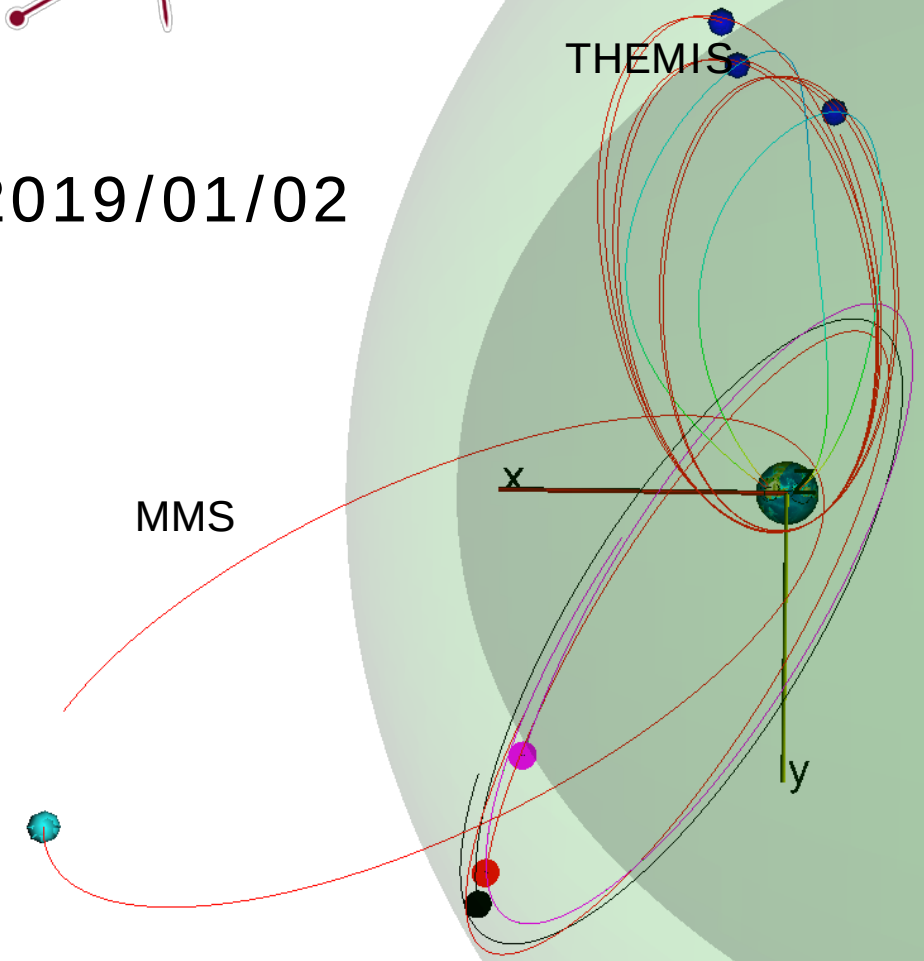
cluster

- Since 2001
- Sun-Earth connection
- Four identical spacecraft in constellation
- 44 instruments with 76 sensors
- Ions, electrons
- Magnetic field
- Electric field
- Electromagnetic waves
- Spacecraft potential control
- Operations up to 2020 currently
- Originally in a high inclination orbit ~4 x 19 R_E

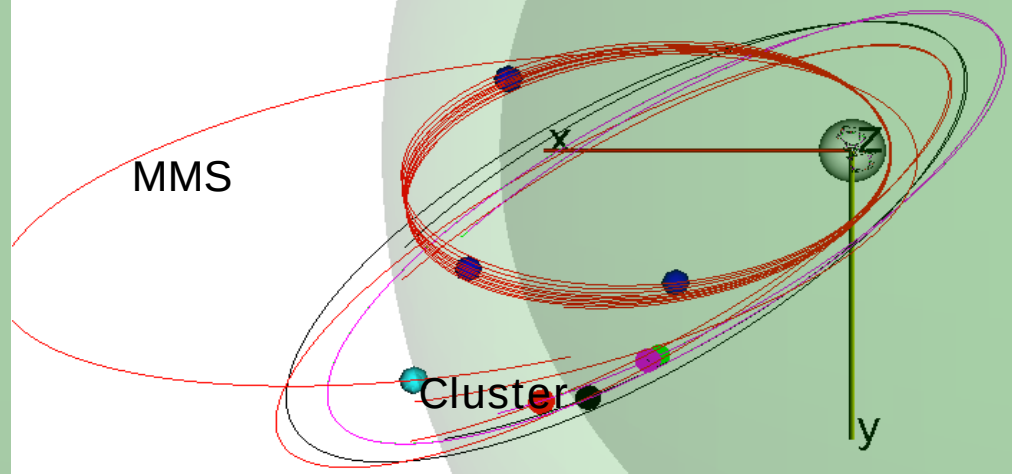


cluster

2019/01/02



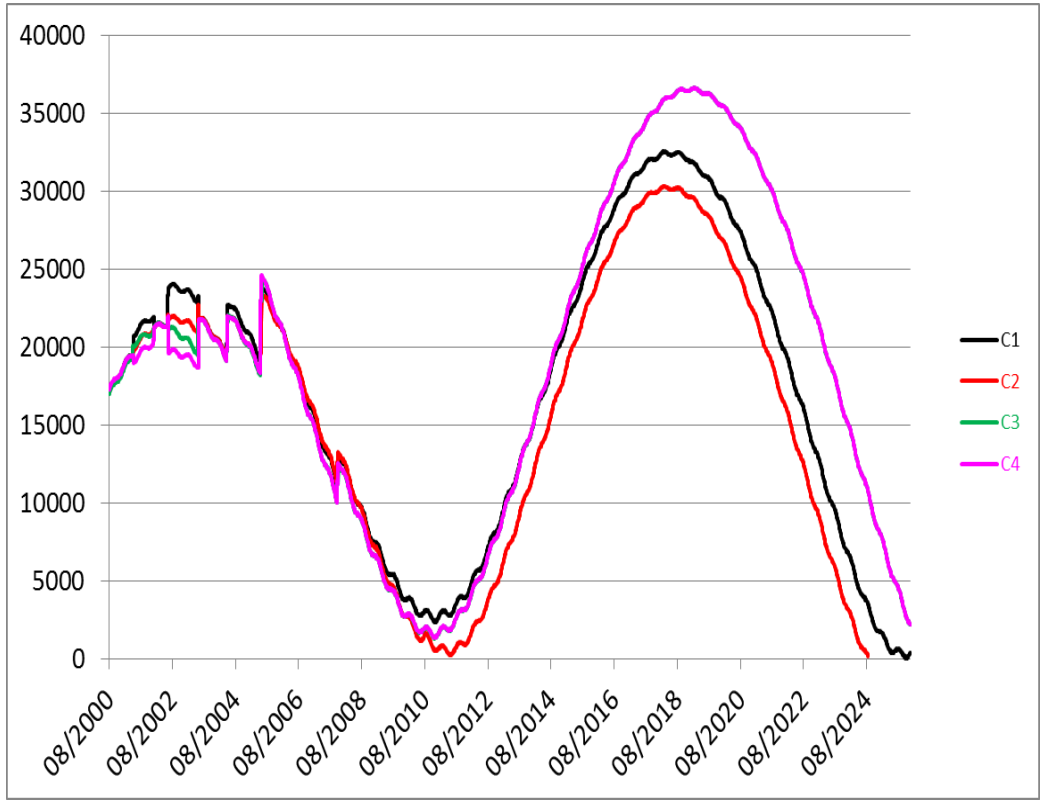
2022/02/04



cluster

esa

Name	ID	Prediction Q2 2017	Prediction 2018-01-09
Rumba / 1 / FM5	2000-045A, 26463	2025-11-04	2025-11-04T18:38
Salsa / 2 / FM6	2000-041B, 26411	2024-09-07	2024-09-08T09:47
Samba / 3 / FM7	2000-041A, 26410	2026-08-21	2026-08-22T14:59
Tango / 4 / FM8	2000-045B, 26464	2026-08-21	2026-08-22T06:25



SMILE

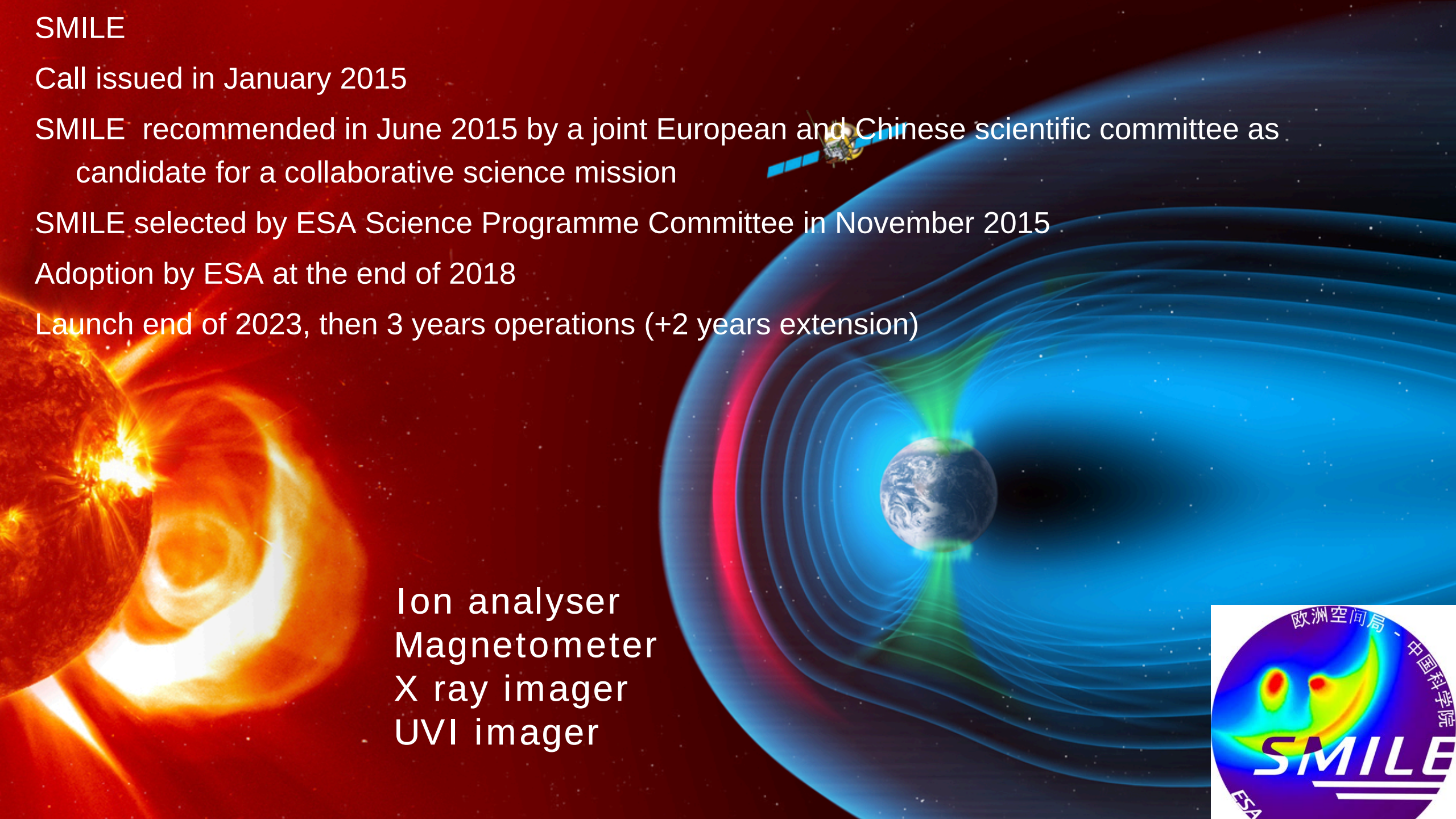
Call issued in January 2015

SMILE recommended in June 2015 by a joint European and Chinese scientific committee as candidate for a collaborative science mission

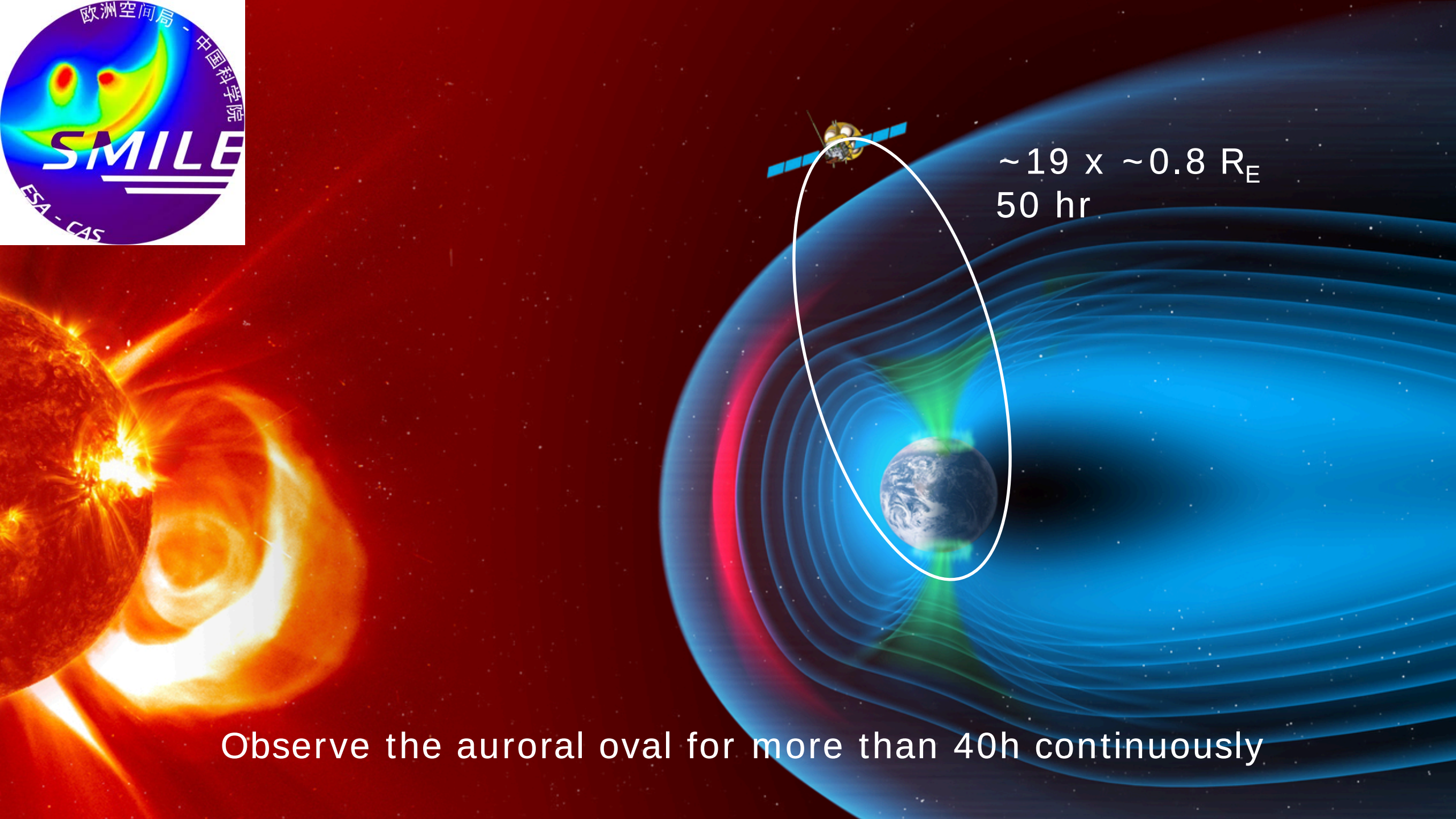
SMILE selected by ESA Science Programme Committee in November 2015

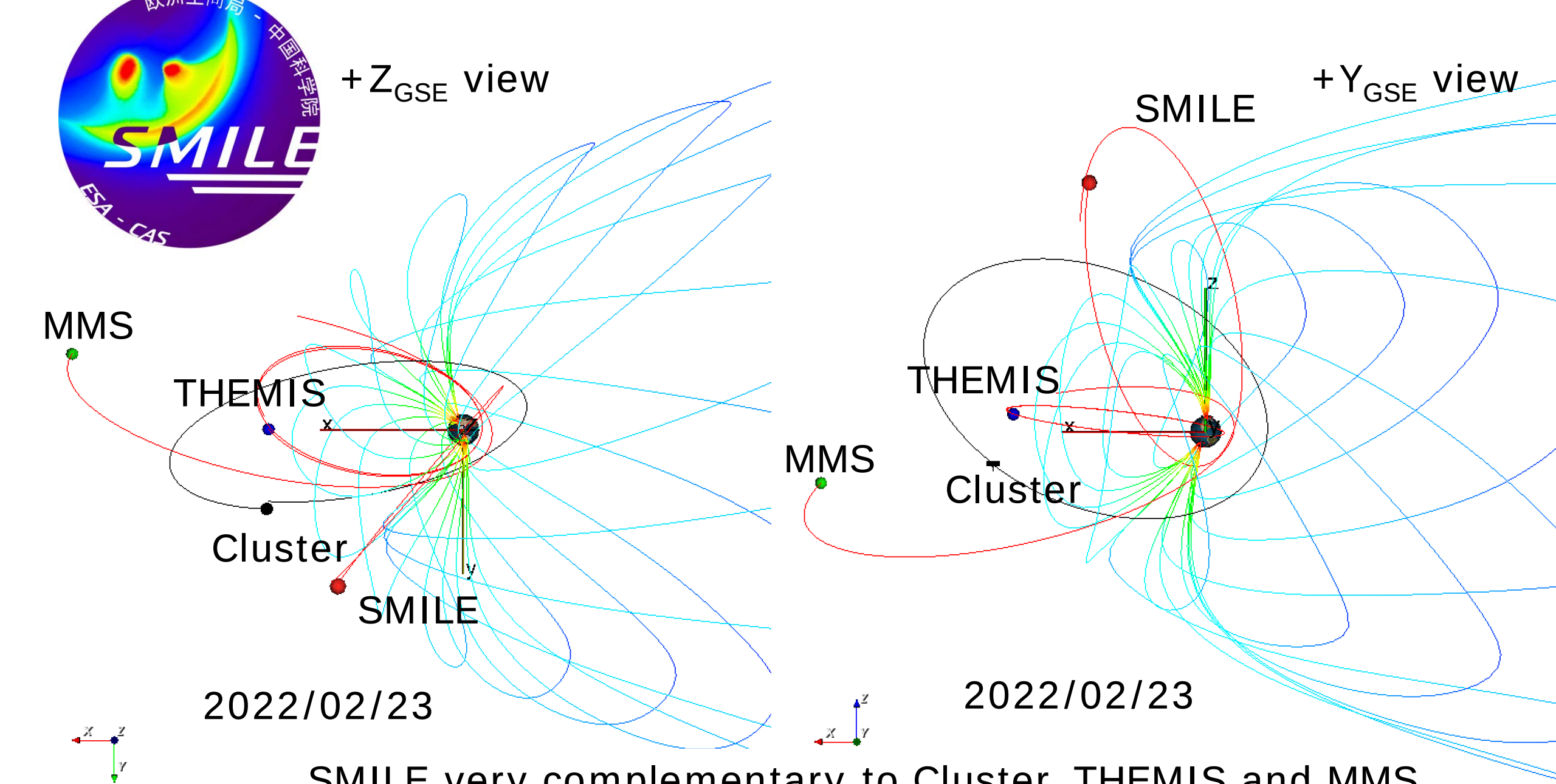
Adoption by ESA at the end of 2018

Launch end of 2023, then 3 years operations (+2 years extension)

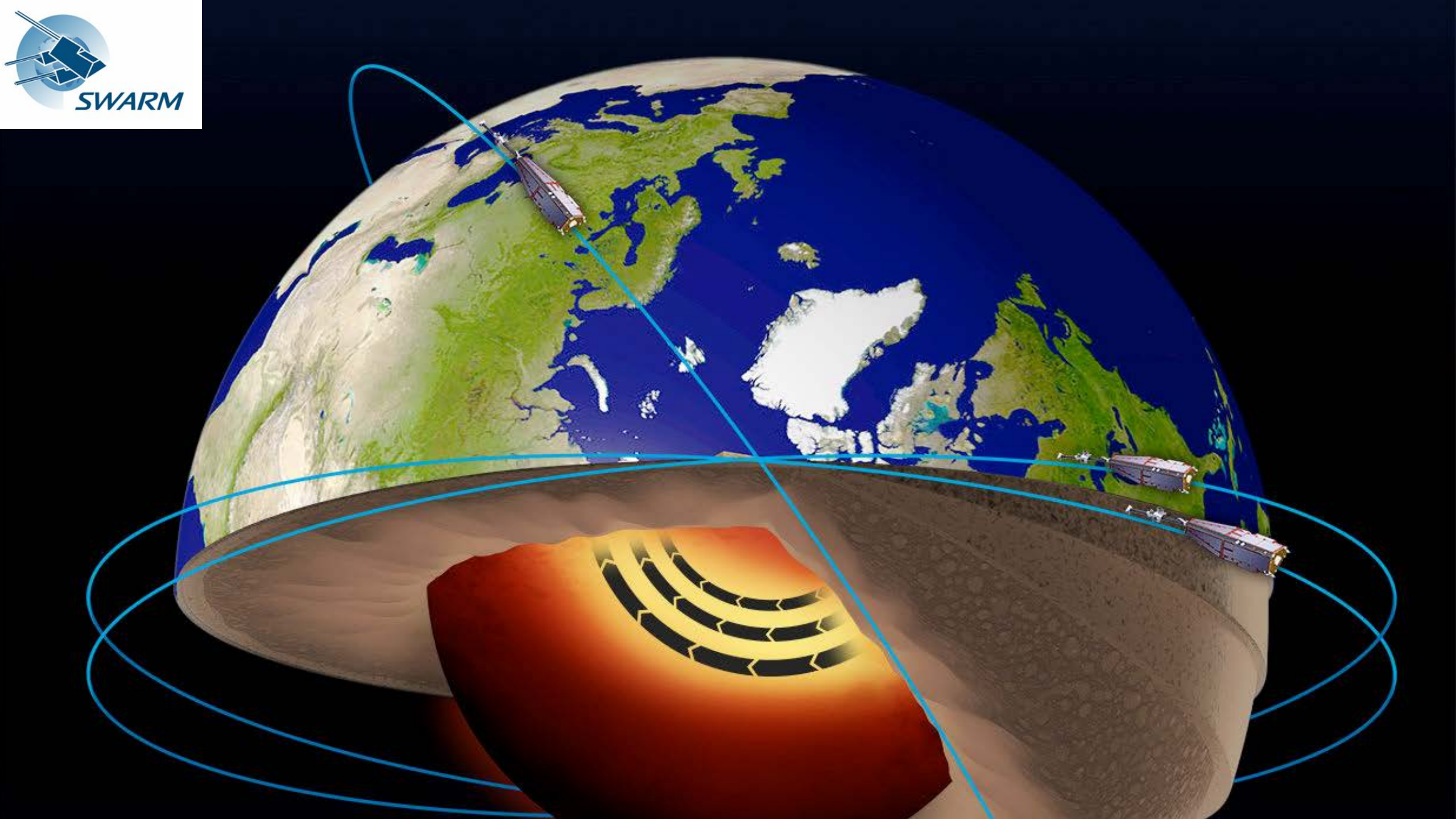


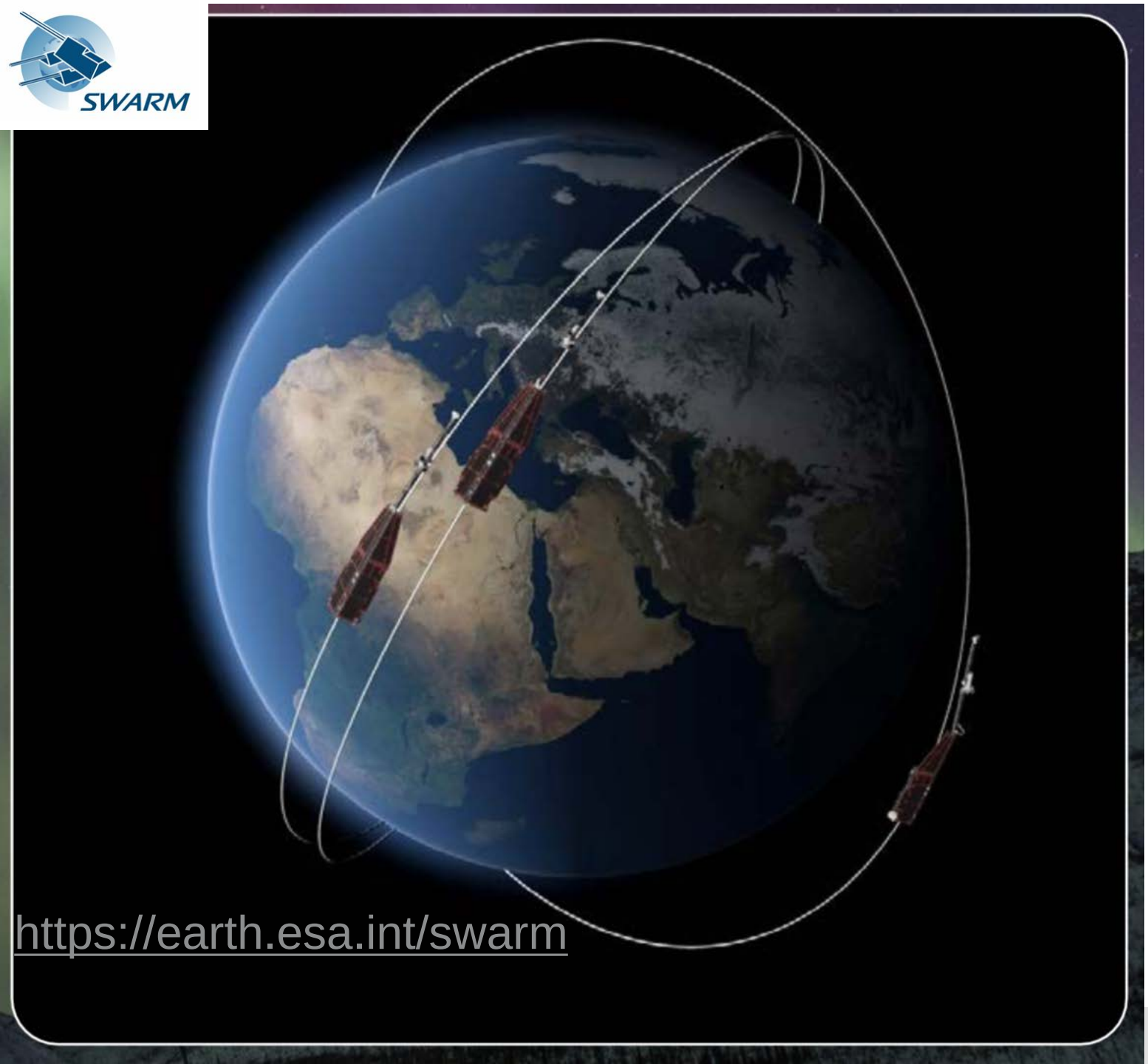
Ion analyser
Magnetometer
X ray imager
UVI imager


欧洲空间局 - 中国科学院
SMILE
ESA - CAS
~19 x ~0.8 R_E
50 hr
Observe the auroral oval for more than 40h continuously



SMILE very complementary to Cluster, THEMIS and MMS
(remote sensing and in-situ)


SWARM



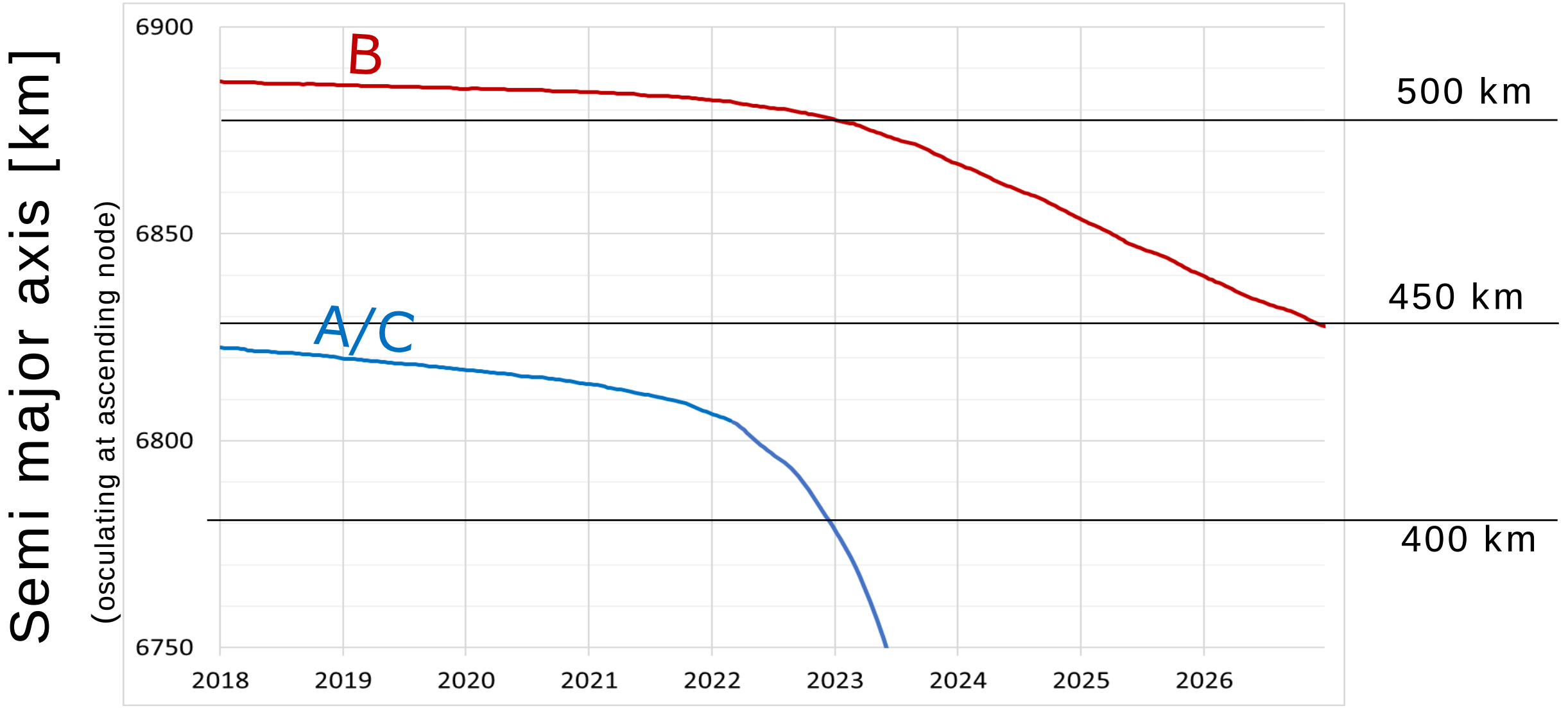
Alpha+ ~ approx. 450 km
Charlie

Bravo ~ approx. 510 km

~ 90 minute orbit

High res. B fields
Langmuir probe and 3D thermal imager – thermospheric density and winds

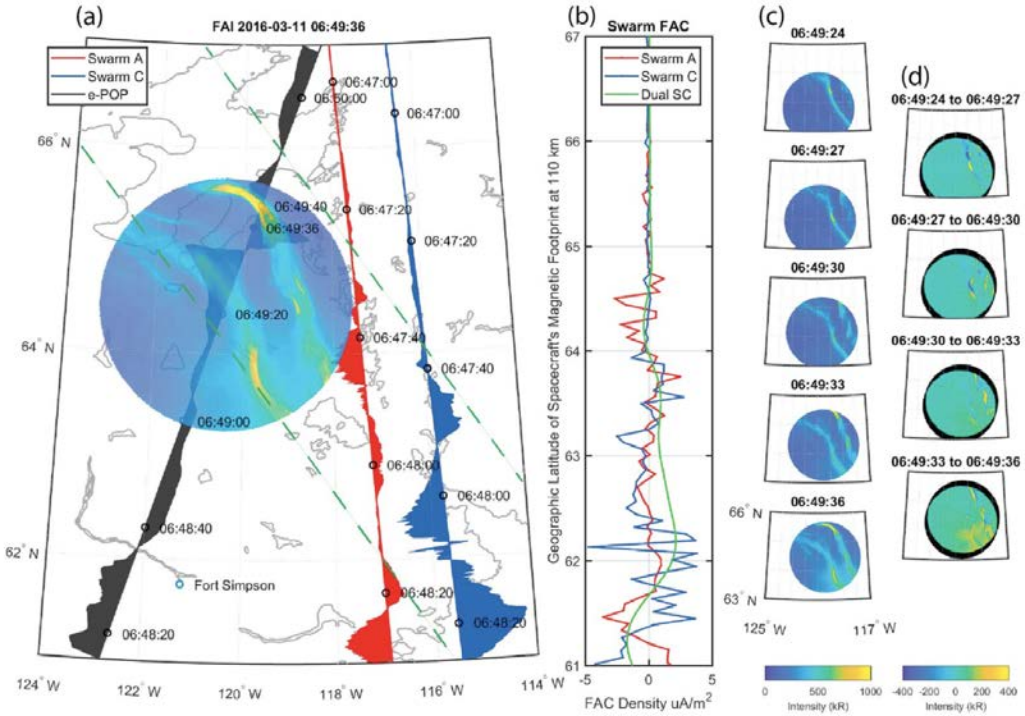
Altitude Evolution (Medium Solar Activity)



CAScade, **S**mallsat and **IO**nospheric **P**olar **E**xplorer" (CASSIOPE) enhanced polar outflow probe

As part of the Third Party Missions programme, the e-POP instrument of the Canadian Space Agency's CASSIOPE mission joined the constellation in February 2018, as Swarm 'Echo'

325 x 1500 km, 80.99° inclination
103 minutes (14 orbits per day)



Miles, D. M., Mann, I. R., Pakhotin, I. P., Burchill, J. K., Howarth, A. D., Knudsen, D. J., ... Yau, A. W. (2018). Alfvénic dynamics and fine structuring of dis- crete auroral arcs: Swarm and e-POP observations. Geophysical Research Letters, 45, 545–555. https://doi.org/10.1002/2017GL076051

https://www.esa.int/Our_Activities/Observing_the_Earth/Three_Earth_Explorer_ideas_selected

Daedalus:

A Low-Flying Spacecraft for the Exploration of the Lower Thermosphere - Ionosphere

Daedalus:

150x2000 km orbit – 85º inclination

Earth Explorer candidate mission –

Potential selection May 2022
Launch 2027-28 timeframe

And now to science perspective from Rumi and Jonathan