Observational Needs
NASA's Earth Science Division

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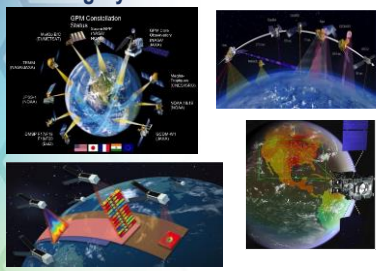
NASA Observing System *INNOVATIONS*



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Private Sector Small-Satellite Constellation Pilot (1)

ESD is pursuing a rich program of orbital missions using small satellites

- **CYGNSS (Cyclone Global Navigation Satellite System)**: homogeneous tropical constellation of 8 ***micro-satellites*** using reflected GPS to measure surface winds/air-sea interactions, especially valuable/unique in the precipitation-dominated, dynamic, eyewalls of tropical storms and hurricanes – frequent tropical sampling from 1 orbit plane **SCIENCE**
- **TROPICS (Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats):** homogeneous tropical constellation of 6 ***CubeSats*** to measure atmospheric profiles in storms/hurricanes – frequent sampling from 2-3 orbit planes **SCIENCE**
- **In-Space Validation of Earth Science Technologies (InVEST):** on-orbit ***CubeSat-based*** technology validation and risk reduction that could not otherwise be fully tested using ground/airborne systems **TECHNOLOGY**
- **Venture Class Launch Services:** Investment in new, low-cost (<$15M/launch), commercial launch vehicles capable of orbiting small payloads to LEO – science control of launch schedule and orbits **ENABLING**

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Private Sector Small-Satellite Constellation Pilot (2)

Present ESD funding opportunities for use of Small-Satellites and resulting data

- **Earth Venture–Mission and –Instrument programs:** Science-driven, PI-led, cost/schedule constrained, competitively selected, frequently solicited (every 4 years for EVM, every 18 months for EVI); proposals using small-sats have been selected for both EVM and EVI
- **InVEST:** Competitively selected spaceborne technology validations that ***must use*** small-sats or cubesats; 3-year solicitation cadence, frequent launch opportunities using NASA CSLI and VCLS
- **R&A and Applications ROSES calls:** R&A and Applied Sciences competitive research calls are data-source agnostic – use of measurements and information from small-satellite systems/constellations is welcomed if their scientific and applications value to the research is justified in the proposal
- **Earth Observations from Private Sector Small Satellite Constellations Pilot:** Data buys of ***existing*** data products related to ECVs, derived from private sector-funded small-satellite ***constellations*** (3-satellite minimum constellation, full longitude coverage); ***for evaluation by NASA researchers to determine value*** for advancing NASA research and applications activities and objectives; ***pilot buys in 2018***

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Private Sector Small-Satellite Constellation Pilot (3)

Status:

- **RFIs released 12 August 2016 and 5 Dec 2017** requesting capability statements
  - 5 responses received to 2016 RFI (3 qualifying)
  - 11 responses received to 2017 RFI (4 qualifying)
- **FY18 funding is available**
- **Intend to issue JOFOC contracts to all qualifying respondents**
- **Broad set of ESD-funded researchers will be supported to *assess the value of the geophysical information in the products wrt NASA research and applications objectives***
  - 1 year evaluation period
  - Participants primarily chosen from existing ESD-funded community – evaluation support as budget augmentation
  - Written reports to ESD (not scientific papers)

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Private Sector Small-Satellite Constellation Pilot (4)

ESD "Value" Elements:

- **Quality of geophysical information**
- **Data availability (latency) and rights (sub-distribution)**
  - Long-term contracts will need to adhere to ESD Data Policy – discussions during pilot evaluation period will help detail cost sensitivities
- **Supplier future plans for constellation(s)**

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