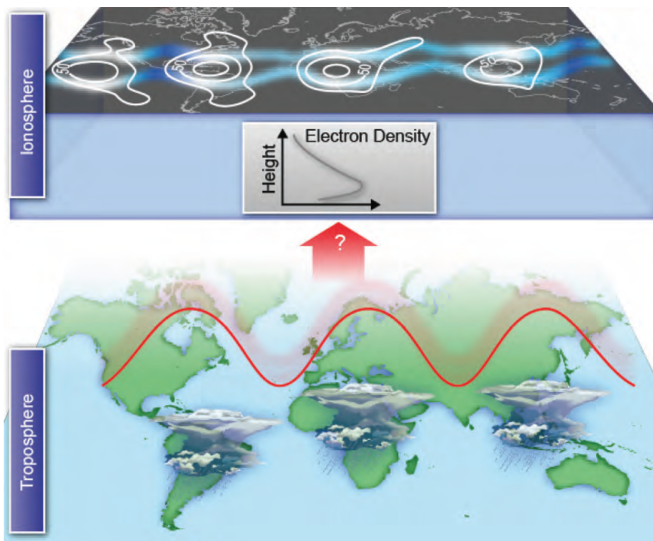


DYNAMIC

A recommended solar-terrestrial probe (STP) mission in the 2012 Decadal Survey for Solar and Space Physics (Heliophysics)

DYNAMIC primary objective:
Understand how lower-atmosphere
variability affects geospace.



DYNAMIC will:

- ❑ Reveal the fundamental processes (e.g., wave dissipation, dynamical-chemical coupling, nonlinear interactions) that underlie the transfer of energy and momentum into the IT system (especially within the critical 100- to 200-km height regime).
- ❑ Measure the resultant thermosphere and ionosphere variability that these waves incur at higher altitudes.

Key Parameters

Key Parameters	Altitude Range
$V_n(z), T(z)$ all local times, preferably sufficient resolution to resolve gravity waves	~80-300 km ~80-300 km
Altitude profiles: O, N ₂ O ⁺	100-300 km 200-600 km
V_i	In situ
V_n - vector	In situ
O ⁺ , O ₂ ⁺ , NO ⁺ , H ⁺ , He ⁺ O, N ₂ , O ₂ , H, He	In situ

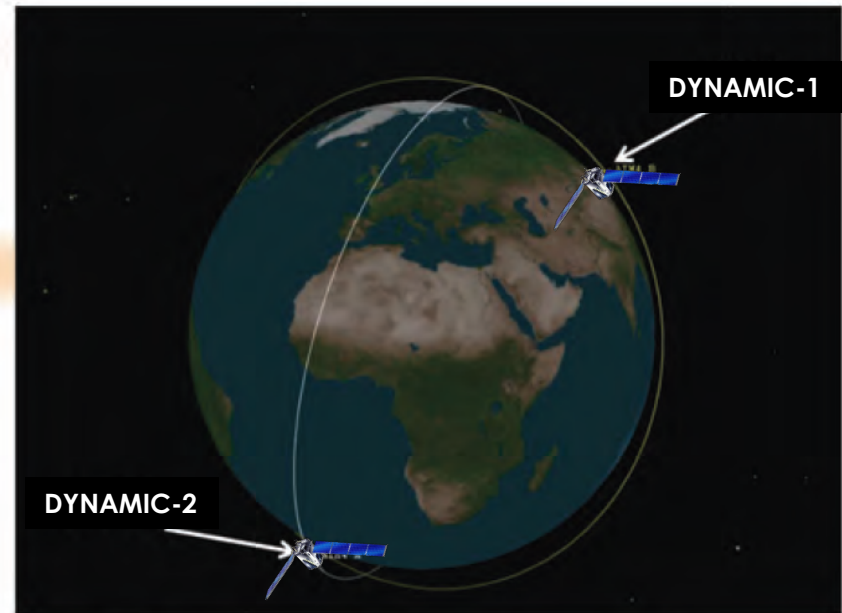
essential to understand the ionospheric response to neutral dynamics

A distinguishing feature of DYNAMIC is the measurement of neutral winds and temperatures day and night, and with highest resolution possible, between 100 and 200 km (remote sensing).

This is where the wave spectrum dissipates, evolves with height, deposits momentum and heat into the mean thermosphere, drives composition changes, and interacts with the plasma to generate electric fields.

Observational Strategy

- Extend to high latitudes to capture high-latitude sources (e.g., sudden stratospheric warmings) and to differentiate waves of auroral and lower atmosphere origin.
- 2 identical satellites, 600 km, 80° inclination, 6 hours apart in local time
- diurnal tides & PW with 1-day resolution
- gravity waves each orbit
- PW-GW-diurnal tide interactions
- semidiurnal tides & zonal mean every 20 days
- wave-mean flow interactions over 10-20 day time scales
- Ionospheric response over time scales according to the above.



\$300-\$450M

Capabilities Beyond Main Objective

DYNAMIC addresses all five Decadal Survey AIMI Science Goals

- *Global Behavior of the Ionosphere - Thermosphere: How does the IT system respond to, and regulate, magnetospheric forcing over global, regional and local scales?*
- *Meteorological Driving of the IT System: How does lower-atmosphere variability affect geospace?*
- *Ionosphere -Thermosphere-Magnetosphere Coupling: How do high-latitude electromagnetic energy and particle flows impact the geospace system? What are the origins of plasma and neutral populations within geospace?*
- *Plasma -Neutral Coupling in a Magnetic Field: How do neutrals and plasmas interact to produce multi-scale structures in the AIM system?*
- *Planetary Change: How is our planetary environment changing over multi-decadal scales, and what are the underlying causes?*