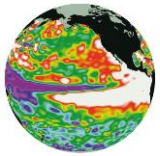
# NASA Earth Science Missions
## *Current & Planned*
### *Plus Earth Ventures*

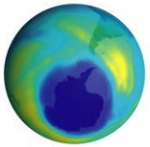
# Why We Launch the Missions

## Earth Science Focus Areas:

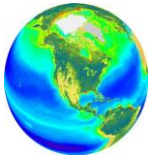
Climate Variability & Change



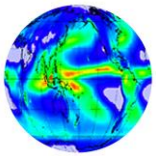
Atmospheric Composition



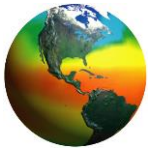
Carbon Cycle & Ecosystems



Water & Energy Cycle



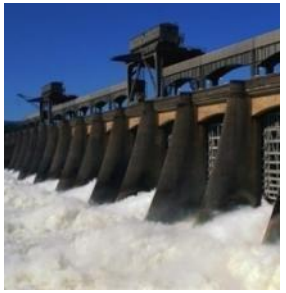
Weather



Earth Surface & Interior

## Earth Science Applications Areas:

Health &
Air Quality

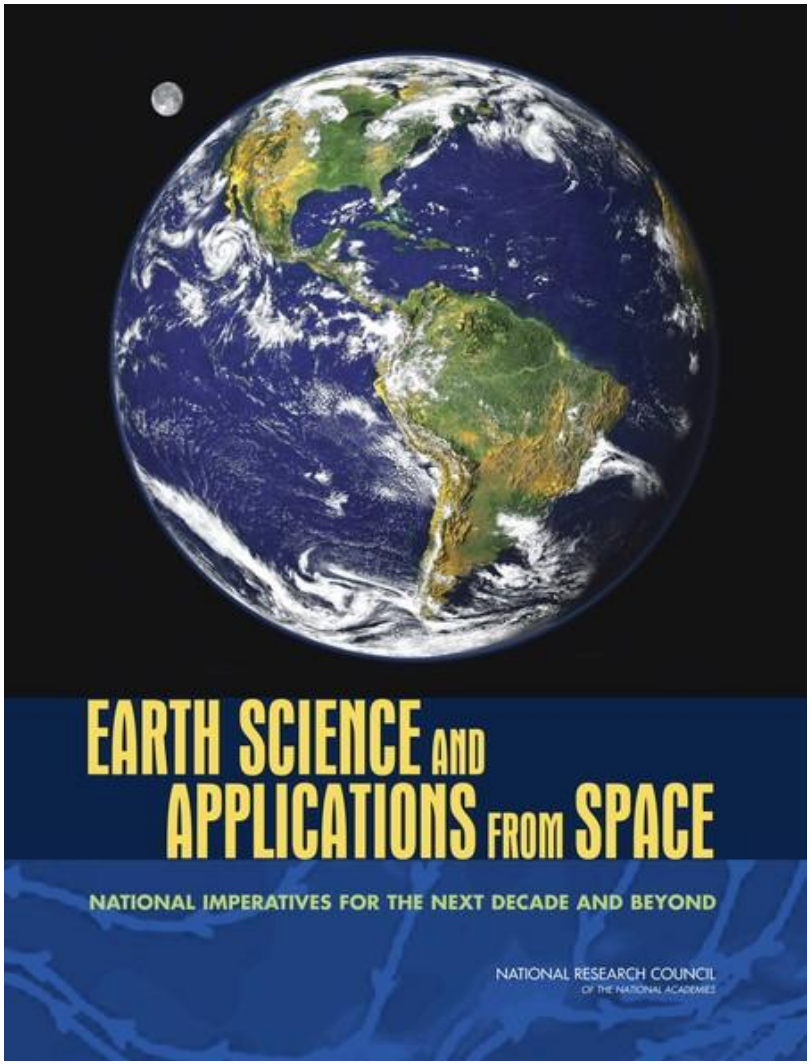


Water
Resources

Disasters

Ecological
Forecasting

# From Science & Applications to Missions



# A Very Popular Table

TABLE 2.2 Launch, Orbit, and Instrument Specifications for Missions Recommended to NASA

| Decadal Survey Mission | Mission Description | Orbit[a] | Instruments | Rough Cost Estimate (FY 06 $million) |
|---|---|---|---|---|
| **2010-2013** | | | | |
| CLARREO (NASA portion) | Solar and Earth radiation; spectrally resolved forcing and response of the climate system | LEO, Precessing | Absolute, spectrally resolved interferometer | 200 |
| SMAP | Soil moisture and freeze-thaw for weather and water cycle processes | LEO, SSO | L-band radar<br>L-band radiometer | 300 |
| ICESat-II | Ice sheet height changes for climate change diagnosis | LEO, Non-SSO | Laser altimeter | 300 |
| DESDynI | Surface and ice sheet deformation for understanding natural hazards and climate; vegetation structure for ecosystem health | LEO, SSO | L-band InSAR<br>Laser altimeter | 700 |
| **2013-2016** | | | | |
| HyspIRI | Land surface composition for agriculture and mineral characterization; vegetation types for ecosystem health | LEO, SSO | Hyperspectral spectrometer | 300 |
| ASCENDS | Day/night, all-latitude, all-season $CO_2$ column integrals for climate emissions | LEO, SSO | Multifrequency laser | 400 |
| SWOT | Ocean, lake, and river water levels for ocean and inland water dynamics | LEO, SSO | Ka- or Ku-band radar<br>Ku-band altimeter<br>Microwave radiometer | 450 |
| GEO-CAPE | Atmospheric gas columns for air quality forecasts; ocean color for coastal ecosystem health and climate emissions | GEO | High-spatial-resolution hyperspectral spectrometer<br>Low-spatial-resolution imaging spectrometer<br>IR correlation radiometer | 550 |
| ACE | Aerosol and cloud profiles for climate and water cycle; ocean color for open ocean biogeochemistry | LEO, SSO | Backscatter lidar<br>Multiangle polarimeter<br>Doppler radar | 800 |
| **2016-2020** | | | | |
| LIST | Land surface topography for landslide hazards and water runoff | LEO, SSO | Laser altimeter | 300 |
| PATH | High-frequency, all-weather temperature and humidity soundings for weather forecasting and sea-surface temperature[b] | GEO | Microwave array spectrometer | 450 |
| GRACE-II | High-temporal-resolution gravity fields for tracking large-scale water movement | LEO, SSO | Microwave or laser ranging system | 450 |
| SCLP | Snow accumulation for freshwater availability | LEO, SSO | Ku- and X-band radars<br>K- and Ka-band radiometers | 500 |
| GACM | Ozone and related gases for intercontinental air quality and stratospheric ozone layer prediction | LEO, SSO | UV spectrometer<br>IR spectrometer<br>Microwave limb sounder | 600 |
| 3D-Winds (Demo) | Tropospheric winds for weather forecasting and pollution transport | LEO, SSO | Doppler lidar | 650 |

# Round Two

***Notional Schedule for Next Earth Science Decadal Survey***

| Event | End Date | Duration (months) |
|---|---|---|
| ESD preparation | Oct-13 | 15 |
| Call for inputs | Jan-15 | 3 |
| Community meetings | Apr-15 | 9 |
| Report writing period | Jan-16 | 8 |
| Final report editing | Sep-16 | 4 |
| Release of NRC's 2nd Earth Science Decadal Survey | Jan-17 | |

# What are the key questions and future science for NASA Ocean Biology and Biogeochemistry?