The Earth Science Constellation comprises the Morning Constellation and the Afternoon Constellations (A-Train):

- **International in scope:** Member satellites/instruments from the U.S., France, Japan, Argentina, Canada, Brazil, Netherlands, Finland and the U.K.
- **Multiple U.S. Government Agencies:** Several NASA Centers, the United States Air Force (USAF), and the United States Geological Survey (USGS)

### Options for the Continuing Evolution of the Earth Science Constellation

**Constellation History and Future Changes**

**Morning Constellation**
- Year 1999: Formation with Landsat-7 and Terra

**Afternoon Constellation**
- Year 2002 – 2006: Formation with Aqua, Aura, PARASOL, CALIPSO, and CloudSat

**Years 2018 – 2023**
- Anticipated Changes:
  - CloudSat orbit lowered (February 2018)
  - Landsat-9 added
  - Terra, CALIPSO, Aqua, Aura fuel reserves low - require orbit adjustments.
  - Landsat-7 exits Constellation & prepares for Restore-L servicing.

### Options for Continued Evolution of the Constellation

**Exit constellation and return**
- CloudSat was forced to exit A-Train in 2011. It returned in 2012 with new Ops concept.

**Drift Mean Local Time (MLT)**
- Results in deteriorating lighting conditions (CALIPSO to begin drifting in 2019)

**Coincident science after orbit lowering**
- PARASOL lowered in December 2009 has continued coincident science observations

**Coincident science with neighbor satellites**
- Observations overlap with SNPP overflights

**The Future?**
- Four missions are left in the constellation after 2023

### Summary

Space agencies face significant challenges in order to extend the current observation capabilities and long-term climate record from the Earth Science Constellation.