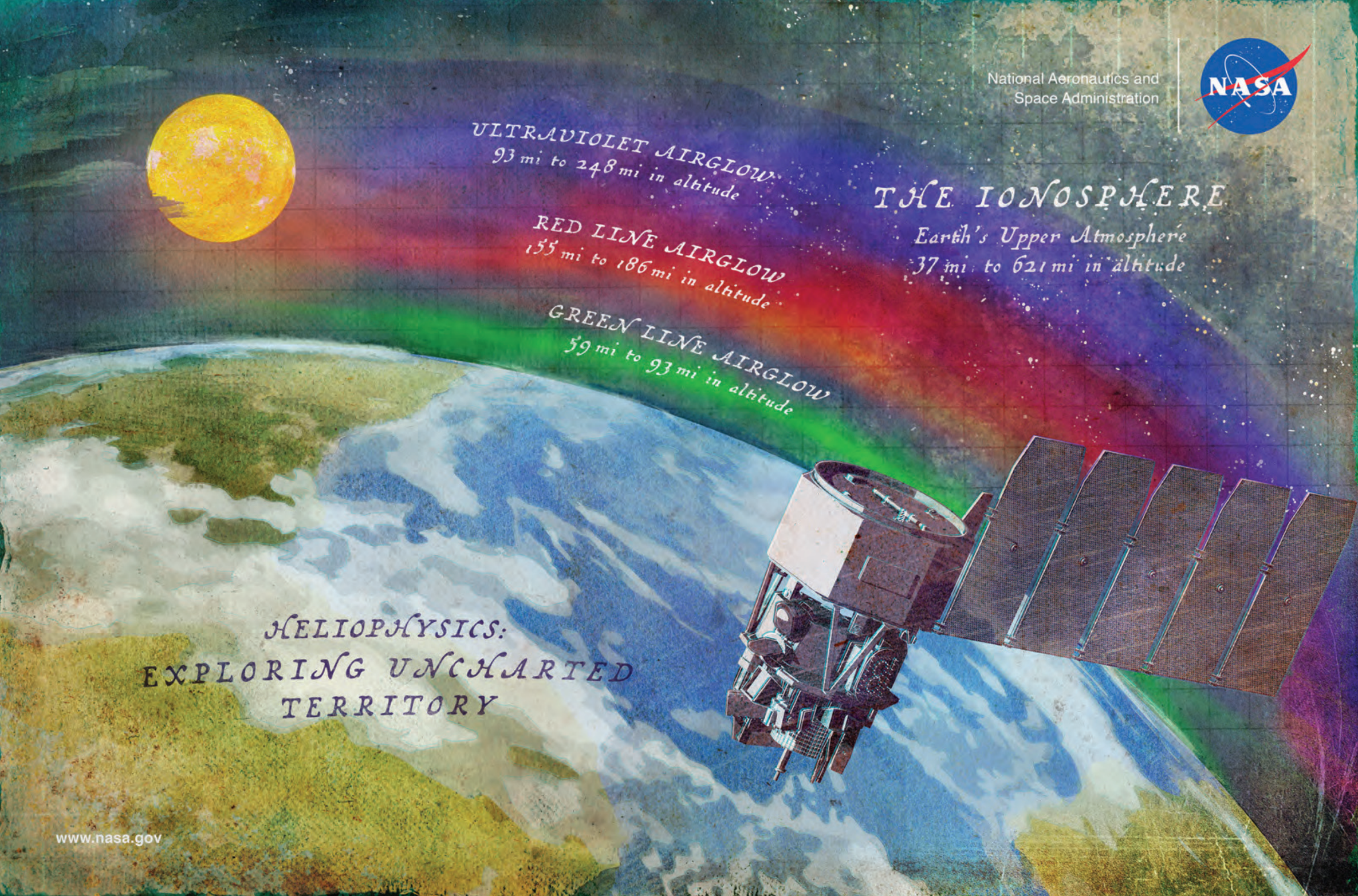
National Aeronautics and
Space Administration
NASA
ULTRAVIOLET AIRGLOW
93 mi to 248 mi in altitude
RED LINE AIRGLOW
155 mi to 186 mi in altitude
GREEN LINE AIRGLOW
59 mi to 93 mi in altitude
THE IONOSPHERE
Earth's Upper Atmosphere
37 mi to 621 mi in altitude
HELIOPHYSICS:
EXPLORING UNCHARTED
TERRITORY
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Exploring the Nearest Reaches of Space

As you go higher and higher above Earth's surface—past the troposphere, past the stratosphere—the atmosphere gradually gets thinner. About 60 miles above Earth's surface, the atmosphere becomes so thin that planes can't fly.

This is where space begins.

While the atmosphere continues upward, getting ever more tenuous, it overlaps with the lowest boundary of space—the ionosphere. The ionosphere is home to many low-Earth orbiting satellites, including the International Space Station. It also acts as a conduit for many of our communications signals, such as radio waves and the signals that make GPS systems work.

NASA Heliophysics missions study the ionosphere in all its complexity. It's an area that at times can be filled with beauty such as aurora, and at other times experience increases in radiation that can interfere with radio communications, satellites and even astronauts. So, the more we understand about the ionosphere, the more we can protect our assets in space.

But studying the ionosphere has historically been difficult. This is partly because it's not easy to fly experiments through many parts of the ionosphere, and partly because of just how complex the system is. Incoming energy from the solar wind, changes in near-Earth space, and—as has been only recently realized—terrestrial weather can all affect this region.

Depicted on the front of this poster is one of NASA's new missions to study the ionosphere. The Ionospheric Connection Explorer, or ICON, will observe the ionosphere and neutral upper atmosphere both in situ and remotely from low-Earth orbit. Another new mission, the GOLD instrument, short for Global-scale Observations of the Limb and Disk, will be a hosted payload on a commercial communications satellite. GOLD will observe this region from its position in geostationary orbit over the Western Hemisphere.

These two new missions join past ionospheric and upper atmospheric missions—such as TIMED, CINDI, AIM—a host of CubeSats, and numerous sounding rocket experiments, which gather data in the ionosphere for just five minutes at a time. Together these missions explore this near-Earth space, providing fundamental knowledge of Earth's neighborhood—so close to home and yet still not completely understood.

The Ionosphere:

Above Earth's ozone layer, the planet's atmosphere is exposed to the full brunt of the Sun's radiation. The strong ultraviolet radiation breaks down stable, neutral molecules, ultimately creating a sea of charged electrons and ions. This population of electrically-charged particles is the ionosphere, and it co-exists in the same space as the extremely-thin neutral upper atmosphere. Because it is made up of charged particles, the ionosphere is uniquely reactive to shifting electric and magnetic fields in near-Earth space. These changing conditions in space are called space weather when they affect technology and other systems on or orbiting Earth.