

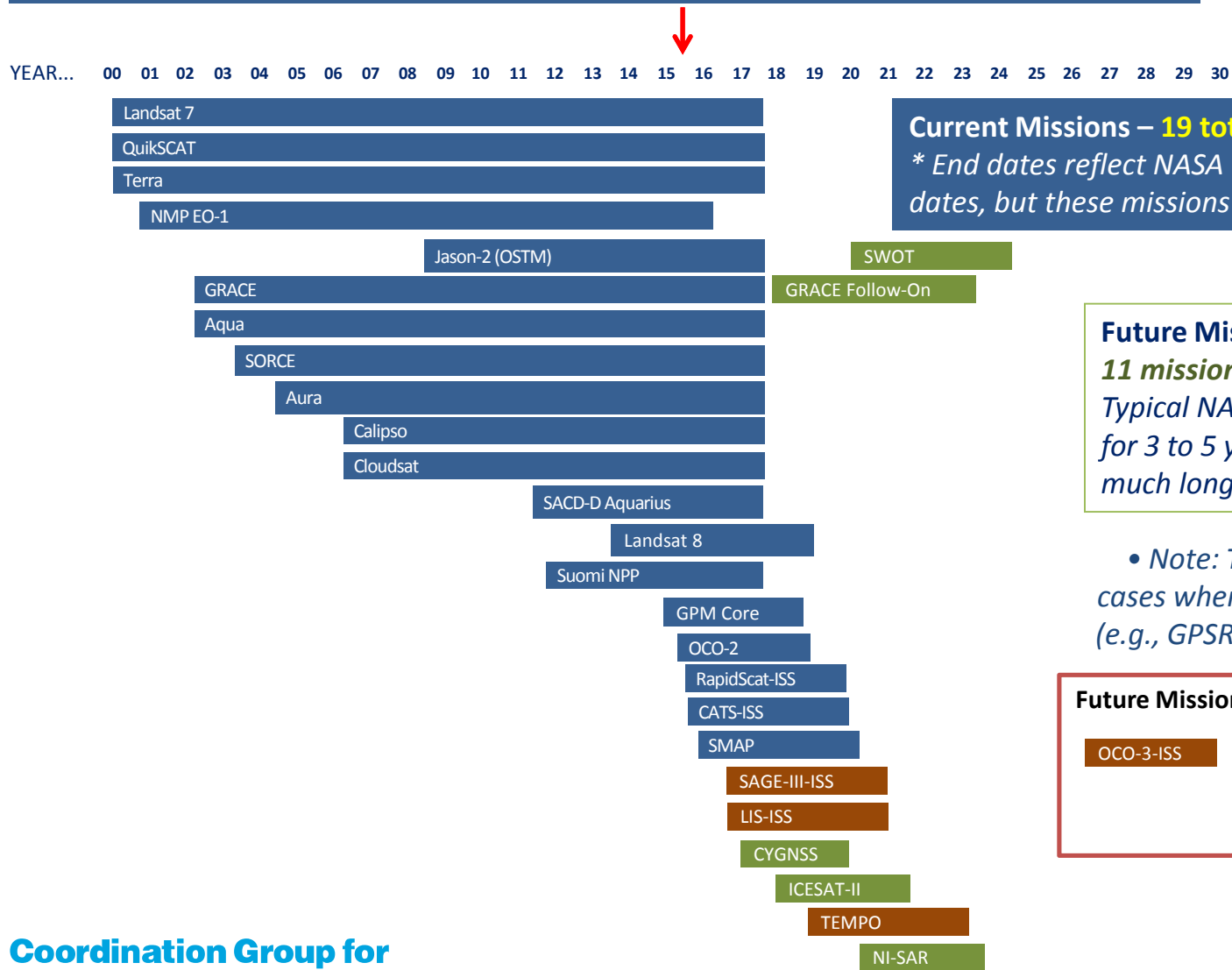
# Status report on the current and future satellite systems by NASA

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## Overview of NASA's current and future satellite systems



**Current Missions – 19 total** (as of May, 2015)  
 \* End dates reflect NASA "Senior Review" approved dates, but these missions will likely operate longer.

**Future Missions**  
**11 missions and 4 instruments.**  
 Typical NASA missions are planned for 3 to 5 years life but have lived much longer in the past.

• Note: This chart does not include cases where we have one instrument (e.g., GPSRO) on a partner's satellite.

**Future Missions/Instruments: TBD or >2020**

OCO-3-ISS	GEO-CAPE	ACE
	HypSIRI	ASCENDS
	CLARREO	PACE



## CURRENT **NASA** LEO and R&D SATELLITES ... Recent News

- NASA is currently operating **19 Earth Science missions**. 2 missions are operational LEO (Jason-2, NPP) and 17 are R&D satellites or instruments.
- The Orbiting Carbon Observatory-2 (**OCO-2**) mission launched on July 2, 2014. OCO-2 is NASA's first dedicated Earth remote sensing satellite to study global atmospheric carbon dioxide from space on regional scales ( $\geq 1000\text{km}$ ).
- The **RapidScat-ISS** instrument was launched on September 20, 2014 and successfully integrated onto the International Space Station (ISS). RapidScat is a scatterometer that replaces the inoperable SeaWinds payload on QuickSCAT for measuring ocean wind.
- The Cloud-Aerosol Transport System (**CATS**) instrument was launched on January 10, 2015 and successfully integrated onto the International Space Station (ISS). CATS is a lidar remote-sensing instrument that will measure atmospheric aerosols and clouds.
- The Soil Moisture Active Passive (**SMAP**) mission, launched on January 31, 2015. The SMAP mission is designed to globally measure soil moisture and determine the freeze or thaw state over a three-year period, every 2-3 days.
- **ACRIMSAT** was **decommissioned** July 31, 2014, due to battery failure. The mission has been in operation since 1999.
- **TRIMM** was **decommissioned** April 15, 2015, due to the depletion of orbit fuel. The mission has been in operation since 1997, for 17.5 years!



## CURRENT NASA LEO and R&D SATELLITES ... More Mission News

- 6 of NASA's operating missions utilize **international partnerships**.
- 5 of NASA's missions (Aqua, Aura, Calipso, Cloudsat, OCO-2) are part of the international **"A-Train" Constellation** with OCO-2 recently joining the A-Train in 2014.
- **NASA's missions are aging** ... except for Suomi-NPP (2011), SAC-D/Aquarius (2011), Landsat 8 (2013), GPM (2014), OCO-2 (2014) and SMAP (2015), all missions have passed their nominal design life, and are currently in extended operations.
- **Battery aging** is observed on QuikSCAT, GRACE, CloudSat and SORCE, which reduces data sampling.
- Instruments with **reduced capability** are Landsat-7 ETM+ (failed Scan Line Corrector), QuikSCAT's SeaWinds (antenna no longer rotates, used primarily to cross-calibrate with other on-orbit scatterometers), Terra's ASTER (SWIR module is no longer functional), Aqua AMSU (Channels 4,5,7 have failed), Aura's TES (no global survey), and Aqua AMSR-E (cross-calibration only).
- Instruments that are **not operating** are Aqua's HSB and Aura's HIRDLS.
- The EO-1 mission is **out of orbit maintenance fuel**, and the mean local time of the ascending node is expected to reach 8:00am in 2016, reducing the utility of the data.
- The cross-calibration of QuikSCAT and RapidScat-ISS is expected to be complete before QuikSCAT re-enters its next eclipse season and is **decommissioned**.



## CURRENT NASA LEO and R&D SATELLITES ... Non-Mission News

- NASA's missions were conceived as research missions, but have supported **operational and near-real-time applications** due to their recognized value, longevity, sustained calibration and validation, and data quality.
- Continued operation of the missions is determined through a biennial science review process, called the "**Senior Review**", which considers operational use but primarily uses science for defining factor for continuation. Continued operations (2 more years) is expected to be approved for all NASA missions in mid-2015. The next Senior Review is scheduled for 2017.
- **Direct Broadcast** is currently available for three NASA missions including: Aqua, Terra, and Suomi-NPP. More information can be found at NASA's Direct Readout Laboratory (DRL) website: <http://directreadout.sci.gsfc.nasa.gov>
- NASA also provides access to **Near Real-Time (NRT)** products from the MODIS (on Terra and Aqua), OMI and MLS (on Aura), and AIRS (on Aqua) instruments in less than 2.5 hours from observation from the Land and Atmosphere Near real-time Capability for EOS (LANCE) data system at <http://earthdata.nasa.gov/lance>



## FUTURE NASA LEO and R&D SATELLITES

- NASA's **Earth Systematic Mission (ESM)** program includes 4 missions in formulation or development ...
  - Ice, Cloud, and Land Elevation Satellite (**ICESat-2**), Stratospheric Aerosol and Gas Experiment (**SAGE**)-III, Gravity Recovery and Climate Experiment Follow-On (**GRACE-FO**) and Surface Water Ocean Topography (**SWOT**) missions.
  - NASA continues with the pre-formulation studies, formulation, and development of 8 other missions with launch dates that extend well beyond 2020 (see tables in paper).
- NASA's **Earth System Science Pathfinder (ESSP)** program provides competitive opportunities for small and innovative instruments and missions. ESSP currently includes one satellite and one instrument and also includes the **Earth Venture-class (EV)** line of competitive opportunities:
  - The Cyclone Global Navigation Satellite System (**CYGNSS**) will launch in 2016 and the Tropospheric Emissions: Monitoring of Pollution (**TEMPO**) instrument will be launched in 2018 as a hosted GEO payload.
  - Future solicitations for will be released every 4 years (EVS-science, EVM-mission) and >18-month intervals for EVI-instrument (EVI-I). The next planned release is EVM-2 and EVI-3 in 2015.