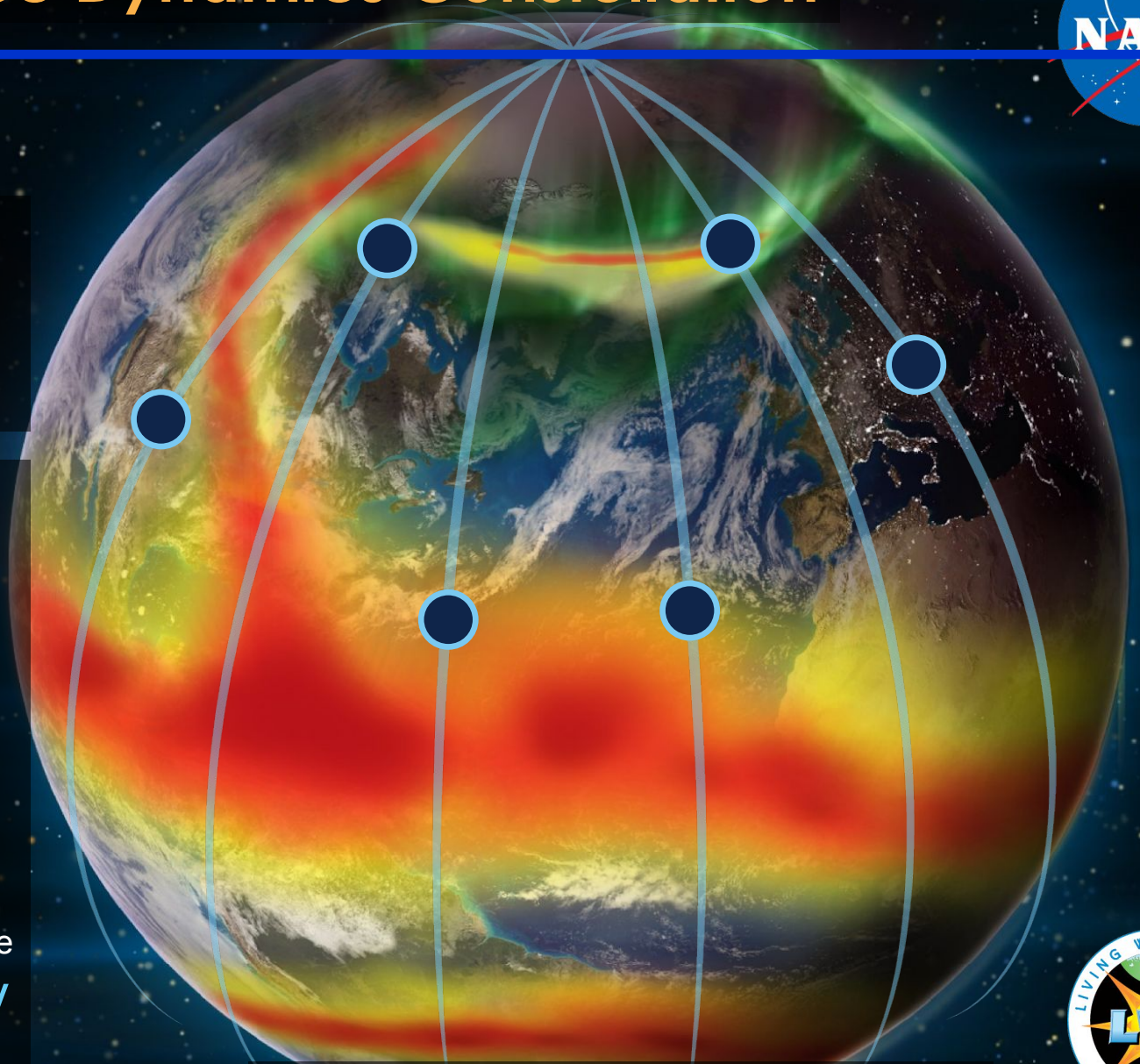
Geospace Dynamics Constellation

GDC
GEOSPACE DYNAMICS CONSTELLATION
Exploring Our Connected Atmosphere

- Goal1: High latitude response to magnetospheric forcing
- Goal 2: Internal processes that globally redistribute mass, momentum, and energy

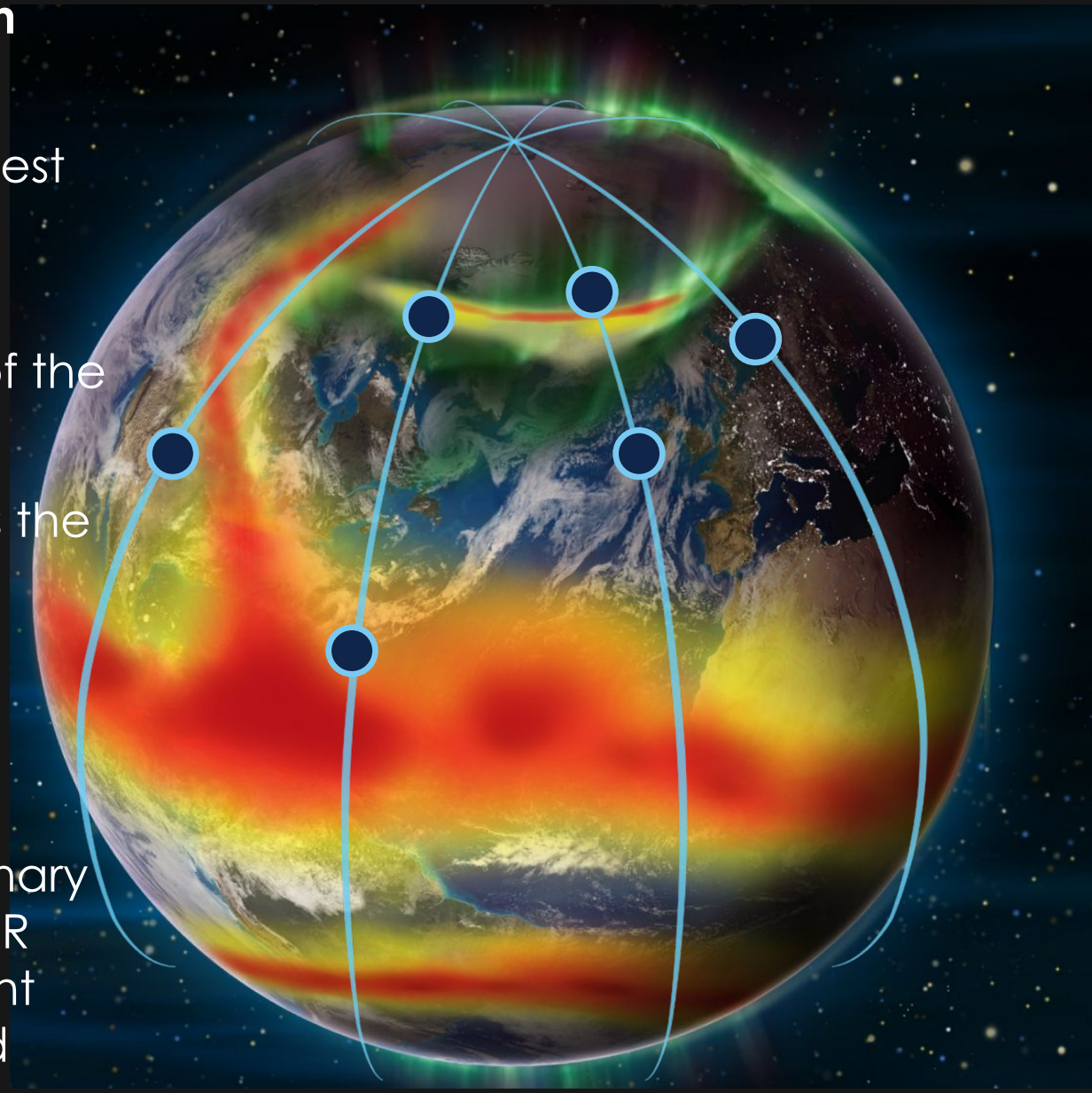
- **6 satellite mission at 350-400 km** to study the transition between Earth's atmosphere and the space environment in the ionosphere and thermosphere
- **The first comprehensive measurements in this region**, including energy inputs from the space environment above and the variable upper atmosphere response
- **Interdisciplinary study** of fundamental processes of planetary upper atmospheres, to understand the **space environment role in planetary habitability**
- Provides critically-needed space



2023 CEDAR workshop San Diego, CA
June 27, 2023

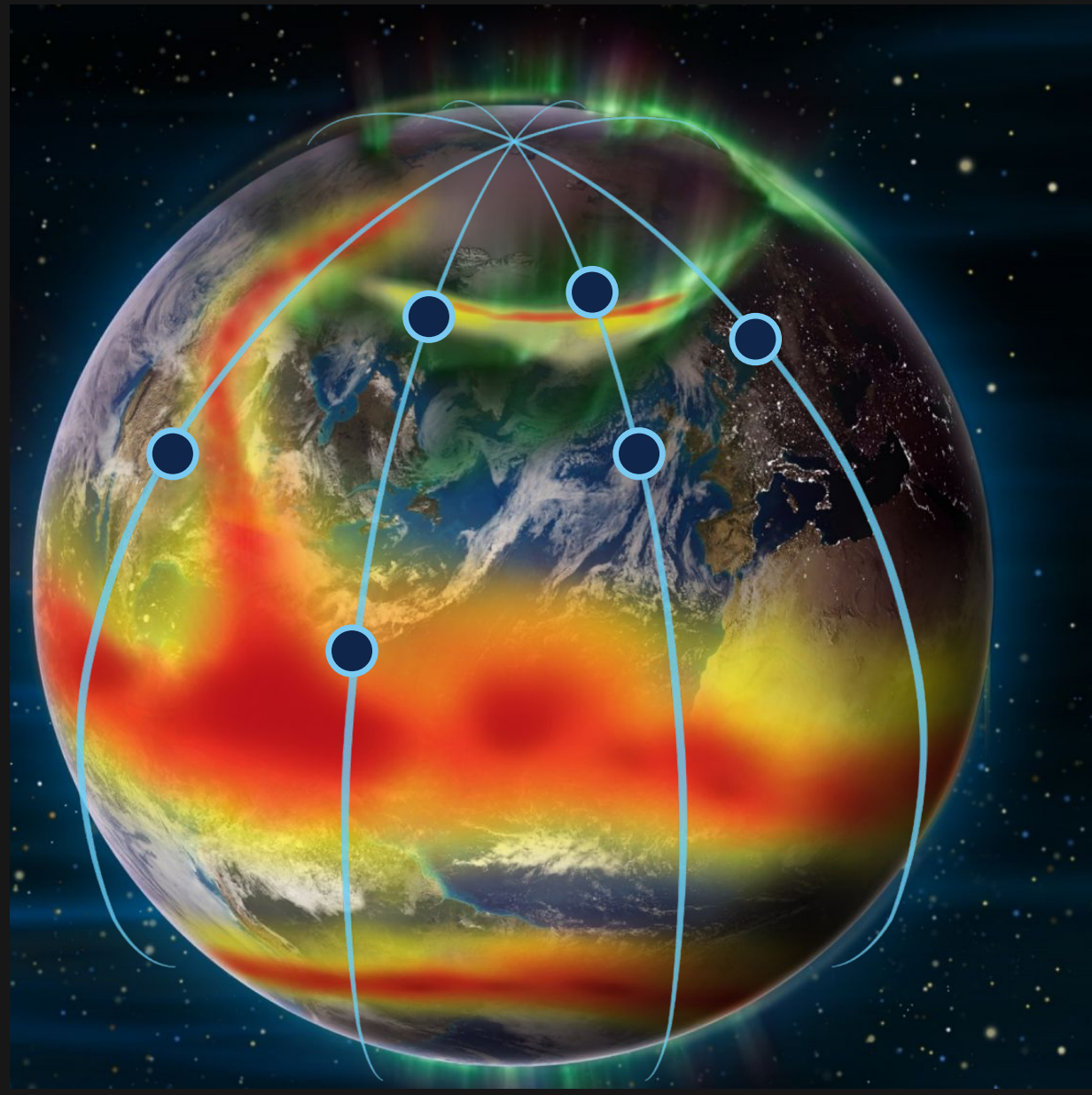
GDC is paused - *NOT* canceled

- **GDC has the full support of all stakeholders within NASA.**
- In March 2023, the FY24 President's Budget Request (PBR) recommended a "pause" for GDC to synchronize schedule with future funding.
- This is a funding profile issue outside the control of the GDC project; this is not an issue with GDC.
- In the US Budget process, Congress appropriates the funding.
- During the "pause", GDC will continue steady development, with a focus on science and instrument development.
- GDC will be ready to move into Phase B (preliminary design) quickly once the pause is lifted. In the PBR scenario this would mean full speed development resumes in 2026. The launch will likely be delayed slightly relative to the original plan (2029).



Thank you for supporting GDC

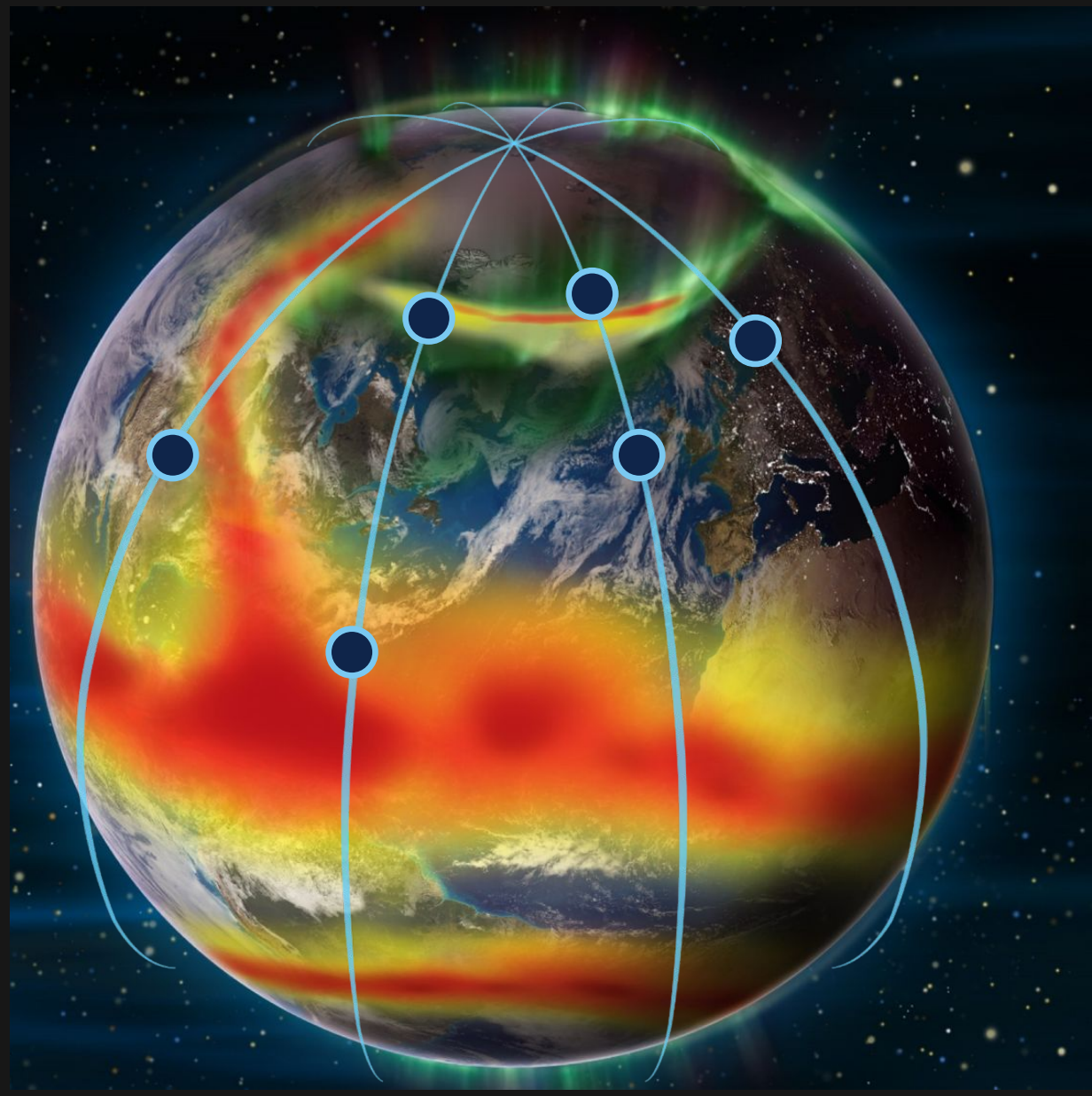
- The CEDAR community has been very supportive of GDC and DYNAMIC.
- The letters of support that the Steering Committee and CEDAR members signed are important ways to let NASA and stakeholders know about the importance of these missions.
- Many Decadal Survey white papers were submitted that outlined the high value of science that can be done with missions like GDC and DYNAMIC.
- Thank you for your continuing support.



Updates / Current Status

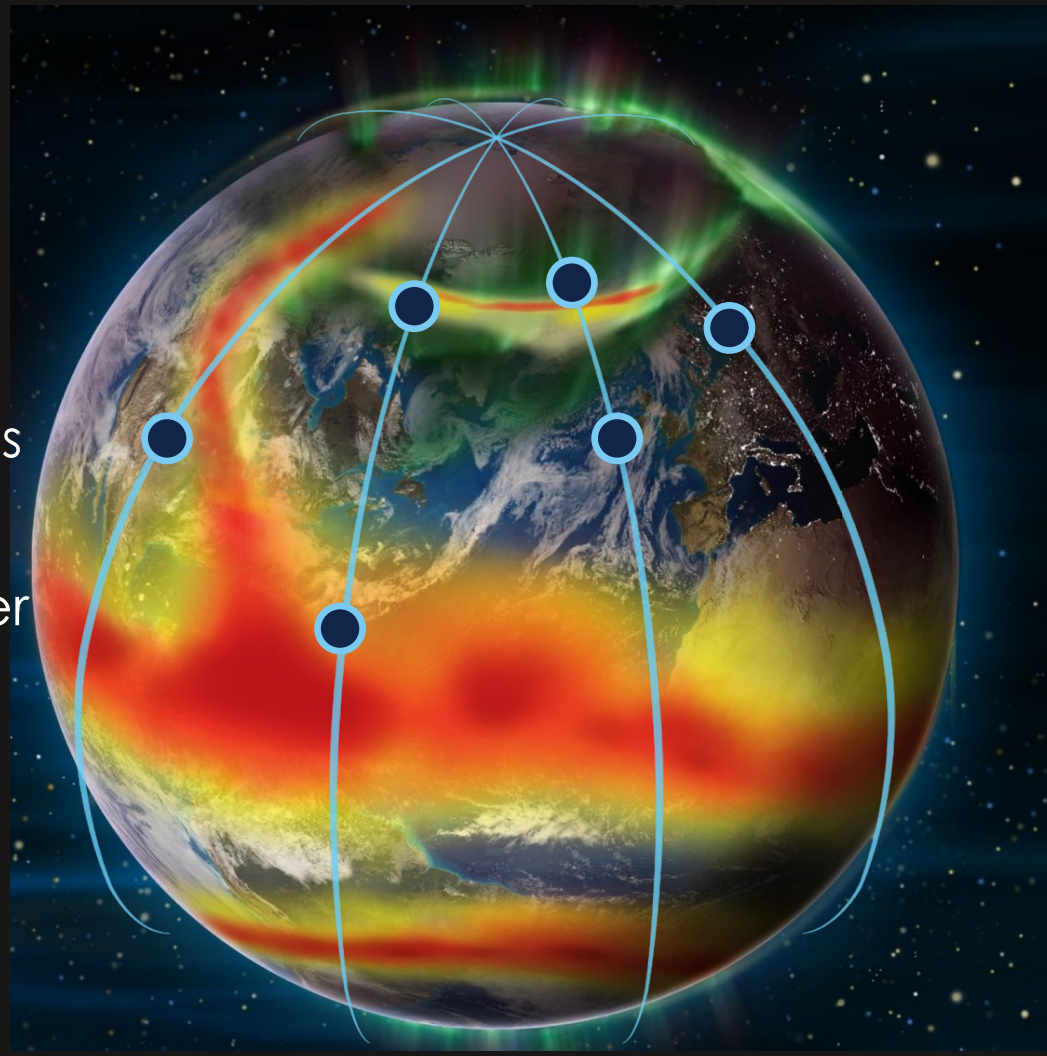
Since AGU in December:

- HQ selected two additional instruments
  - Thermal Plasma Sensor (TPS) – P. Anderson/UTD – thermal ion density, velocity, temperature
  - Near Earth Magnetometer Instrument in an Integrated System (NEMISIS) – M. Moldwin/Michigan – magnetic field
- HQ directed development of one instrument
  - Probe for Radio Occultation oF Ionospheric LayErs (PROFILE) -- O. Verkhoglyadova/JPL – radio occultation TEC / scintillation



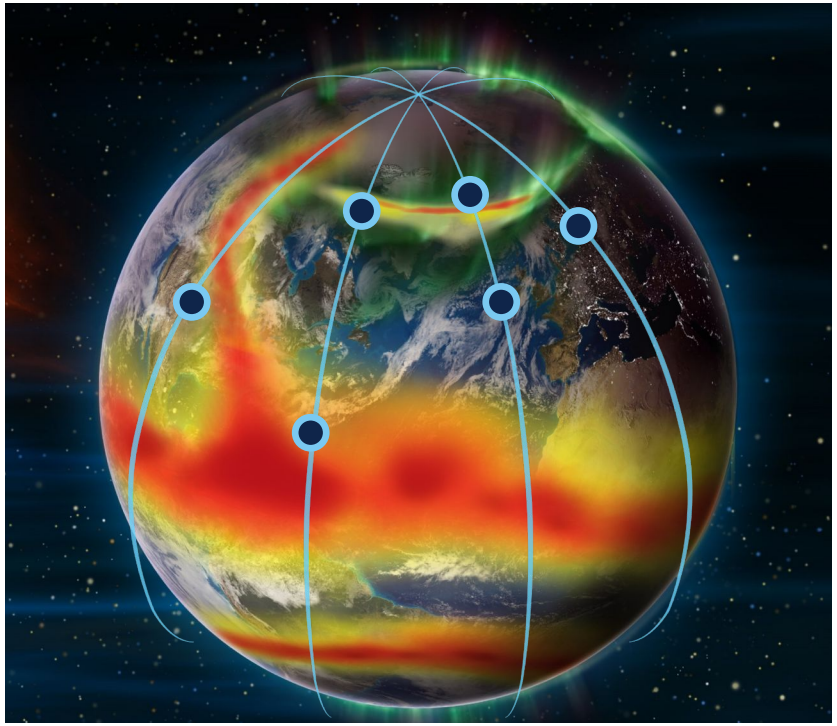
Updates / Current Status

- GDC is continuing with the spacecraft procurement process
- MoSAIC instrument had a successful instrument Systems Requirements Review in May 2023. CAPE will follow, this fall.
- NASA is finalizing responses to Independent Review Board Action Items on Space Weather, communications strategy, ground-based observations, and others.
- GDC is still "forming", getting the instrument teams under contract, integrating the separately proposed science investigations, etc.
- Once the project has gotten past this initial stage (spacecraft vendor and instrument teams integrated, requirements defined) we will have open access workshops and portions of science team meetings, to enhance community engagement with GDC and find ways to leverage this strategic mission for a broad range of science.



Geospace Dynamics Constellation

6 polar-orbiting satellites
6 science instruments
(including GPS-RO planning underway)
3 interdisciplinary science teams
1 space weather radiation monitor
Precise Orbit Determination for
GNSS neutral density cross-calibration

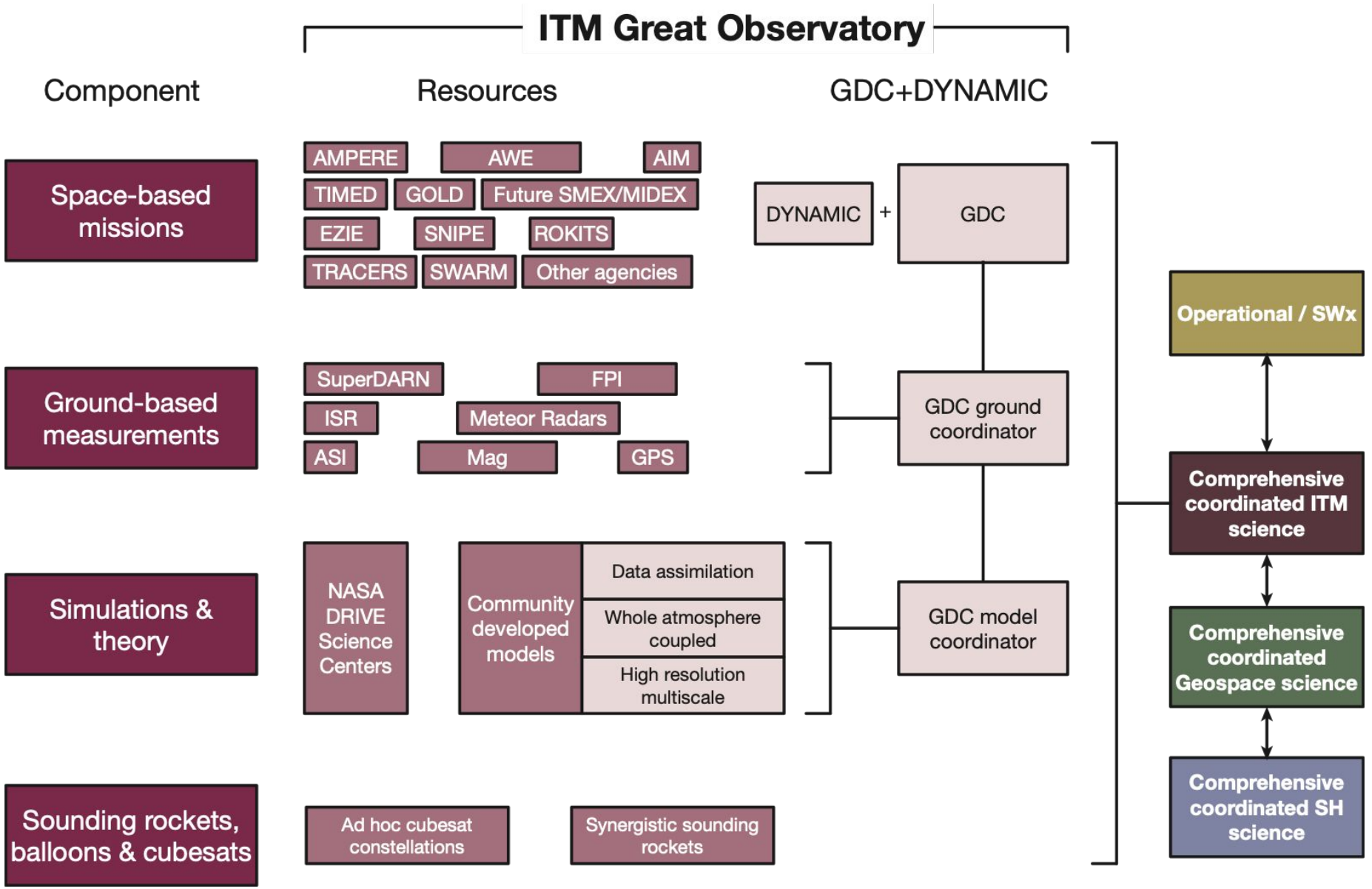


Science Instruments:

- AETHER Langmuir probe (PI Andersson, CU Boulder)
- MoSAIC ion/neutral mass spec (PI Benna, UMBC)
- CAPE auroral precipitation (PI Gershman, GSFC)
- TPS Thermal plasma (PI Anderson, UT Dallas)
- NEMISIS Magnetometer (PI Moldwin, U of Michigan)
- PROFILE GNSS radio occultation (PI Verkhoglyadova, JPL)

Interdisciplinary Science Teams:

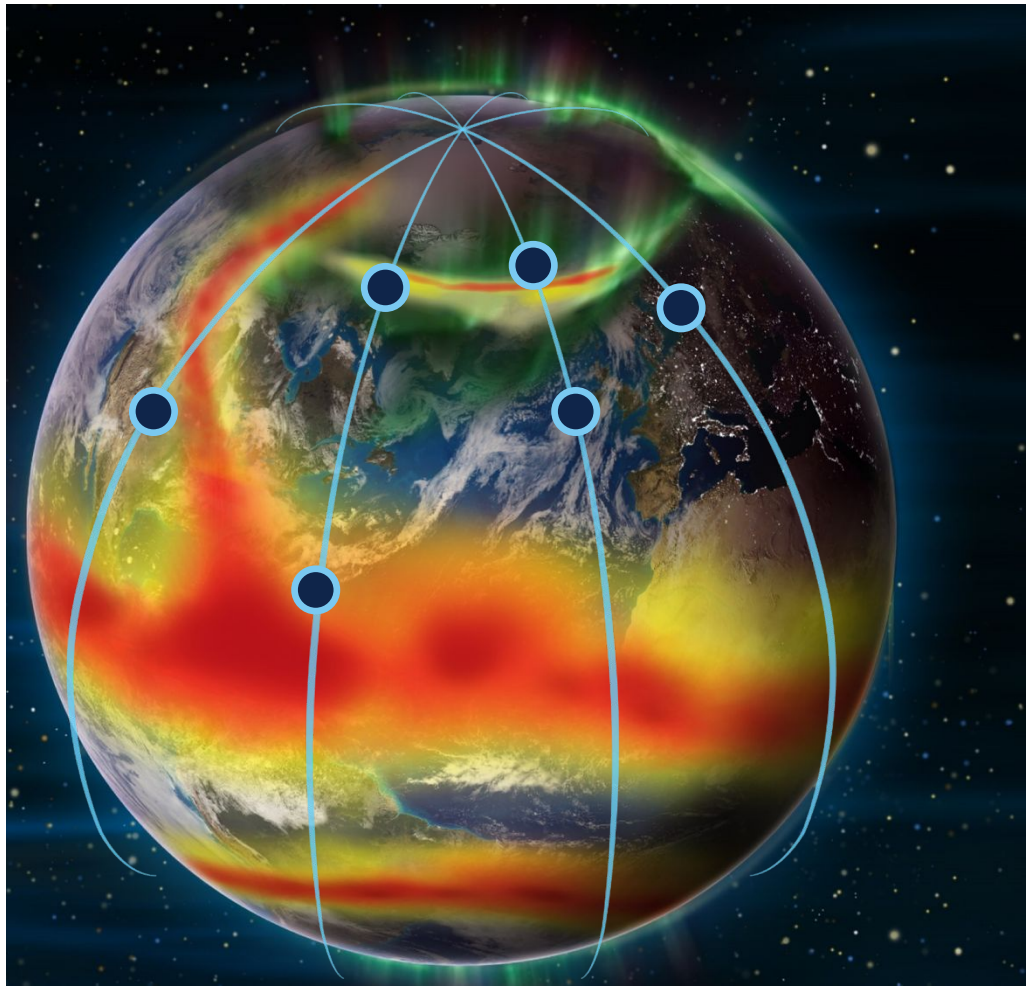
- NEXUS (PI Thayer, CU Boulder): GNSS neutral density; real-time space weather experience (GOLD & IMAP)
- ADAPTIVE (PI Bishop, Aerospace Corp): model/data connection & visualization; space weather expertise
- SOPHIE (PI Deng, UT Arlington): multiscale forcing from above, mesoscale extensions to numerical models


ITM Great Observatory
Component
Resources
GDC+DYNAMIC
Space-based missions
AMPERE
AWE
AIM
TIMED
GOLD
Future SMEX/MIDEX
EZIE
SNIPE
ROKITS
TRACERS
SWARM
Other agencies
DYNAMIC
+
GDC
Ground-based measurements
SuperDARN
FPI
ISR
Meteor Radars
ASI
Mag
GPS
GDC ground coordinator
Simulations & theory
NASA DRIVE Science Centers
Community developed models
Data assimilation
Whole atmosphere coupled
High resolution multiscale
GDC model coordinator
Sounding rockets, balloons & cubesats
Ad hoc cubesat constellations
Synergistic sounding rockets
Operational / SWx
Comprehensive coordinated ITM science
Comprehensive coordinated Geospace science
Comprehensive coordinated SH science

Conclusions

- **GDC is paused, not canceled**. This is just a bump in the road on the way to transforming our understanding of the ITM system.
- **GDC and DYNAMIC will be a strategic hub for the ITM Great Observatory (ITM-GO)** The final DYNAMIC AO has been released. Together GDC+DYNAMIC will quantify the response to forcing from above and below.
- GDC will provide **real-time space weather** information

Get involved through the Ground-based WG being led by Bea Gallardo-Lacourt (see next slide for QR code).



Contacts:
Doug Rowland (PS) douglas.e.rowland@nasa.gov
Larry Kepko (DPS) larry.kepko@nasa.gov
Katherine Garcia-Sage (DPS) katherine.garcia-sage@nasa.gov

GDC
GEOSPACE DYNAMICS CONSTELLATION
Exploring Our Connected Atmosphere

- GDC continues development, with a primary focus on science and instrument development.
- GDC is expecting to select a spacecraft vendor late this year.
- Launch date TBD but expected in early 2030s.

GDC CEDAR SESSIONS

GDC Mission: Instruments & Science
Tue June 27, 2023, 10:00 – 12:00 (Westcoast Room)

Science in the GDC and DYNAMIC Era
Thu June 29, 2023, 04:00 – 06:00 (Eastcoast Room)