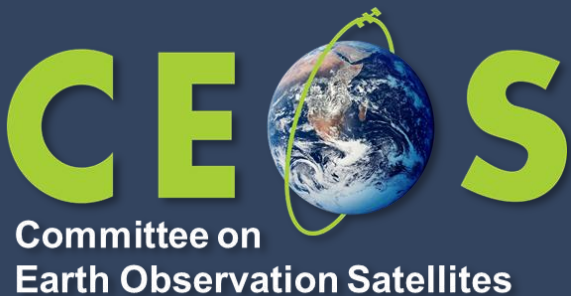


CEOS AC-VC 22

June 1-6, 2026

*Expanding Geostationary Atmospheric
Composition Satellite Constellation:
Towards Global Coverage*



**Ali Omar
Emma Knowland, Shobha
Kondragunta, Pieter Levelt, Ben
Veihelmann and the White Paper
Team**

Leiden, the Netherlands

1-6 June 2026

GENESIS

- In 2024, CEOS AC-VC commissioned a new White Paper
- The initial goal was to complement GEMS, TEMPO, and Sentinel-4 with global air quality and greenhouse gas observations
- A dedicated team has been meeting bi-weekly to draft the document
- The initial plan was presented at the October 2025 CEOS SIT Meeting
- Following this meeting, the scope was reduced to focus exclusively on air quality

A finalized White Paper will be ready for the **2026 SIT Fall meeting** for review by the Principals.

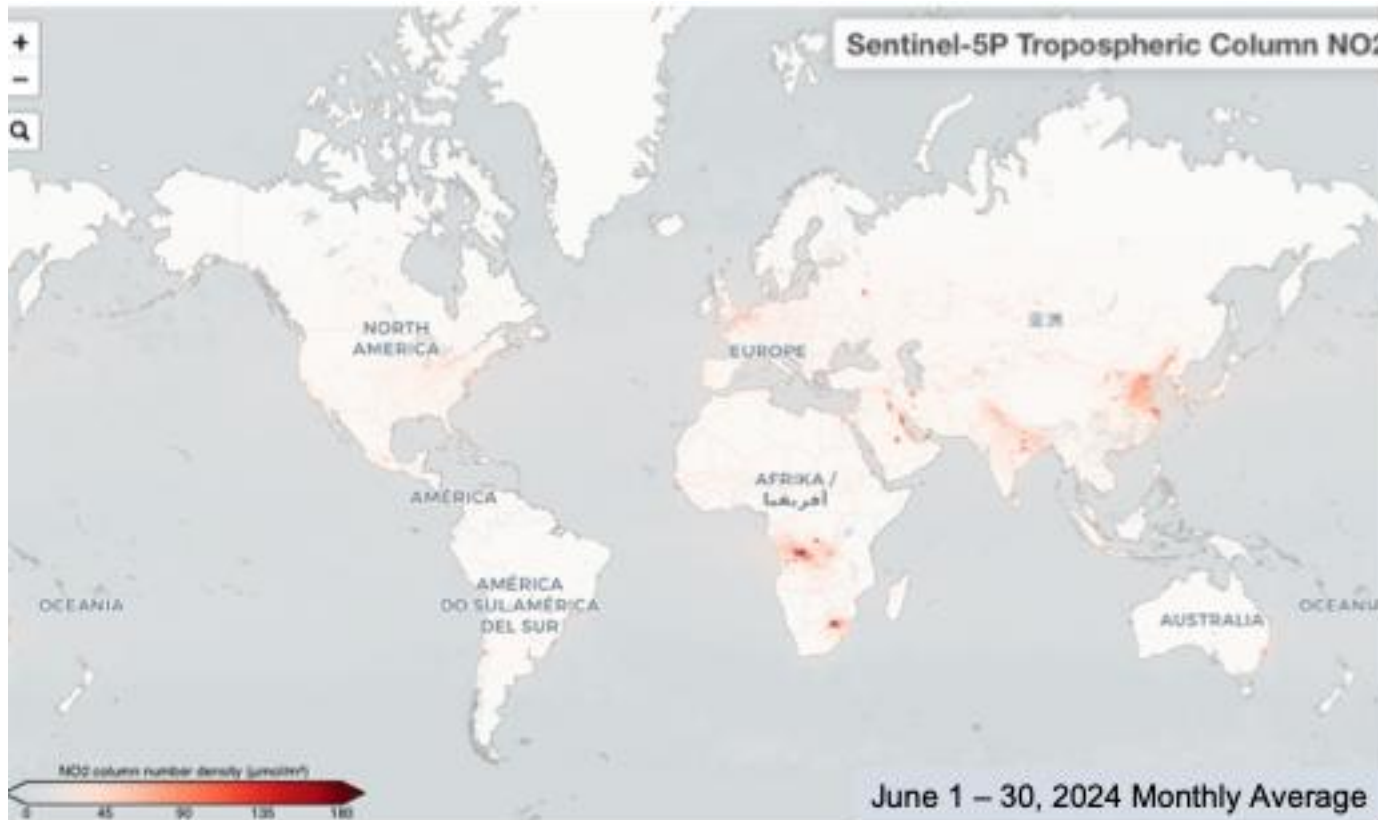
Study Co-Authors



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★ **White Paper Co-Leads**

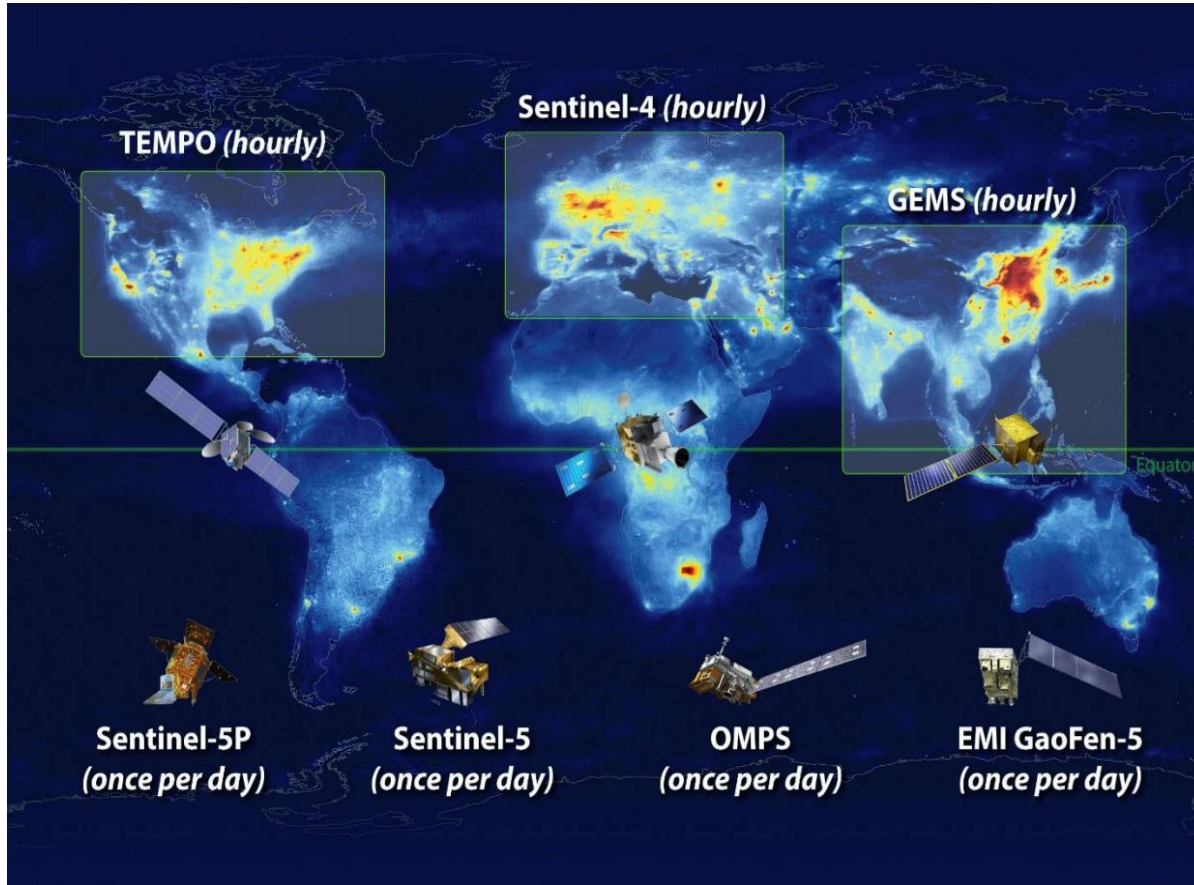
The Challenge – Addressing the Gap in Observations



- Human activities drive rapid atmospheric changes.
- The fast pace of change requires hourly observations.
- These shifts directly impact air quality and human health.
- Accurate measurements are vital to guide actions and evaluate the success of current strategies

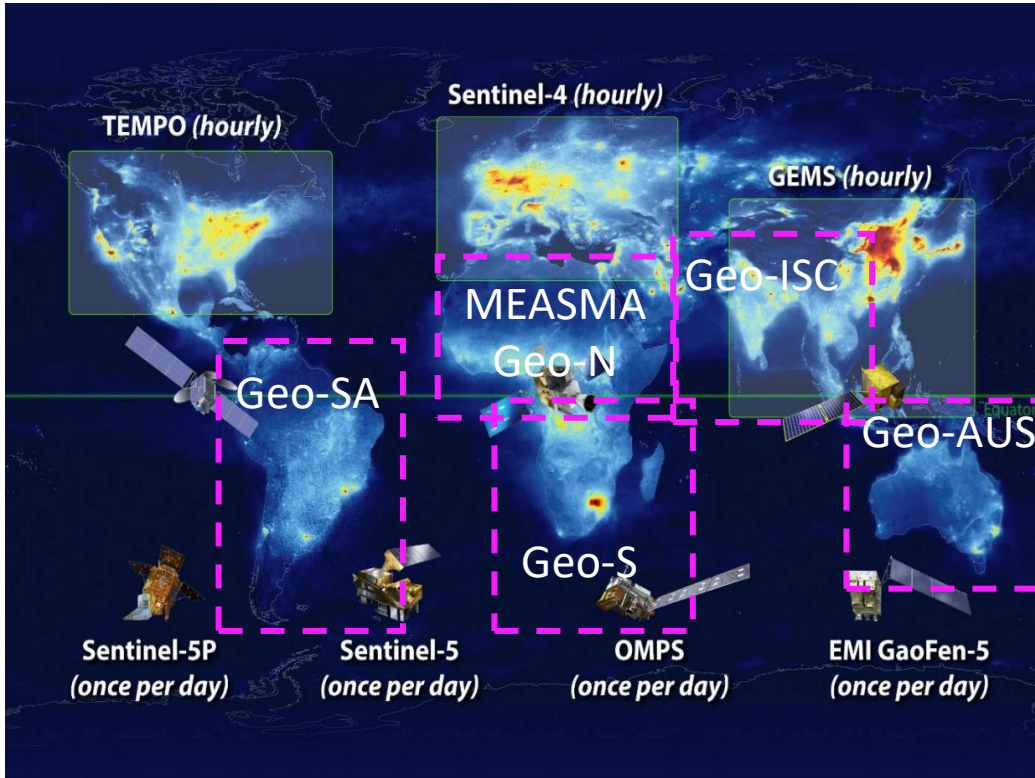
Tropospheric Nitrogen dioxide (NO_2) column concentration retrieved by Sentinel 5P for the month of June 2024. High column densities (denoted by bright red colors) over the South Africa are associated with high power plant and industrial emissions in the region. Elevated column densities over south equatorial Africa are associated with dry season biomass burning activity

The Current Landscape



- ❖ The CEOS Atmospheric Composition Virtual Constellation (AC-VC) partners provide valuable data
- ❖ Gaps remain in observing diurnal cycles, rapidly changing events, and specific pollutants in the SH and populated NH regions
- ❖ Polar-orbiting satellites offer global coverage, but limited temporal resolution

Closing the Gap: The Global Geostationary Satellite Solution



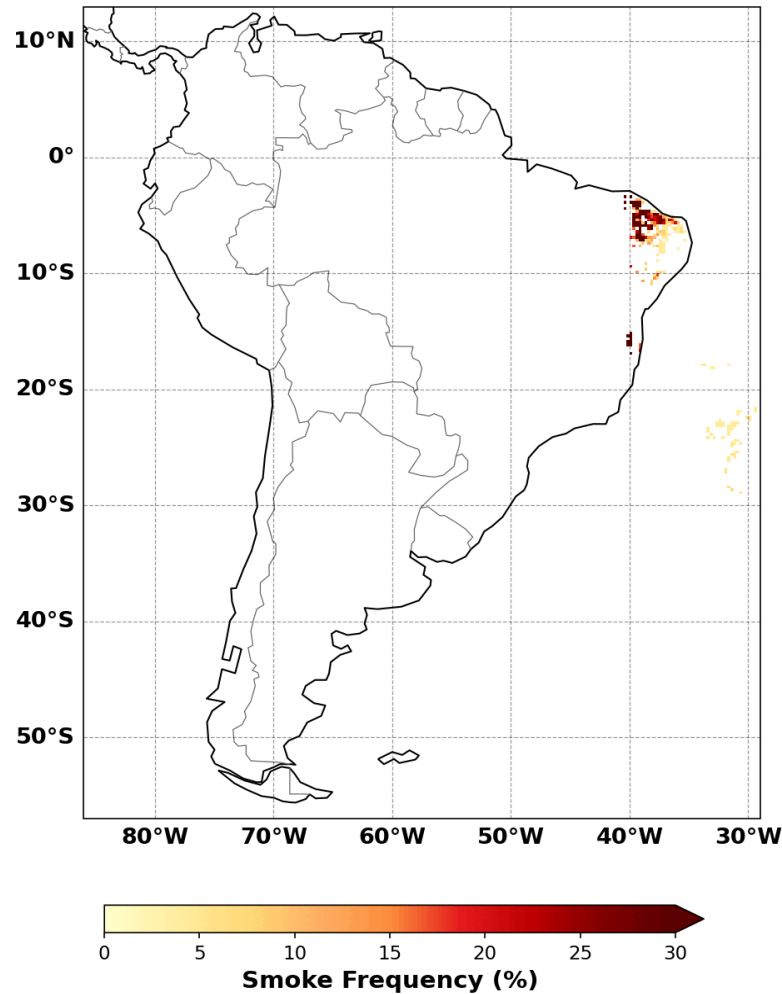
- Five new **geostationary** satellites identified to cover the gaps
- Continuous, wide-area coverage over currently undermonitored regions
- Complementing and enhancing existing constellation
- Significant ownership and participation at the regional level to build capacity
- Leverage the Analysis Ready Data (ARD) concepts for Geo

The benefits of investing in geostationary atmospheric composition monitoring extend far beyond the science. By improving our ability to predict and respond to environmental challenges, we can realize significant economic savings in areas such as healthcare, agriculture, and resource management.

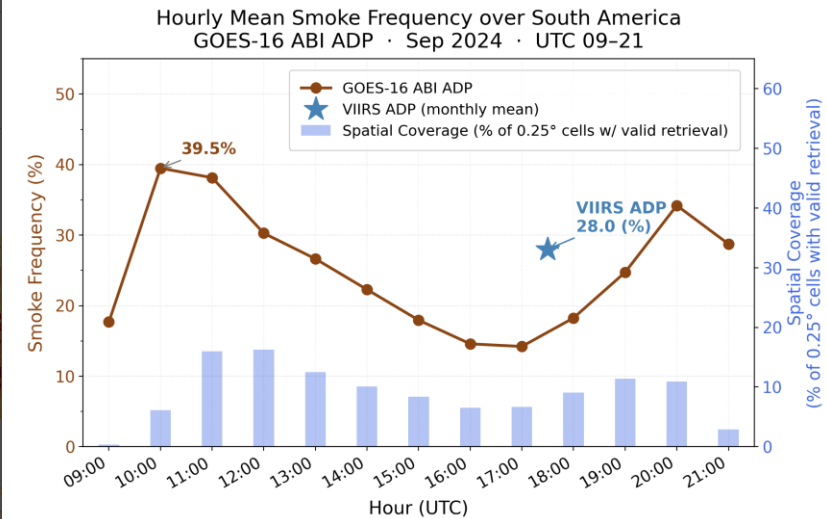
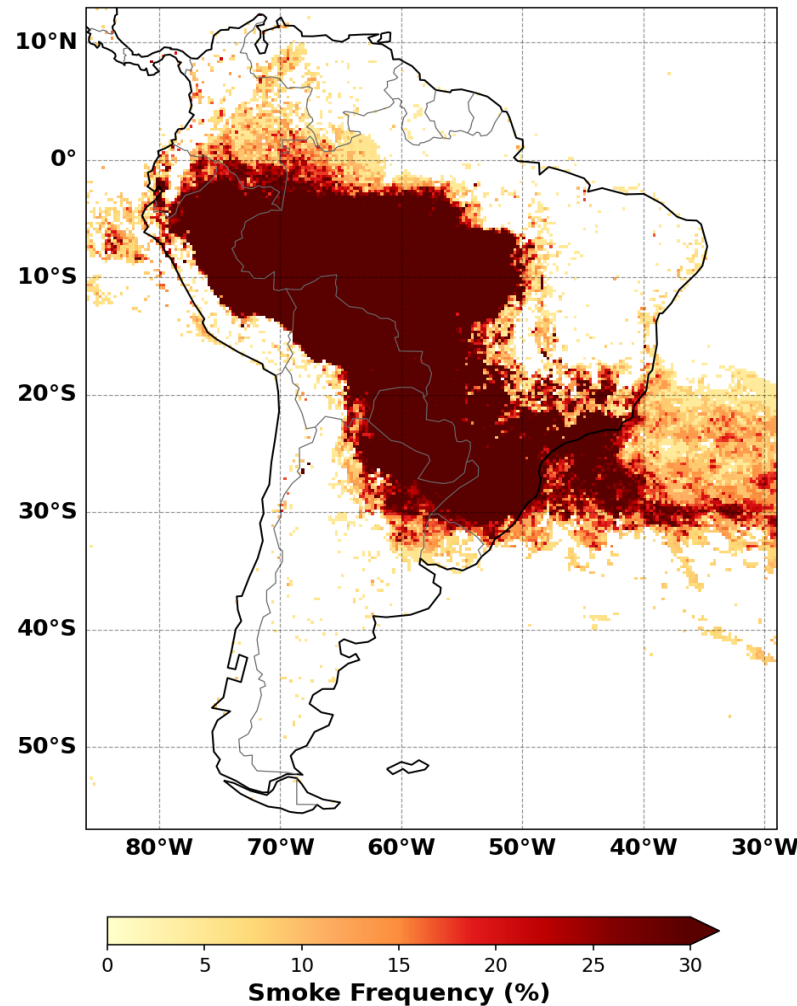
Smoke from fires in South America: Diurnal Changes in Smoke Frequency



Smoke Frequency: September 2024 09:00 UTC



Smoke Frequency: September 2024



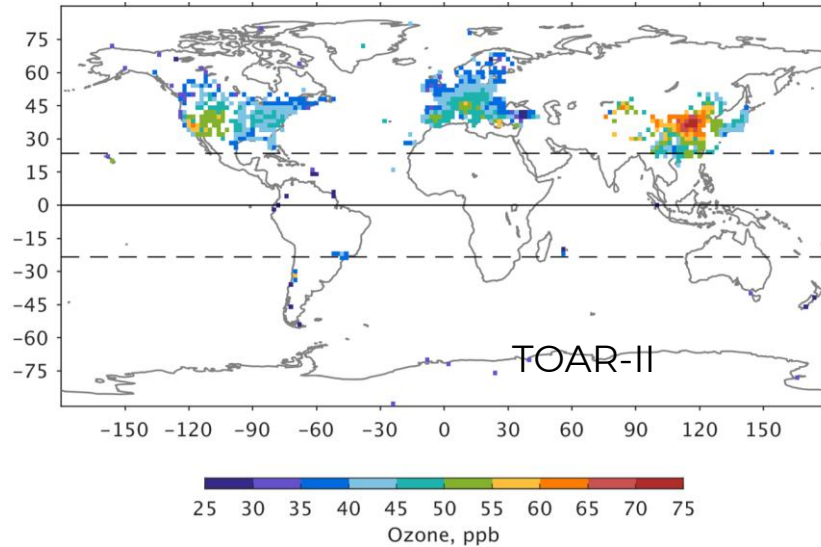
Strengthening Ground-Based Measurements for Calibration/Validation



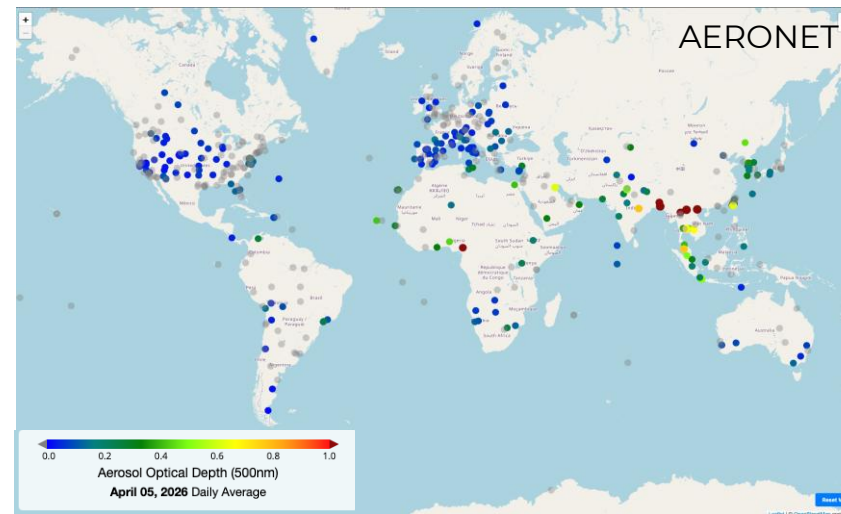
- Leverage existing ground-based networks (e.g., AERONET, Pandonia, NDACC).
- Establish strategically located collection of instruments at relevant sites
- Focus on comprehensive instrumentation and local capacity building.
- Engage diaspora scientists to reach local institutions (e.g., AMS Townhall Jan 2025) in developing countries

The disparity in atmospheric composition ground-based measurements around the globe creates an issue, as unmonitored regions are often disproportionately impacted by pollution but lack the resources to monitor and mitigate the impacts effectively.

Ground Stations for Monitoring Ozone, Nitrogen dioxide, and Particulate Matter



- All available surface ozone (O_3) observations from the Tropospheric Ozone Assessment Report (TOAR). Note that Ozone monitors exist in Australia but are not yet in the open-access TOAR-II database (Szopa et al., 2026)
- Pandonia Global Network (PGN) – Trace gases NO_2 , O_3 , HCHO, etc
- AERONET – Optical Depth (proxy for PM)



Strengths

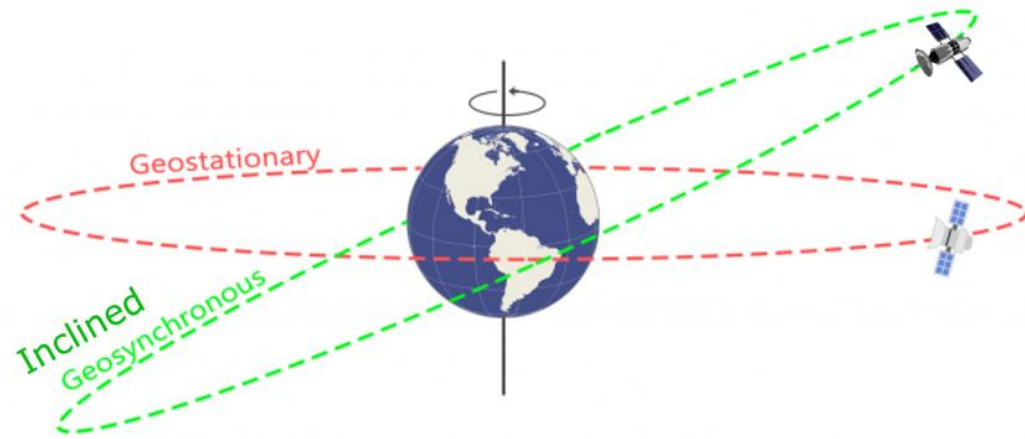
Uniform and standardized

- Algorithms /data processing
- Instrument operating routines
- Quality control

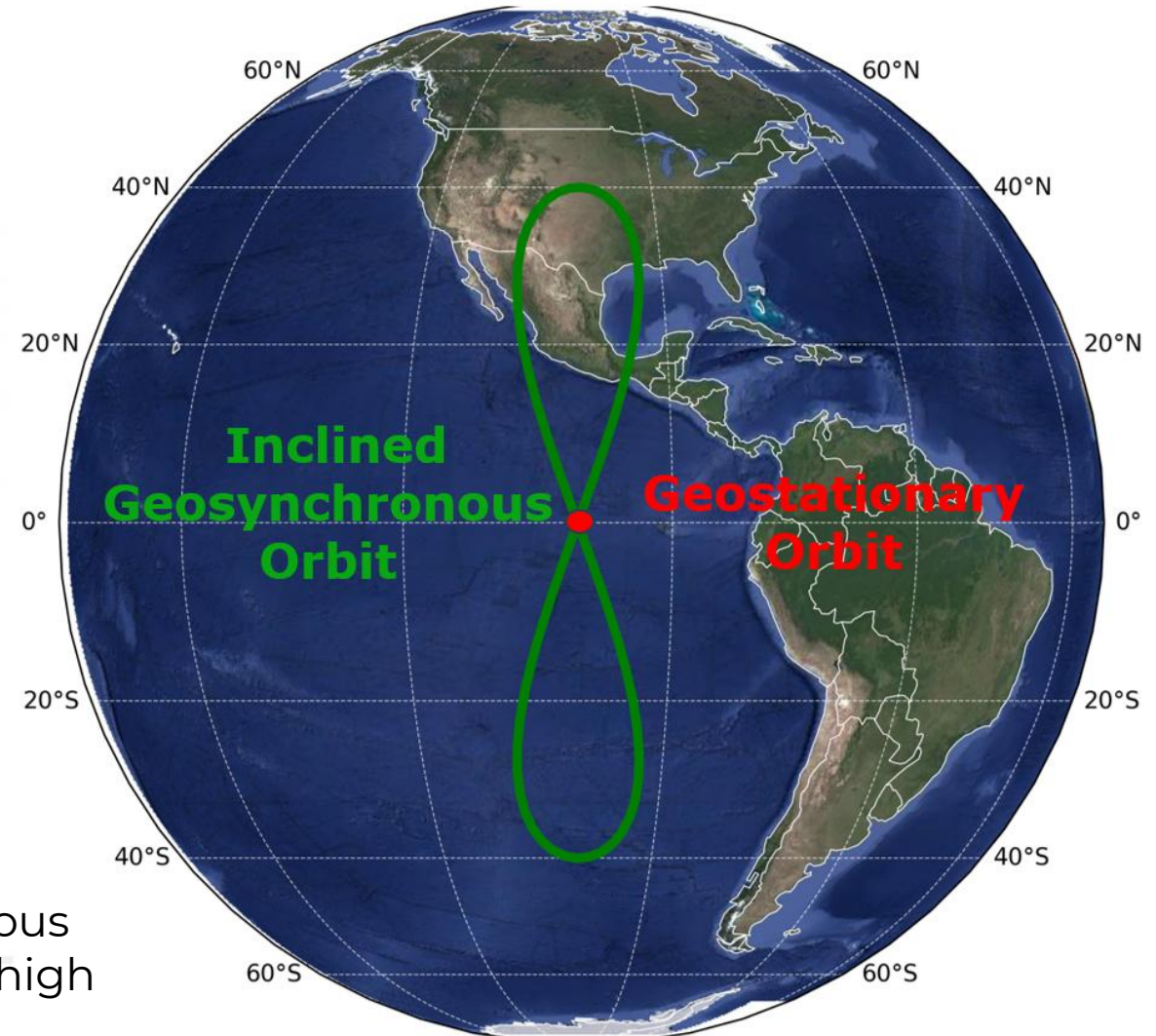
Real-time data processing

Data archiving

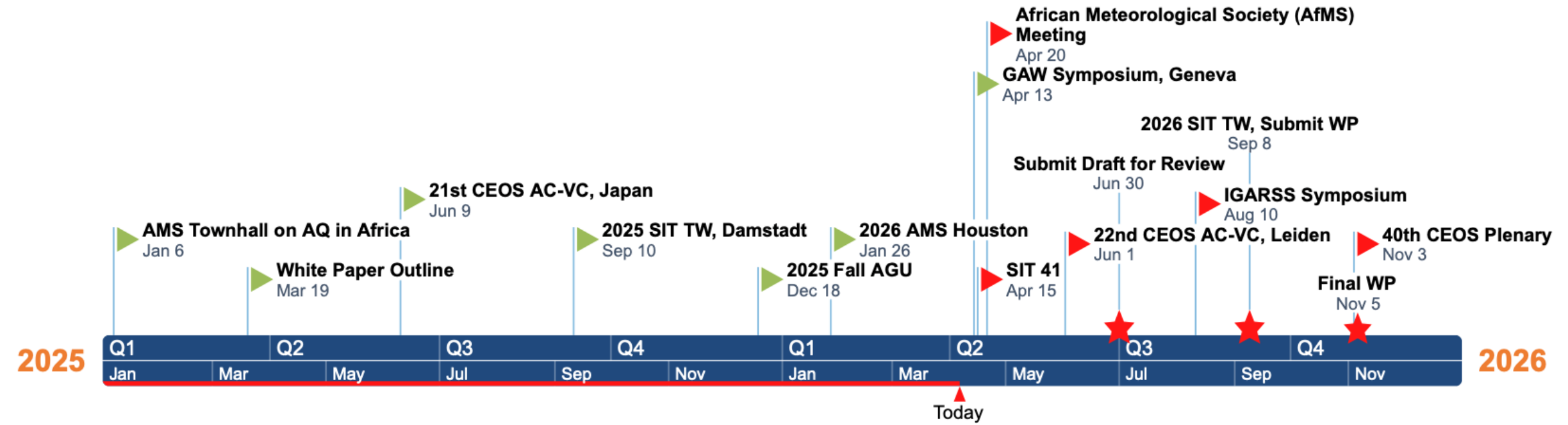
Inclined Geosynchronous Orbits (IGOs)



Altitude = 35,786 km



ECCC has proposed the use of Inclined Geosynchronous Orbits (IGOs) to observe under monitored regions at high northern latitudes



AQ Community Review WhitePaper

Jul 1 - Aug 14

Prepare Draft Final White Paper

Aug 17 - Sep 3

★ Major Milestone/Deliverable

Backup slides

- Updated the SIT-41 on current status and strategic objectives of the *Expanding Geostationary Atmospheric Composition Satellite Constellation: Towards Global Coverage* white paper.
- Highlight the urgent, global need for improved atmospheric composition monitoring capabilities.
- Emphasize the vital importance of deploying geostationary satellites to complement existing polar-orbiting systems.
- Solicit volunteer subject matter experts and reviewers to author and review sections of the white paper

End goal – a fully endorsed White Paper (Nov 2026)

Join our team if you want to participate as author or reviewer

Write to: ali.h.omar@nasa.gov

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|-----------|--|-----------|--|
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Limitations of
existing observations |
| 03 | CLOSING THE GAP
Geostationary
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