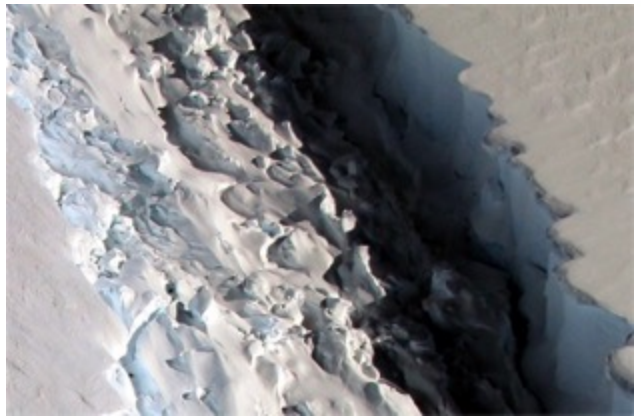
National Aeronautics and Space Administration

SCIENCE






2017 Decadal Survey **for**

Earth science and applications from space

6th AeroSAT workshop

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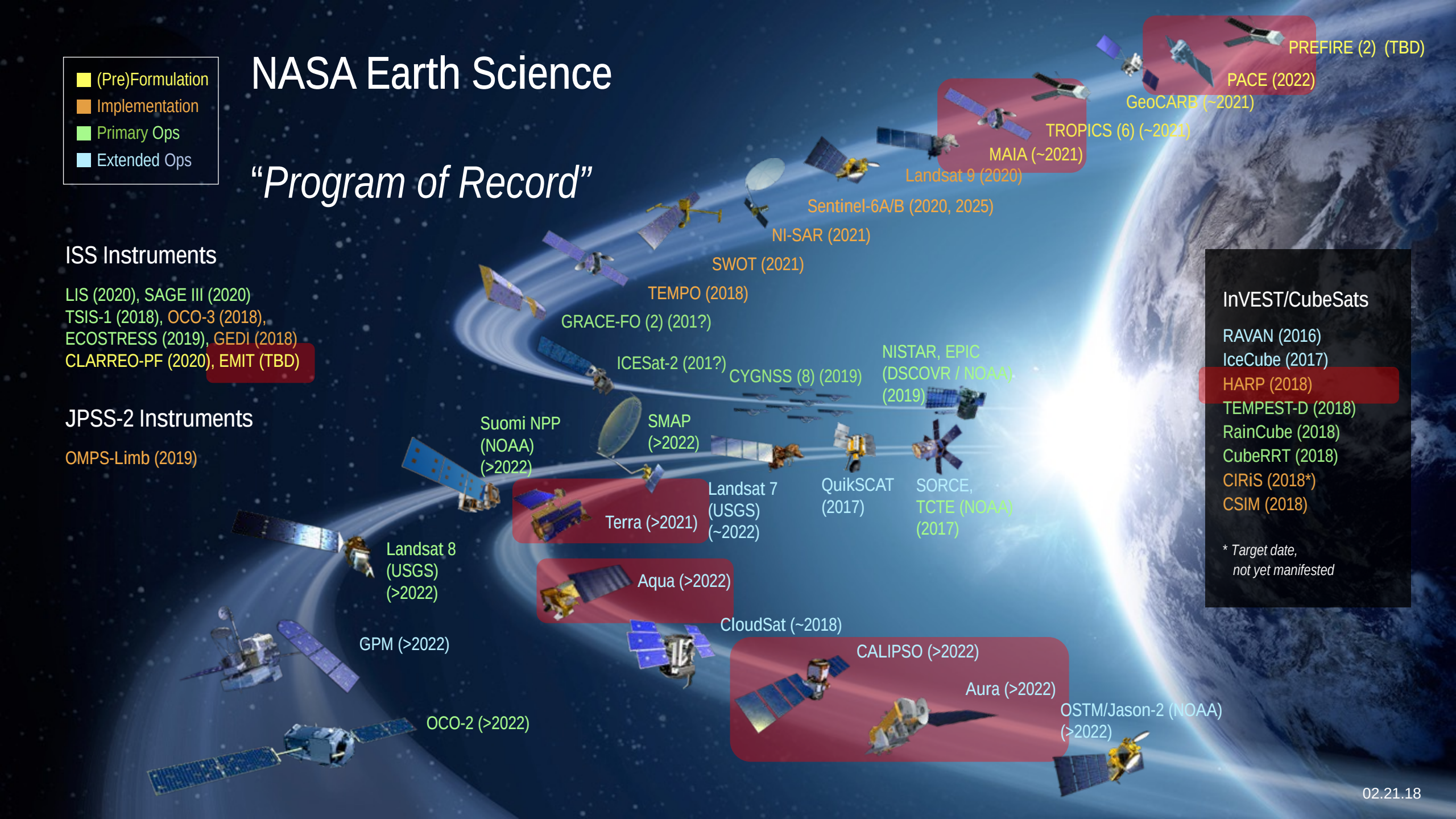
Oct 2018


(Pre)Formulation
Implementation
Primary Ops
Extended Ops
NASA Earth Science
"Program of Record"
ISS Instruments
LIS (2020), SAGE III (2020)
TSIS-1 (2018), OCO-3 (2018),
ECOSTRESS (2019), GEDI (2018)
CLARREO-PF (2020), EMIT (TBD)
JPSS-2 Instruments
OMPS-Limb (2019)
PREFIRE (2) (TBD)
PACE (2022)
GeoCARB (~2021)
TROPICS (6) (~2021)
MAIA (~2021)
Landsat 9 (2020)
Sentinel-6A/B (2020, 2025)
NI-SAR (2021)
SWOT (2021)
TEMPO (2018)
GRACE-FO (2) (201?)
ICESat-2 (201?)
CYGNSS (8) (2019)
NISTAR, EPIC
(DSCOVR / NOAA)
(2019)
Suomi NPP
(NOAA)
(>2022)
SMAP
(>2022)
Terra (>2021)
Landsat 7
(USGS)
(~2022)
QuikSCAT
(2017)
SORCE,
TCTE (NOAA)
(2017)
Landsat 8
(USGS)
(>2022)
Aqua (>2022)
CloudSat (~2018)
GPM (>2022)
CALIPSO (>2022)
Aura (>2022)
OCO-2 (>2022)
OSTM/Jason-2 (NOAA)
(>2022)
InVEST/CubeSats
RAVAN (2016)
IceCube (2017)
HARP (2018)
TEMPEST-D (2018)
RainCube (2018)
CubeRRT (2018)
CIRiS (2018*)
CSIM (2018)
* Target date,
not yet manifested
02.21.18

Decadal Survey for Earth science and applications from space

- Members of US Earth Science community:
  - define **NASA Earth Science priorities for the next 10 years**, and
  - **recommend observations** & funds needed **to address the science questions.**
- 2017 Report: http://nap.edu/24938
- *"The next decade is one in which progress will not come easily."*
- Strategic Framework

  Ambitious science, despite constraint will require us to:
  - Embrace **innovative methodologies for integrated science/applications**;
  - Commit to **sustained science and applications**;
  - Amplify the **cross-benefit of science and applications**; and
  - **Leverage external resources and partnerships (incl. international).**

Observable Approaches

This presentation

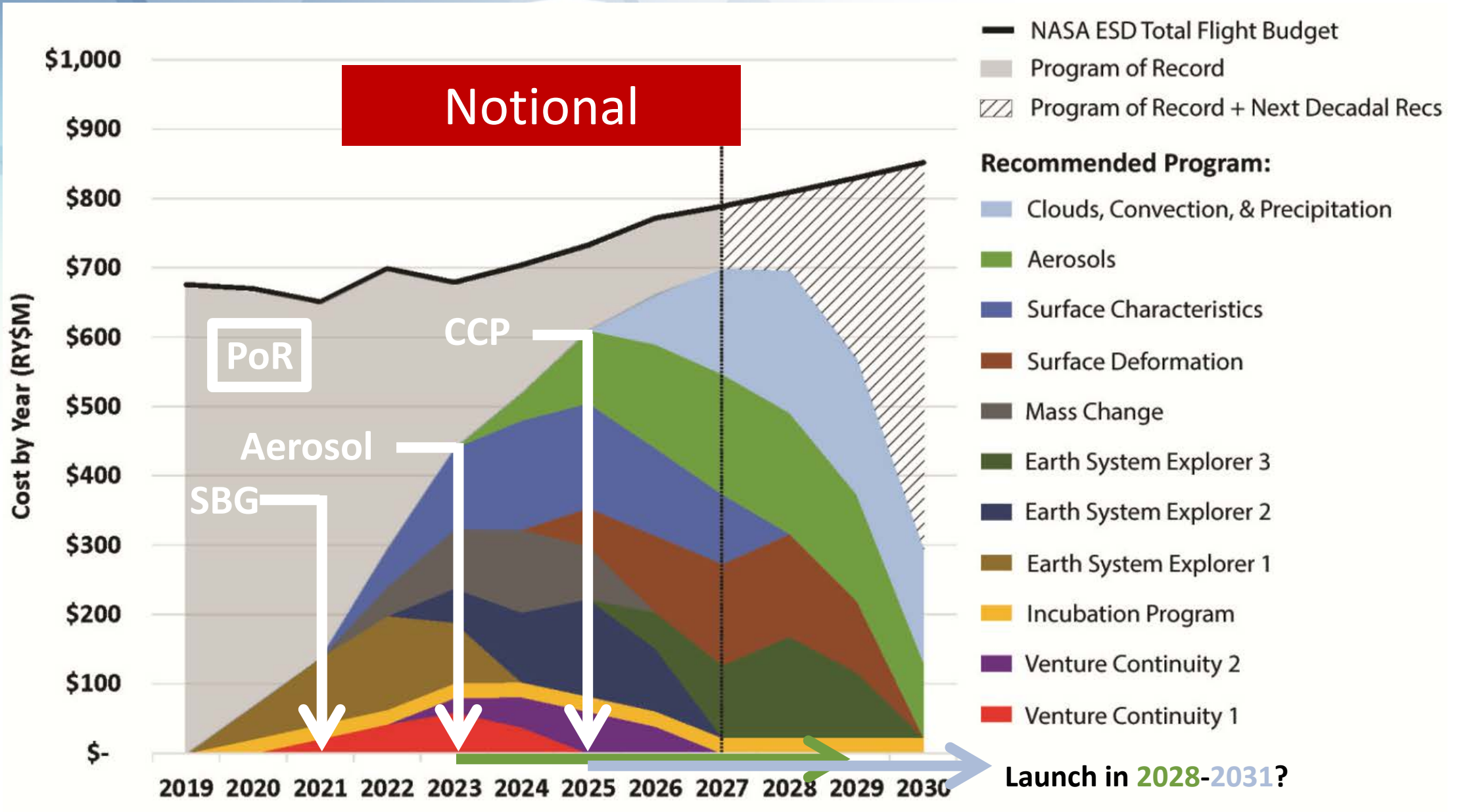
- *Program of Record* to be completed
- *Designated Observables* (designated observing systems)
  - Large missions
  - Cost cap: $300 to $800 M (full mission costs: instr., spacecraft, mission ops, launch, science, calval, etc.)
- *Earth Explorer*
  - Medium missions
  - Cost cap: <$350 M (full mission costs)
- *Incubator* to mature technology
- *Earth Venture Continuity* (addition to existing Suborbital, Instrument, and Mission strand)
  - To demonstrate sustained observations at lower costs
  - Cost cap: <$150 M

DS's recommended Designated Observables

This presentation

Observable	Science/Applications Summary
Aerosols (A)	**Aerosol properties, aerosol vertical profiles, and cloud properties** to understand their effects on climate and air quality
Clouds, Convection, & Precipitation (CCP)	**Coupled cloud-precipitation state and dynamics** for monitoring global hydrological cycle and understanding contributing processes including cloud feedback

Observable	Science/Applications Summary
Mass Change (MC)	**Large-scale Earth dynamics** measured by the changing mass distribution within and between the Earth's atmosphere, oceans, ground water, and ice sheets
Surface Biology and Geology (SBG)	**Earth surface geology and biology**, ground/water temperature, snow reflectivity, active geologic processes, vegetation traits and algal biomass
Surface Deformation and Change (SDC)	**Earth surface dynamics** from earthquakes and landslides to ice sheets and permafrost



National Academies of Sciences, Engineering, and Medicine. 2018. *Thriving on Our Changing Planet: A Decadal Strategy for Earth Observation from Space.* Washington, DC: The National Academies Press. https://doi.org.10.17226/24938.

Will depend on Budget & outcome of Pre-formulation Studies

Designated Observable Studies Pre-Formulation (pre-Phase A)

- NASA solicitated **Pre-formulation Study Teams** for each Designated Observable to **develop a range of observing system concepts**
- 4 **Studies** are going to be performed **across multiple NASA centers** with involvement of national (govt. and commercial) and international partners during the **next 3-5 years**
- Aerosol & Cloud/Convection/Precipitation (A-CCP) **is a single study** due to very strong synergies

A-CCP Study Overview

- Goals: define **focused science questions**, derive observing system's **desired capabilities** and the associated **costs/schedule/risks.**
- Timeline:

Oct 2018:	Study starts
Q2 2019:	Science/Application Traceability Matrix
Q3 2020:	Value Framework, Architecture studies, and independent cost/schedule analysis
Q4 2021:	Demonstrate Mission Concept Review (MCR) readiness

National Aeronautics and Space Administration

Aerosols and Cloud-Convection Precipitation (A-CCP) Study

Draft Study Plan in response to Designated Observables Guidance for Multi-Center Study Plans

An awe-inspiring, truly joint Center plan

Submitted by:
Goddard Space Flight Center
Langley Research Center
Jet Propulsion Laboratory
Marshall Space Flight Center
Ames Research Center
Glenn Research Center

July 16, 2018

https://science.nasa.gov/earth-science/decadal-surveys