

# EN-LoTIS Working Group Town Hall

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John McCormack  
CEDAR Workshop

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First and last name	Affiliation
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James Clemmons	University of New Hampshire, USA
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Gareth Perry	New Jersey Institute of Technology, USA
Robert Pfaff	Goddard Space Flight Center, USA
Theodoros Sarris	Democritus University of Thrace, Greece
Claudia Stolle	Leibniz Institute of Atm. Physics, Germany
Jeff Thayer	University of Colorado at Boulder, USA
Sarah Vines	Applied Physics Lab/JHU, USA

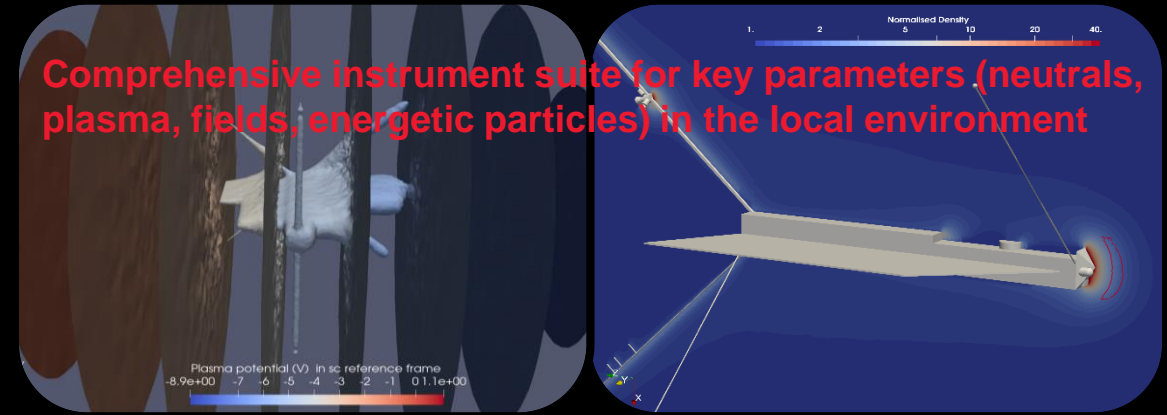
- ❑ EN-LoTIS Working Group will explore agency cooperation on future lower thermosphere-ionosphere (LTI) satellite mission concepts, targeting *in situ observations* that enable advancements in understanding neutral-ion interactions from 100 - 200 km altitude, and the ionospheric E-region in particular.
- ❑ Concept of low-flying LTI mission poses unique scientific & technical challenges. Joint ESA/NASA collaboration proposed to help address these challenges. Initial phase of WG provides information via **interim (6 month)** and **final (12 month)** report to help agencies plan possible future joint mission.
- ❑ We are grateful to all who have shown their interest and willingness to support this endeavour. WG membership was limited for programmatic reasons, but we are actively seeking input/feedback from research community

# Programmatic context (ESA)

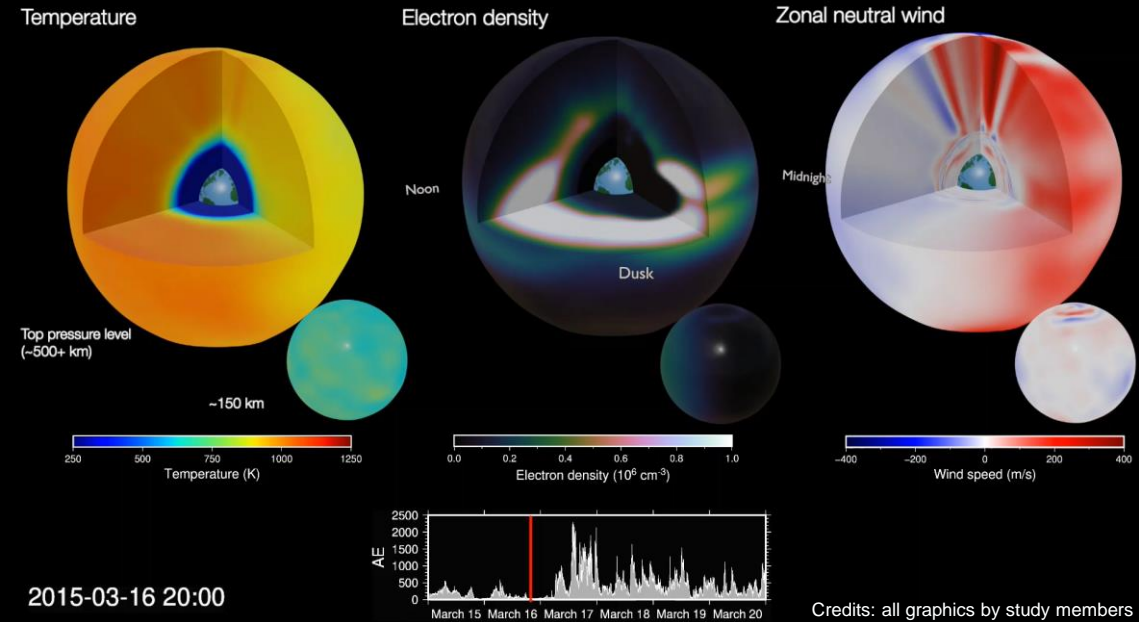
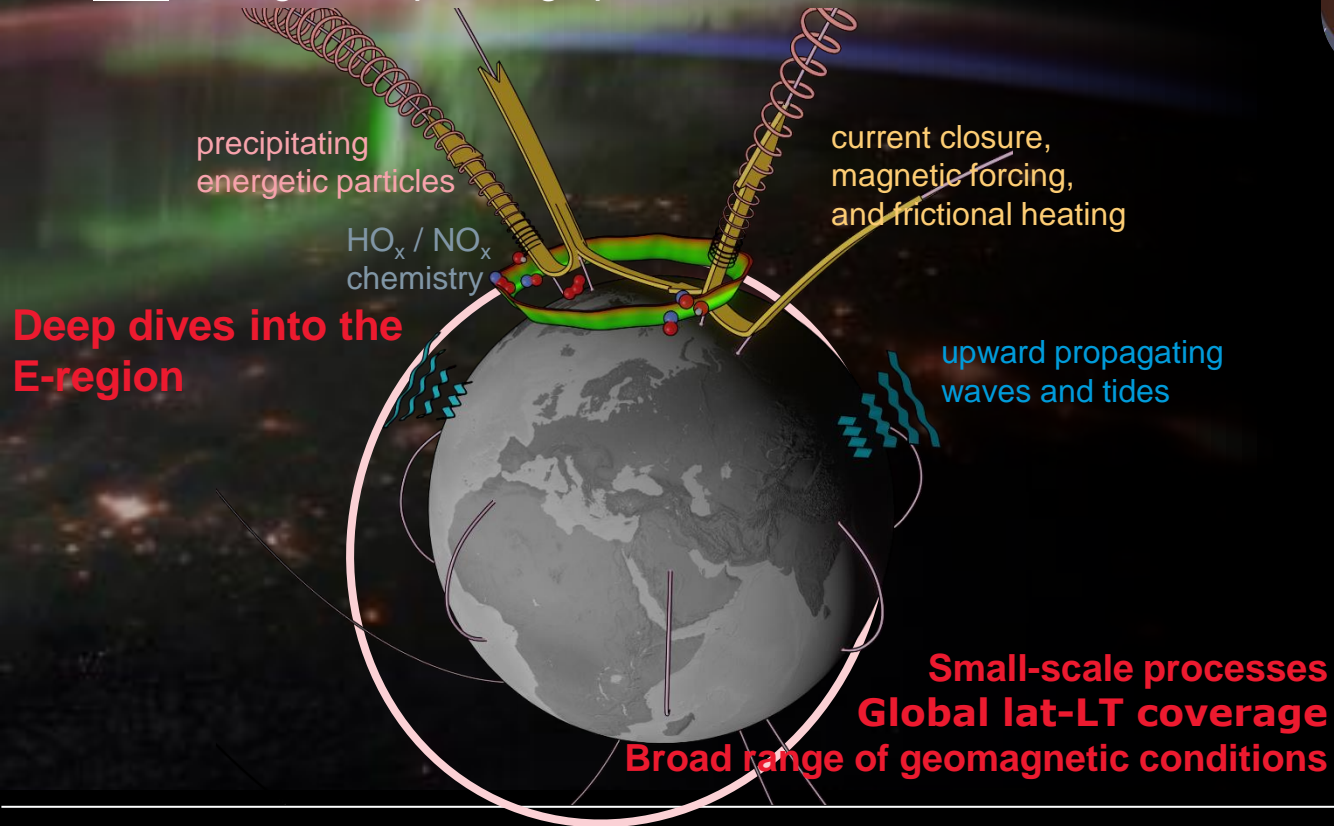
The Daedalus concept, an ESA Earth Observation Programme Earth Explorer 10 mission candidate (Phase 0)



- Targets a better understanding of the **atmosphere-space** (thermosphere-ionosphere) **coupling**, to shed light on key ion-neutral interaction processes affecting structure, energetics, composition and dynamics of the upper atmosphere, by
- Exploring the **transition region** (~120 to 200 km altitude) **in situ**, using a deep diving spacecraft.



Comprehensive instrument suite for key parameters (neutrals, plasma, fields, energetic particles) in the local environment

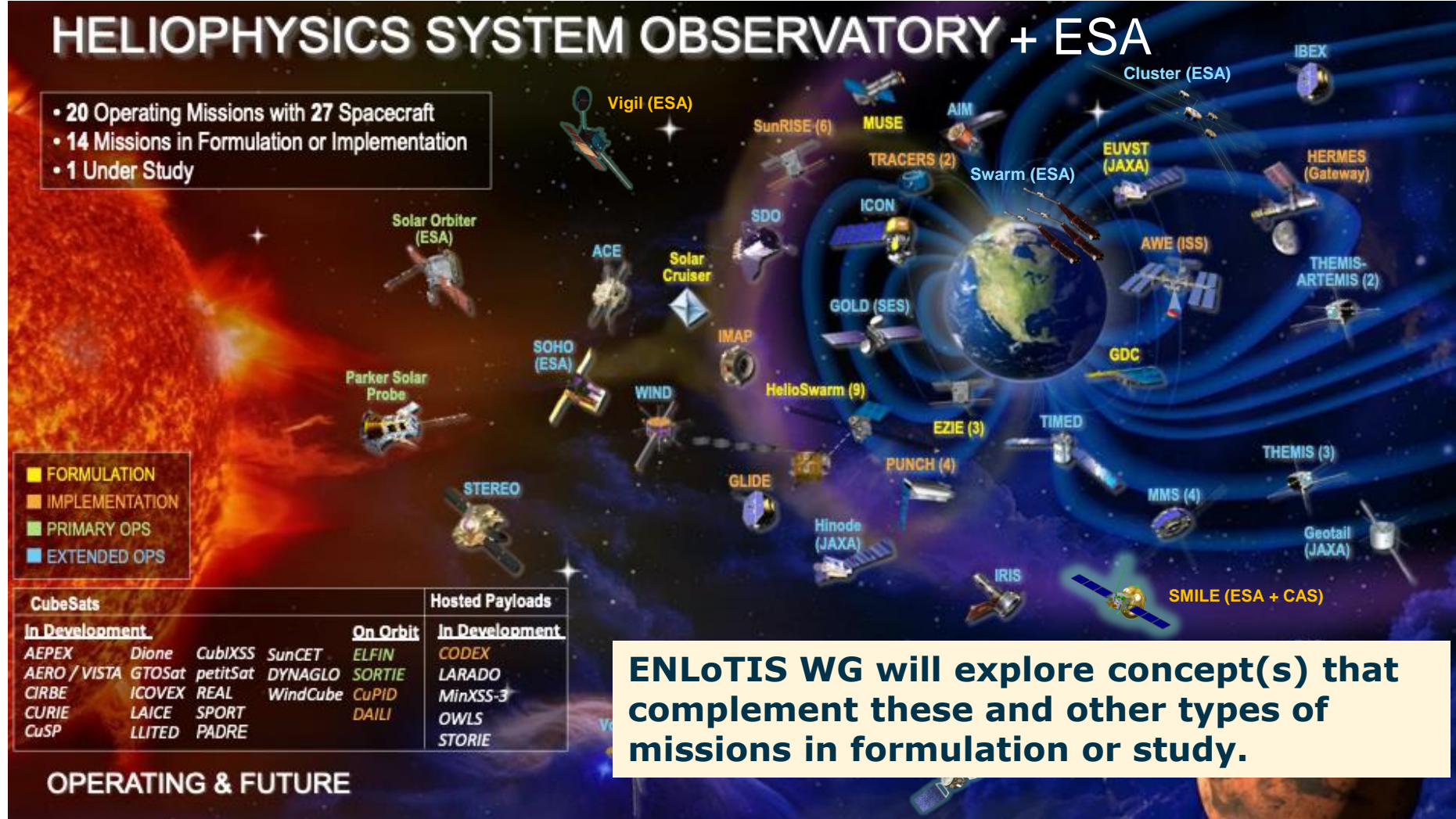


Credits: all graphics by study members

# Programmatic context (NASA)



The NASA heliophysics perspective / framework



## Geospace Dynamics Constellation

Goal 1: Understand how the high latitude T/I system responds to variable solar wind & magnetosphere forcing.

Goal 2: Understand how internal processes in the global ionosphere-thermosphere system redistribute mass, momentum, and energy.

## DYNAMIC

Advance understanding of space weather variability driven by lower-atmosphere weather on Earth using small spacecraft that can launch as a rideshare with the GDC mission.

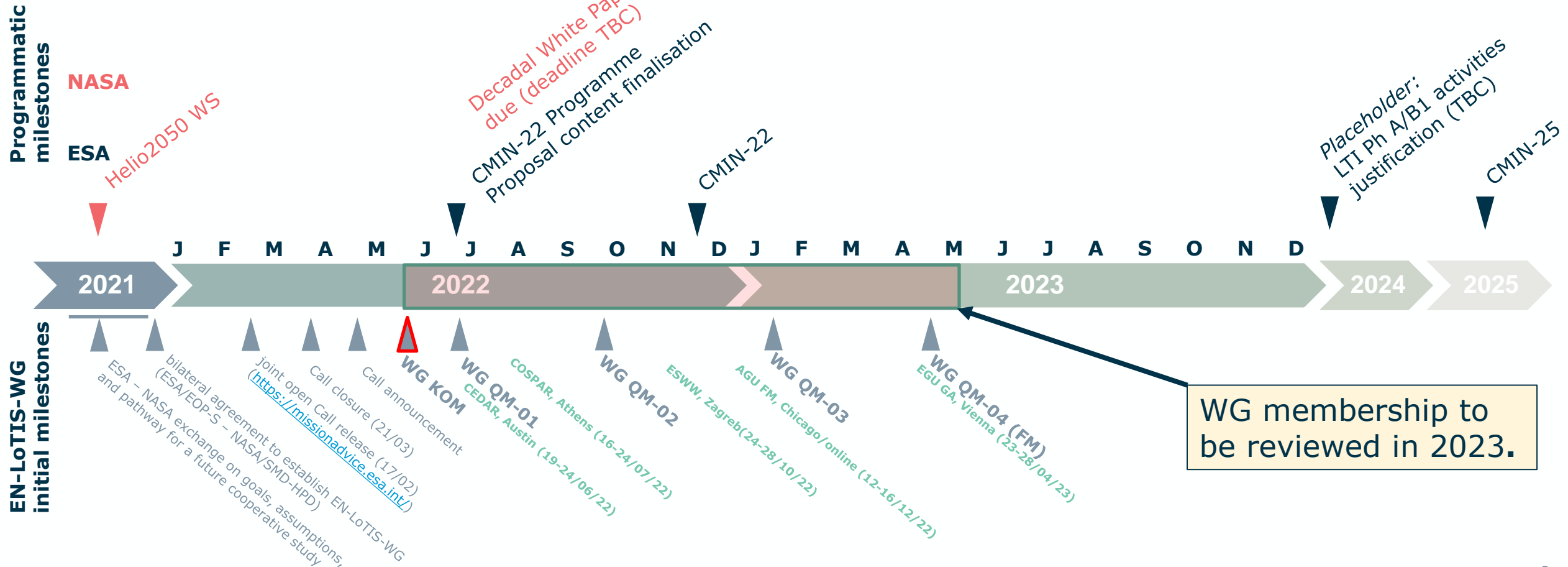
**S/C altitudes > 350 km**

# Programmatic context

timeline of WG activities



→ Initial phase of WG coincides with ESA & NASA planning milestones (Ministerial Conf., Decadal Survey)

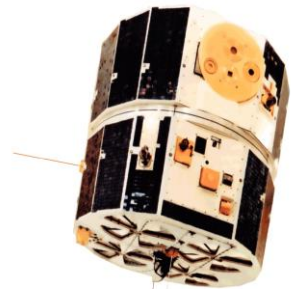


# Programmatic context

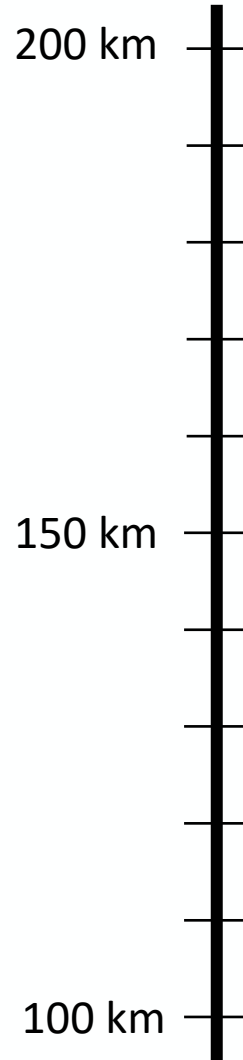
The past, present and future of LTI missions



## Flown missions

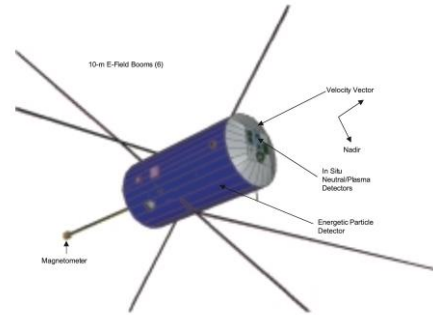


AE-C & AE-E  
(1973-1975)  
Handful of orbits, low inclination, limited instruments



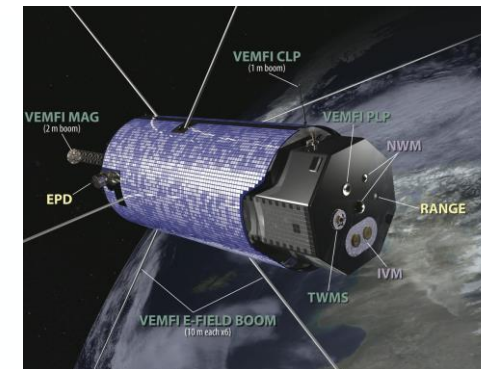
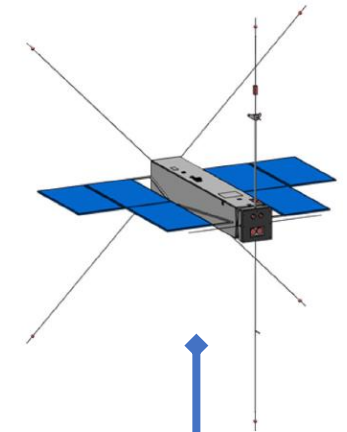
TIMED (1991)  
(descoped)

GEC (2001 STDT)



## Proposed missions

Daedalus (2020)



LOPEX, Dipper, MAX, ASTRE,  
ASTRE2 (1993-2011)

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The WG enables ESA-NASA cooperation on future LTI satellite mission concepts by:

- a) Reviewing and consolidating **consensus science questions or goals, mission objectives, and high-level mission requirements** that would inform the eventual definition and design of (a) future mission concept(s)
  - Not starting from “blank slate” – leverage knowledge from past and current mission studies
  - Input/feedback from research community throughout initial phase will be key
  - From Heliophysics perspective, initial phase of ENLoTIS WG would resemble an “SDT” or Science Definition Team.
- b) Identifying **scientific and technical challenges and constraints** associated with these high-level requirements from (a) in view of facilitating trade-offs and identifying candidate measurements.
  - Balancing science and feasibility – how low should we go vs. how low can we go?
- c) Coordinating with **on-going and planned activities** between NASA & ESA supporting (a) and (b)

# Community discussion: Some questions

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- What is WG's relationship to other community initiatives (past, present, future)?
- What is missing (gap identification)?
- What are means of community engagement – alignment with conferences/workshops over next 12 months (e.g., CEDAR, COSPAR, AGU, EGU)?
- How can we effectively gather the community needs and scientific requirements for data in the LTI, especially from data user and modelling perspectives
- Others?

**<https://missionadvice.esa.int/esa-nasa-science-working-group/>**

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