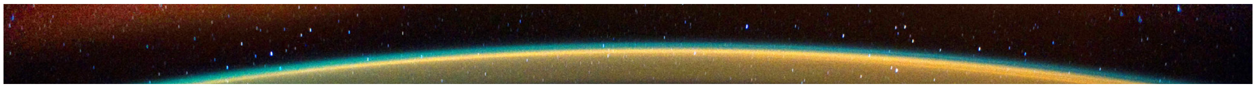


The Ionospheric Connection Explorer (ICON)

Where Earth's weather meets space weather.

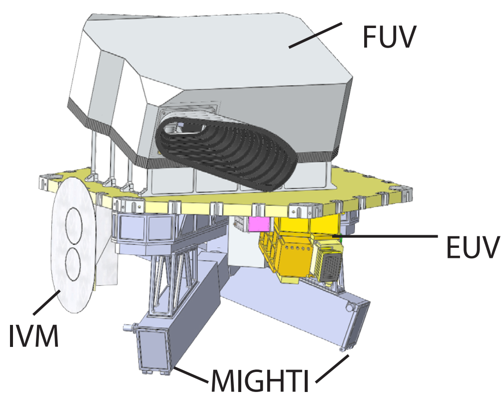
What is ICON going to achieve?

ICON will explore the space environment near Earth to discover the source of its remarkable variability. ICON makes the complete set of measurements needed to describe the fundamental coupling processes occurring in the ionosphere, Earth's natural plasma laboratory. This comprehensive approach is critical to understanding recent findings that tell us the weather in our atmosphere strongly affects the dynamic conditions in the space plasma surrounding us. ICON's observations at the edge of space will bring us the key physical insights needed for predictions of conditions in near-Earth space, and for understanding the connection between our weather and space weather.

ICON's Science Goals are to Understand:

1) the source of strong ionospheric variability; *What physics lies beneath the unpredictability of our space environment?*
2) the coupling of energy and momentum from our atmosphere into space; *Why does our space environment reflect the tropical rainy seasons?*
3) how solar wind and magnetospheric effects modify the internally driven atmosphere-space system. *How does the plasma around Earth grow so dense during magnetic storms?*

Instrument Complement



ICON's payload of four sensitive instruments:

Michelson Interferometer for Global High-Resolution Thermospheric Imaging (MIGHTI): Remotely measuring the neutral wind field and temperatures - Heritage from SHIMMER flown on STPSat-1.

Extreme Ultra-Violet (EUV): Measuring the height and density of the daytime ionosphere - Heritage from SPEAR flown on the Korean STSAT-1.

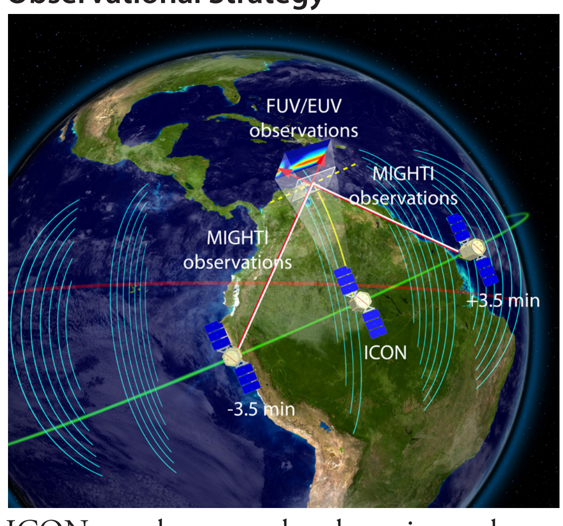
Far Ultra-Violet (FUV): Measuring the daytime atmospheric composition and the ionosphere at night - Heritage from FUV flown on IMAGE.

Ion Velocity Meter (IVM): Measuring the electric fields detected at the satellite - Heritage from IVM flown on C/NOFS CINDI.

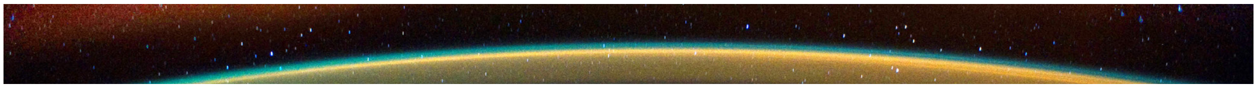
Relevance to NASA Science Goals

- ICON fulfills the 2009 Heliophysics Roadmap goal to *'understand the coupling between planetary ionospheres and their upper atmospheres mediated by strong ion-neutral interactions'.*
- The 2010 Science Plan for NASA's SMD describes a mission whose stated goal is to '*understand how neutral winds control ionospheric variability*.' ICON is specifically designed to address this goal with a novel Explorer-class mission.

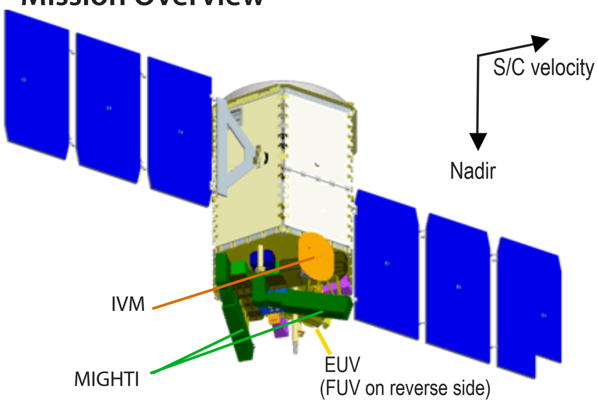
Observational Strategy



ICON travels eastward and continuously images the thermosphere and ionosphere. Fore- and aft-viewing Michelson interferometers (MIGHTI) measure the vector components of the wind. FUV and EUV instruments make coordinated measurements of the atmosphere and ionosphere near the footpoint of ICON's magnetic field-line. An in situ drift meter measures the ion velocity as a response to electric field on the same field-line.



Mission Overview



- The observatory features a single interface between science payload and spacecraft.
- ICON uses a high-heritage Orbital LEOStar-2 bus (SORCE, AIM, OCO(-2), NuSTAR).
- Launch is via NLS Option B from ETR, launch-ready November 2016, with a two-year mission.
- The payload is heavily based upon previously flown instrumentation.
- Orbit is 550 km circular at 27° inclination.
- ICON downlinks 3.3 Gbits / day through stations at Berkeley, Wallops and Santiago.
- MOC and SOC located at Berkeley SSL.
- E/PO lead by UCB, Student Experiment E/PO element built by U. Illinois.

Mission Management	
Principal Investigator	Thomas Immel, UCB
Deputy PI	Stephen Mende, UCB
Project Manager	Bill Craig, UCB
Spacecraft Manager	Ann Cox, Orbital
Project Systems Engineer	Ellen Taylor, UCB
Payload Manager	Stuart Harris, UCB
Business Manager	Trish Dobson, UCB
Mission Operations Manager	Manfred Bester, UCB
MIGHTI Instrument	Christoph Englert, NRL
FUV Instrument	Stephen Mende, UCB
EUV Instrument	Jerry Edelstein, UCB
IVM Instrument	Rod Heelis, UTD
Student Collaboration	Gary Swenson, U. IL
Education Public Outreach	Claire Raftery, UCB

Participating Organizations	
UC Berkeley	PI institution, Project management, Science & Mission ops., Payload I&T, EUV & FUV instruments
NRL	MIGHTI instrument, science
UT Dallas	IVM instrument
U. Illinois	Student instrument, science
U.Colorado, Astra, NCAR, JHU-APL	Science analyses and modeling
Orbital	Spacecraft bus, Observatory I&T, Launch operations

Key Spacecraft Characteristics

Parameter	Requirement	Capability	Margin
Observatory Mass	276.1 kg (240.9 kg CBE)	355.0 kg (Option B)	28.6 % w/ 14.6% contingency
Solar Array Power	414 W	538.3 W	30.0 % w/ 12.2% contingency*
Daily Science Data Storage	3.3 Gbit	16 Gbit	385 %
Pointing Knowledge 3σ	0.01º	0.0078º	28%
Pointing Control 3σ	0.2º	0.0086º	23x
Pointing Stability 3σ	0.03º for 60s	0.0008º for 60s	36x
Downlink Margin	>3 dB	12.7 dB	9.7 dB**
Uplink Margin	>3 dB	6.1 dB	3.1 dB

* Margin for the worst case power generation at beta 50º
** Margin for worst impairment case slant angle

Instrument	Primary Quantity Measured	Requirement	Performance	Margin
MIGHTI	Horizontal wind vector	8.7 m/s	6 m/s	45 %
EUV	Ion density	10 %	6 %	67 %
FUV	O/N_2 ratio	8.7 %	3 %	190 %
IVM	Ion velocity vector	5 m/s	3 m/s	67 %

Schedule Summary