The NPP and the Aqua satellites share the same sun synchronous orbital plane with an equator crossing Local Solar Time (LST) of ~0130 am and pm in ascending and descending nodes, respectively. However, since the two satellites are at slightly different altitudes (i.e., 825 km for NPP and 705 km for Aqua), the same regions of the Earth are observed with time differences varying between zero and fifty minutes during a period of ~2.7 days. The Metop-B and Metop-A satellites fly in a sun-synchronous orbit, at an altitude of about 820km and an equator crossing Local Solar Time (LST) of ~8:45 and ~9:30 am and pm in descending and ascending nodes, respectively. They have a constant time separation time of about 50 minutes. Since the AIRS on Aqua, CrIS on NPP, and IASI on Metop-A and Metop-B are ultraspectral sounding instruments, atmospheric profile time tendency and water vapor flux measurements are achieved from the Aqua/NPP and Metop-A/Metop-B pairs of satellites. Thus, new atmospheric dynamics measurements are available globally four times per day. Vertically resolved water vapor convergence and divergence and atmospheric stability change are important predictors of convective severe weather initiation and tropical storm intensity change.

**“Dual-Regression” Retrieval Algorithm**

Sequences of IASI/CrIS/AIRS Soundings provide important forecast time tendency observations.

**Ultraspectral Sounders On 4 Satellites**
- Aqua/AIRS (13:30 LST)
- Suomi-NPP/CrIS (13:30 LST)
- Metop-A/IASI (09:30 LST)
- Metop-B/IASI (08:45 LST)

**Applications**
- Time tendencies of atmospheric variables from consecutive orbits
- Moisture flux
- Pre-convective stability change
- Cloud top height changes related to storm intensity tendency
- Environmental steering currents

**Global Hawk HS3 Validation Flight (Oct 6, 2012)**

Super-Storm Sandy 45-min Convective Cloud Growth (29 Oct. 2012)

February 2012 Severe Weather Outbreak

IASI Metop-B and IASI Metop-A Differences 500 hPa T and LI (10 March 2013)