From 2007 to 2018, Here We Are

- Congratulations
- Thank You!
Our Evolving HyspIRI Approach – Where We Landed

Key Global Science and Applications Research

**Climate:** Ecosystem biochemistry, condition & feedback; spectral albedo; carbon/dust on snow/ice; biomass burning; evapotranspiration

**Ecosystems:** Global biodiversity, plant functional types, physiological condition, and biochemistry including agricultural lands

**Fires:** Fuel status; fire frequency, severity, emissions, and patterns of recovery globally

**Coral reef and coastal habitats:** Global composition and status

**Volcanoes:** Eruptions, emissions, regional and global impacts

**Geology and resources:** Global distributions of surface mineral resources and improved understanding of geology and related hazards

**Applications:** Disasters, EcoForecasting, Health/AQ, Water

Global Mission Urgency

The HyspIRI science and applications objectives are critical today and uniquely addressed by the combined imaging spectroscopy, thermal infrared measurements, and IPM direct broadcast.

### Measurement

**Imaging Spectrometer (VSWIR)**
- 380 to 2510nm in ≤10nm bands
- 30 m spatial sampling
- 16 days revisit
- Global land and shallow water

**Thermal Infrared (TIR)**
- 8 bands between 4-12 µm
- 60 m spatial sampling
- 5 days revisit; day/night
- Global land and shallow water

**IPM-Low Latency data subsets**

Mission Concept Status

**Level 1 Measurement Requirements:** Vetted by community at workshops and in literature (many refereed journal articles)

**Payload:** VSWIR Imaging Spectrometer, TIR Multi-spectral Radiometer, and Intelligent Payload Module (IPM)

**Original 60 m option:** Mature

**ISS options:** VSWIR & TIR Mature, ECOSTRESS EVI selected

**Separate Smallsat Mission option:** VSWIR and TIR solutions developed with TEAM I/X

**2016 Option:** HyspIRI VSWIR evolved to 30 m and 16-day global revisit. Requires F/1.8 Dyson spectrometer architecture and other current technologies.

**Preparatory Airborne Campaigns:** Measurements used to advance and refine science, applications, algorithms, and processing

**Current Decadal Survey:** >25 HyspIRI-related Dec. Sur. RFIs
### TABLE S.2 Observing System Priorities

<table>
<thead>
<tr>
<th>Targeted Observable</th>
<th>Science/Applications Summary</th>
<th>Candidate Measurement Approach</th>
<th>Designated</th>
<th>Incubation</th>
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<tbody>
<tr>
<td><strong>Aerosols</strong></td>
<td>Aerosol properties, aerosol vertical profiles, and cloud properties to understand their effects on climate and air quality</td>
<td>Backscatter lidar and multi-channel/multi-angle/polarization imaging radiometer flown together on the same platform</td>
<td>X</td>
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<tr>
<td><strong>Clouds, Convection, and Precipitation</strong></td>
<td>Coupled cloud-precipitation state and dynamics for monitoring global hydrological cycle and understanding contributing processes including cloud feedback</td>
<td>Radar(s), with multi-frequency passive microwave and sub-mm radiometer</td>
<td>X</td>
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<td><strong>Mass Change</strong></td>
<td>Large-scale Earth dynamics measured by the changing mass distribution within and between the Earth’s atmosphere, oceans, ground water, and ice sheets</td>
<td>Spacecraft ranging measurement of gravity anomaly</td>
<td>X</td>
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<tr>
<td><strong>Surface Biology and Geology</strong></td>
<td>Earth surface geology and biology, ground/water temperature, snow reflectivity, active geologic processes, vegetation traits and algal biomass</td>
<td>Hyperspectral imagery in the visible and shortwave infrared, multi- or hyperspectral imagery in the thermal IR</td>
<td>X</td>
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<tr>
<td><strong>Surface Deformation and Change</strong></td>
<td>Earth surface dynamics from earthquakes and landslides to ice sheets and permafrost</td>
<td>Interferometric Synthetic Aperture Radar (InSAR) with ionospheric correction</td>
<td>X</td>
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SBG: Where We Go From Here

- ESD will direct responsibility for the designated observables (DOs) to the NASA centers
- Instruments and spacecraft will be provided by partners or competed
- ESD requested multi-center plans for each DO to perform broad trade-space studies to meet research and applications objectives
- 4 Multi-Center plans for DO studies submitted July 16
- Included SBG plan from 5 Centers (JPL, GSFC, ARC, LARC, MSFC)
SBG: Where We Go From Here

- HQ ESD 3-week evaluation
- Study Coordinator JPL/Jamie Nastal integrating responses
- Series of Center and Center-HQ calls to discuss and iterate points in evaluation
- Revised SBG study plan → statement of work to initiate study
- Plan includes broad engagement of academic, interagency, international, and other potential stakeholders and end users
- This workshop is your first opportunity to contribute ideas as the SBG study kicks off
Next Three Days

Day 1 - HysplIRI: Our Foundation

Days 2 and 3 - SBG: Looking Ahead
# A SATM Framework for This Workshop

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<tr>
<td>What areas within an urban region are most impacted or vulnerable to heat stress?</td>
<td>AS-I. Determine areas with highest rates of intensity of heat stress / urban heat island for XXXX dates.</td>
<td>Public Health County Water and Power Utilities</td>
<td>X weather stations in ABC County. Historical daily weather station data, minimal geospatial datasets. ?</td>
<td>Optimally, LST with uncertainty XYZ, with spatial ABC resolution and DEF temporal resolution for GHI years.</td>
<td>Optimally, LST with uncertainty XYZ, with spatial ABC resolution and DEF temporal resolution for GHI years.</td>
<td>pixel size, swath width, wavelength range, dynamic range, NEDT at sensor</td>
<td>Need to have coverage of LA County Region. -- LAC Region is in the XYZ orbit.</td>
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<td>AS-II Determine differences in heat stress as determined by HI vs HVI</td>
<td>Public Health County Water and Power Utilities</td>
<td>X weather stations in ABC County. Historical daily weather station data, minimal geospatial datasets. ?</td>
<td>Spatial Resolution, Temporal Resolution, Spatial Coverage, Uncertainty</td>
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<td>Heat wave info is determined daily by X weather stations. XYZ instrument will fill spatial gaps on days data are available.</td>
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<td>W-2, W-3</td>
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<td>AS-III. Determine urban heat island and vulnerability climatology data over 15 years to inform long term planning metrics to mitigate impacts of heat stress</td>
<td>City or County Planning</td>
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Thank You