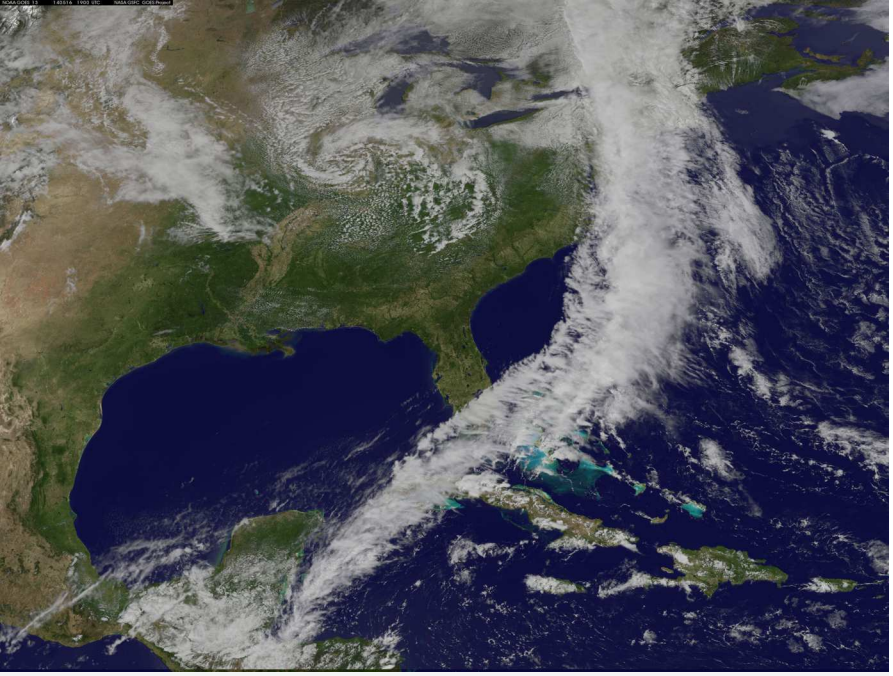

National Aeronautics and Space Administration

Environment

Atmospheric Analysis System

An instrument suite for the vertical characterization of the ionosphere-thermosphere system from 100 km to 700 km altitude.

NASA Goddard has developed an instrument suite that provides four simultaneous ion and neutral measurements of the atmospheric column. Each measurement is a function of altitude with variable sensitivity for neutral atmospheric species. The variable sensitivity makes it possible to extend the measurements over the altitude range of 100 to more than 700 km. The four instruments in the suite are: Neutral wind-temperature spectrometer (WTS); Ion-drift ion-temperature spectrometer (IDTS); Neutral mass spectrometer (NMS); Ion mass spectrometer (IMS).

The WTS and IDTS are capable of separating O and N2 and O+ from H+. The mass spectrometers can separate masses with resolution of 1 in 64 to enable metallic ion identification in the lower thermosphere. The energy analyzer features of the WTS and IDTS will also enable for the first time the measurement of the thermosphere-to-exosphere transition in the Earths upper atmosphere.

BENEFITS

- Variable sensitivity for neutral atmospheric species.
- Extends the measurements over the altitude range 100 to more than 700 km.
- Studies the coupling of multiple atmospheric regions at once, addressing questions of energy, momentum, and mass transfer from one region to another.
- Provides a true measure of the atomic oxygen density without the previous issues of internal ion source contamination.

technology solution

THE TECHNOLOGY

The instrument suite has four sensors consisting of two different types of analyzers. The first two are energy-angle spectrometers: WTS for the wind-temperature-O/N2 ratio, and IDTS for the ion drift-temperature-density ratios (e.g., at low altitudes and at high altitudes). The other two use a mass analyzer that allows two spectrometers to be combined into a single rectangular package, one half for ions (IMS), the other for neutrals (NMS).

In their simplest mode of operation, the WTS and IDTS derive the component of the wind and ion-drift. This is obtained from the angle of the peak of the neutral (ion) flux passing the entrance aperture.

APPLICATIONS

The technology has several potential applications:

- Atmospheric research.
- Environmental monitoring.
- Meteorology and climate research.

PUBLICATIONS

Patent No: 8525110

More Information

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