

SDC Science Definition Process

SDC Technology Workshop

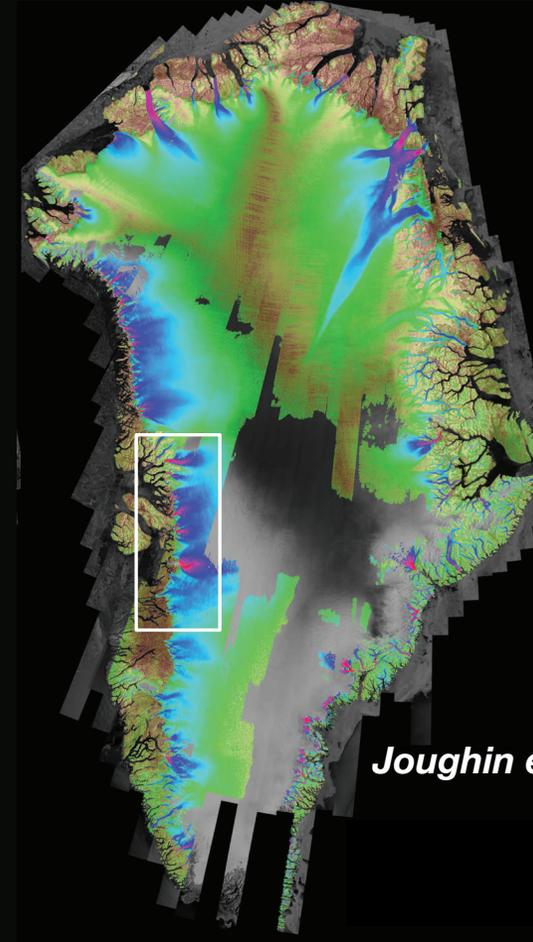
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Ala Khazendar¹ Andrew Molthan² Jeanne Sauber³

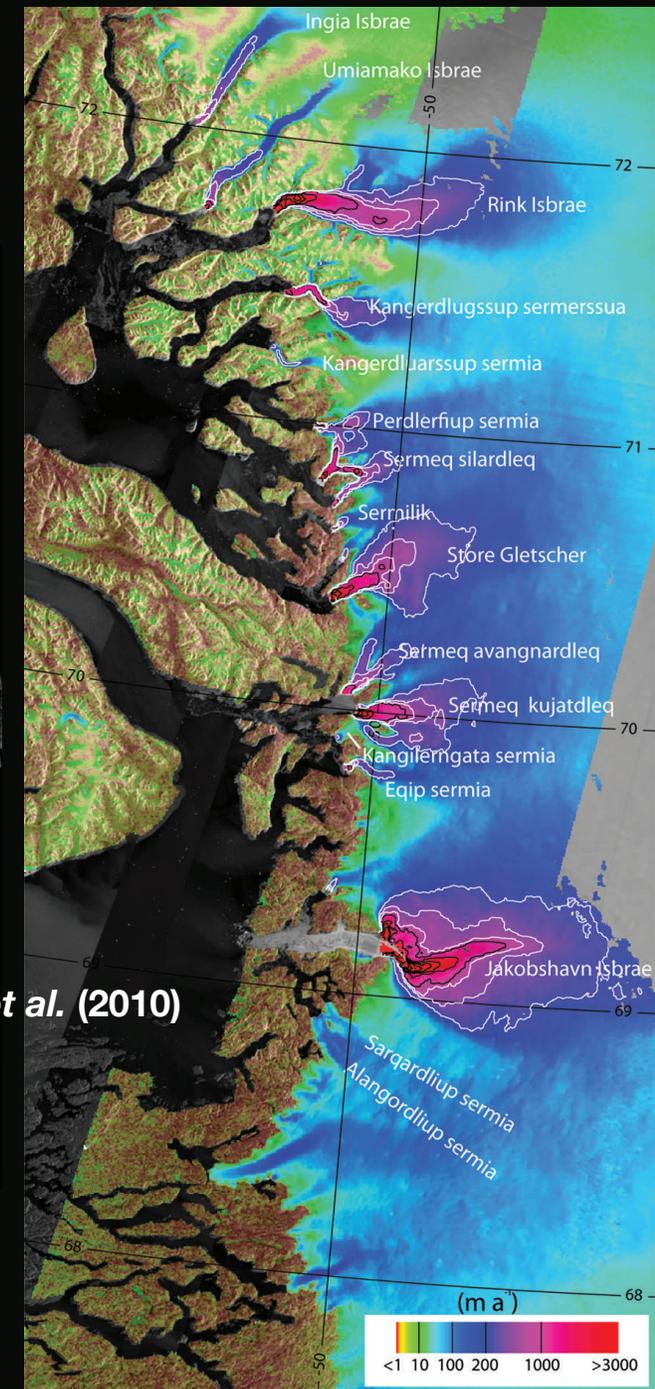
¹Jet Propulsion Laboratory, California Institute of Technology

²NASA Marshall Space Flight Center

³NASA Goddard Space Flight Center

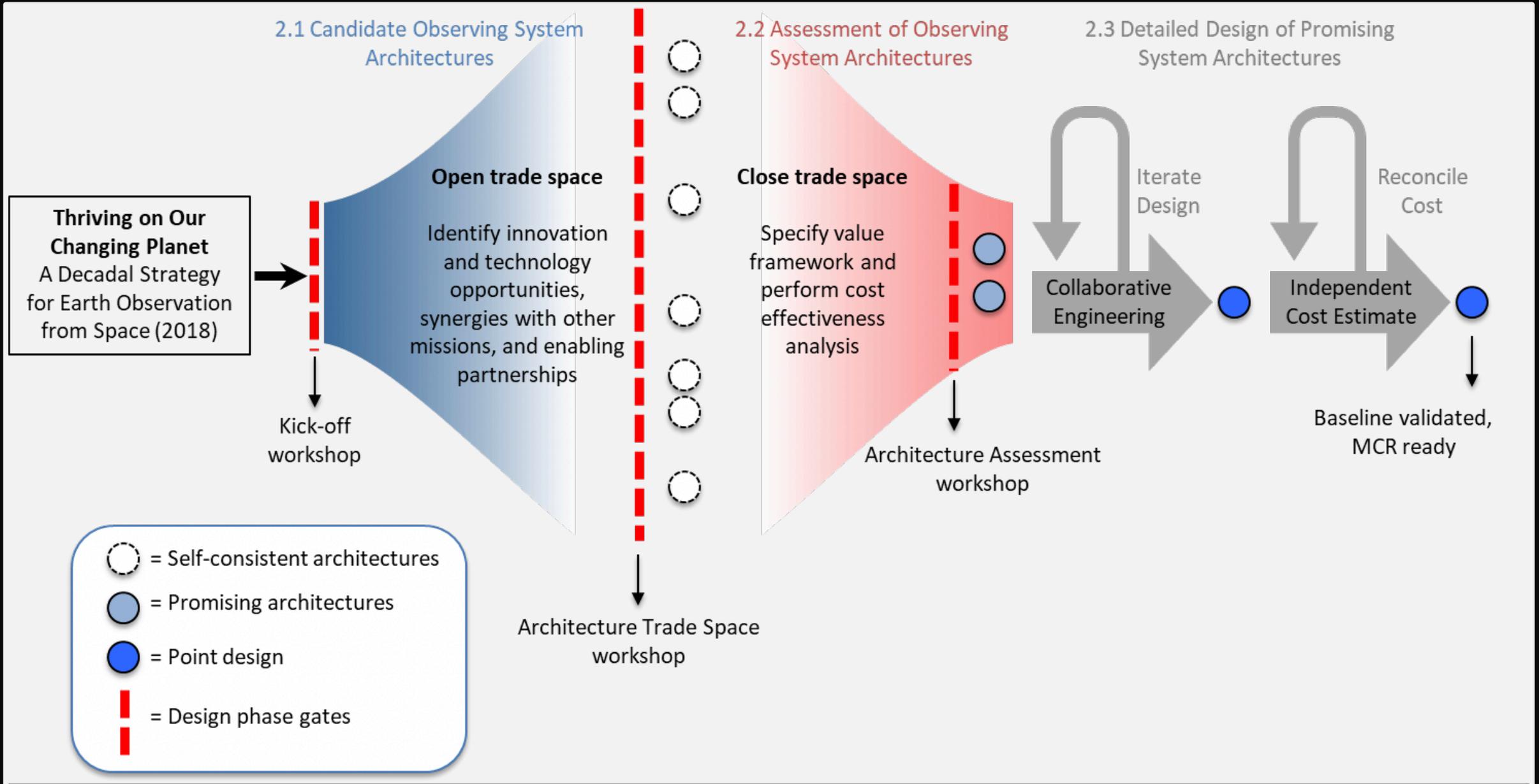


Joughin et al. (2010)



This work was performed at the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

SDC Study: General Approach



Origin of SDC Study: The Decadal Survey

What was done:

Compiled a list of Science and Applications objectives, their Traceability Matrix (SATM) and supporting materials, of SDC-related objectives in the Decadal Survey (DS).

Sources:

DS main text and appendices

SDC proposal

Various discussions with HQ and among centers

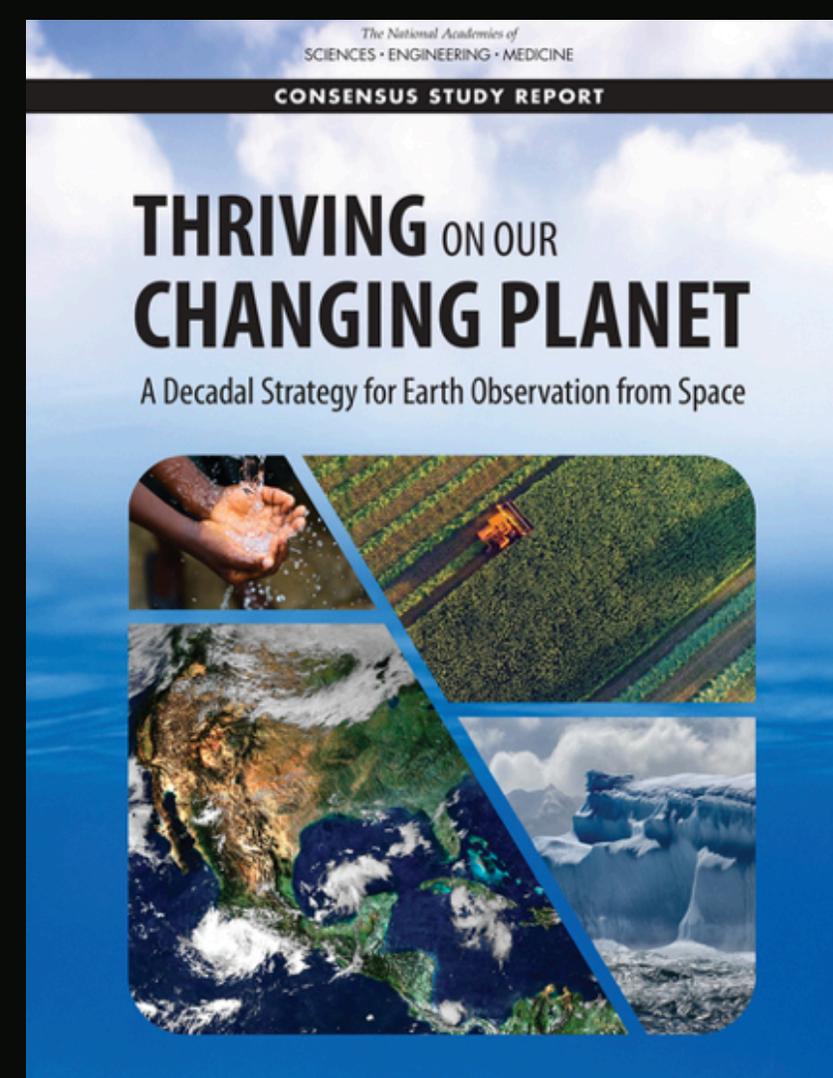
Purposes are to:

Identify what is in the DS regarding SDC.

Update and nuance material in the DS.

Provide a concrete starting point for the R&A work of the SDC study.

Create a roadmap to realizing the research and applications (R&A) goals of the SDC study.



Observational Basis: Program of Record (PoR)

A satellite is shown in orbit above the Earth's surface. The satellite has a complex structure with a large, elongated antenna or sensor array extending from its main body. The Earth's blue and white atmosphere is visible in the background.

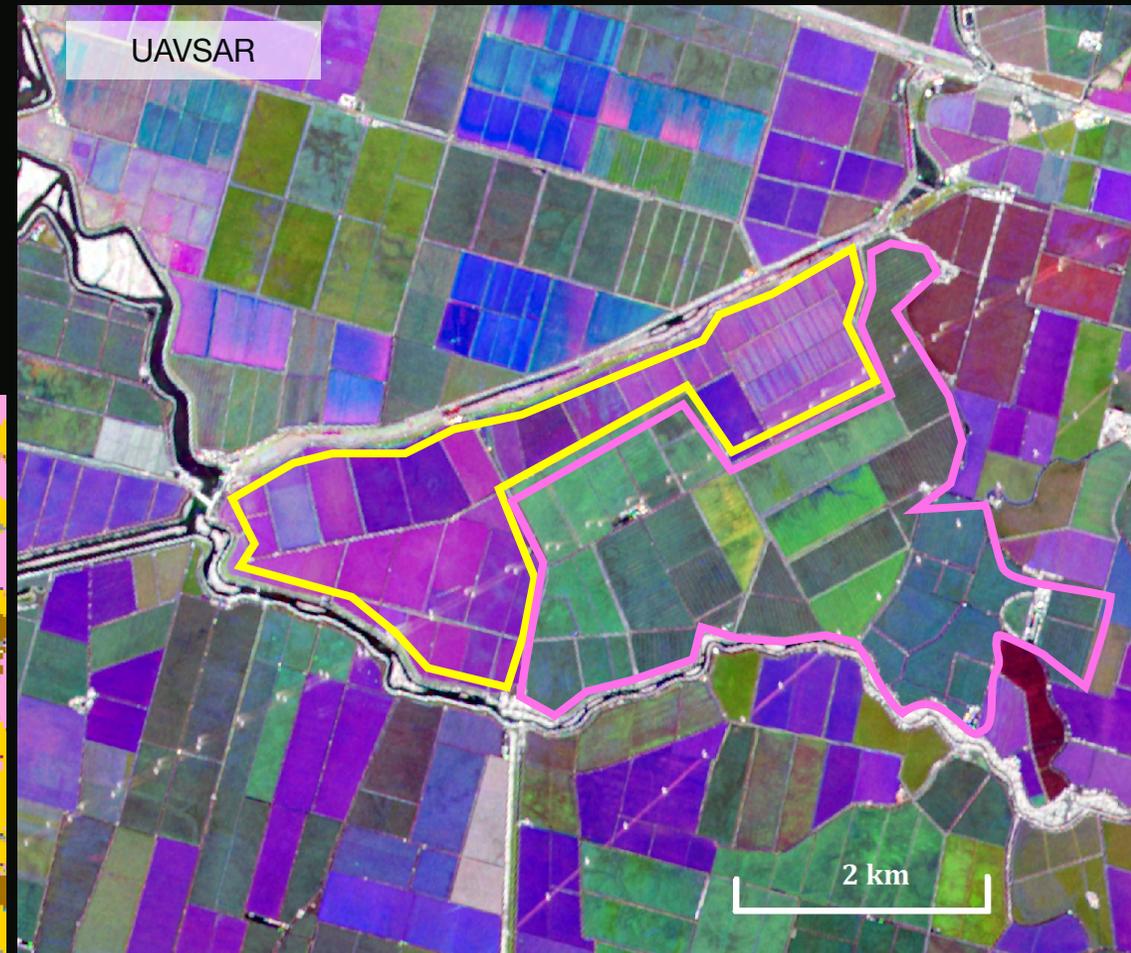
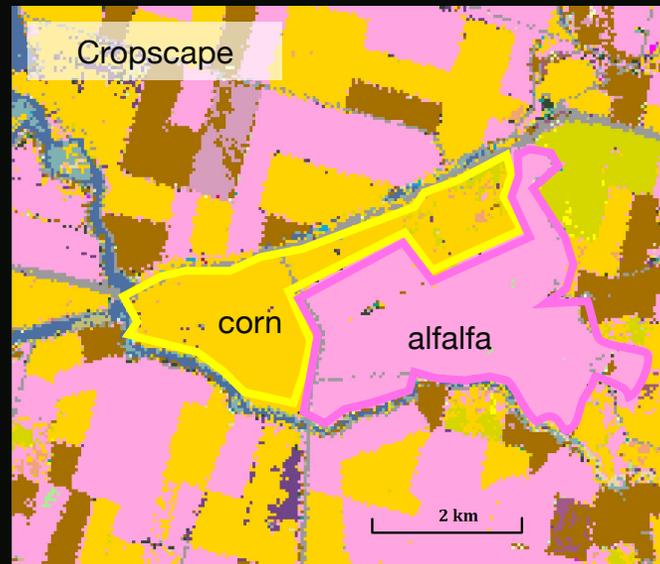
Instruments or missions which have made or will make similar SDC measurements. The PoR includes NASA, NOAA and USGS missions formally budgeted and planned (e.g., NISAR); as well as missions by commercial and international organizations.

In assessing the PoR, attention is to be paid to the European Union's Copernicus Program and its Sentinel satellites. The 6 satellites of this series will reach full operational status by 2023.

Added Ingredient: Amplitude-based radiometry

Direction from NASA to consider architectures that support amplitude-based radiometry for observables such as biomass, soil moisture, wetlands and ecosystem disturbance.

Simple time series can highlight different crop types and management practices: Three coregistered UAVSAR scenes from January, May and August, highlight different crop types.



First SDC Research and Applications Workshop

Held April 29 to May 1, at Caltech, Pasadena

70 Participants:

HQ, NASA Centers, USGS, Academia (~half of participants)

Focus areas:

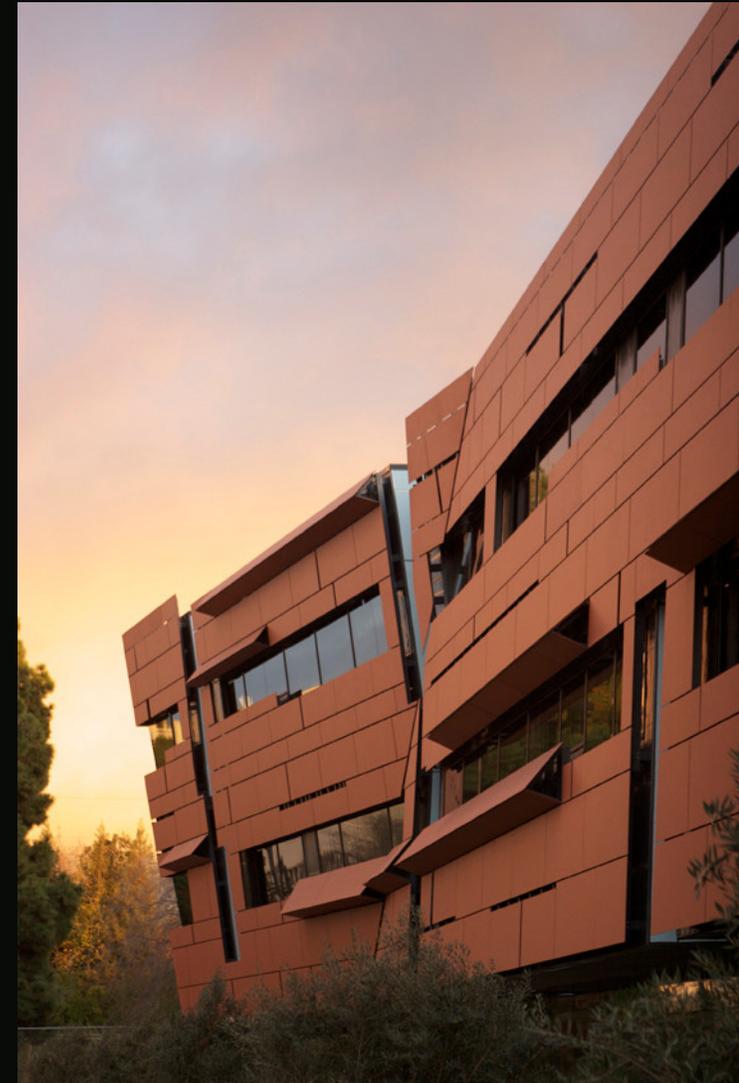
Solid Earth

Geohazards

Cryosphere

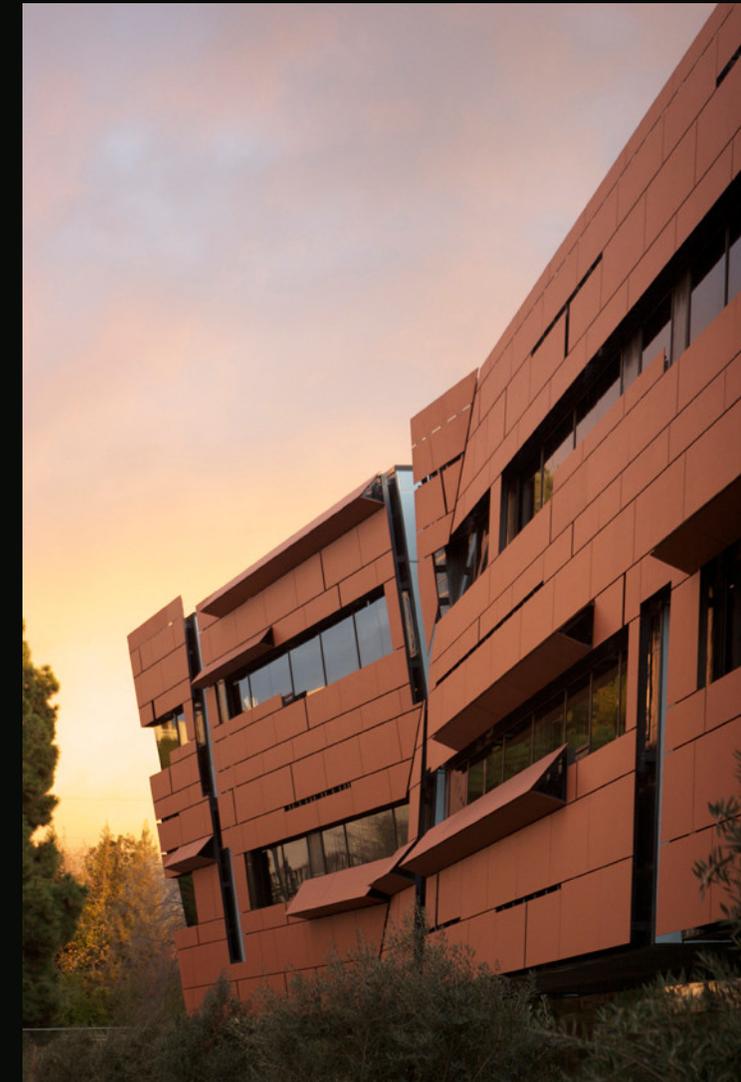
Ecosystems

Hydrology (added after workshop)



First SDC Research and Applications Workshop: Aims

- Identify key *observational characteristics* that are needed *to advance* the science and applications.
- Review the *Decadal Survey* science and application objectives for clarity and completeness.
- *Refine the measurement parameters* as given in the SATM.
- Identify or propose *tools and procedures* that can be used to *assess the enhanced science* to be achieved by the different architectures that will be considered at a later stage in the SDC study.
- Identify the potential research and applications benefits of combining and coordinating the observations of a *heterogeneous constellation* of public and private satellites.
- Begin to define notionally the attributes of candidate *observing architectures*



Workshop Outcomes: Geodetic Observables

Common desired capabilities

Measurement parameters:

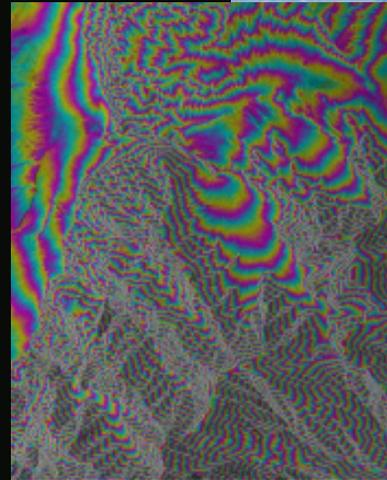
- Spatial resolution: 10 m
- Temporal sampling: Daily or better
- Longer time series, i.e., continuity of measurement.

Methods:

InSAR



Photo: John Sonntag, Operation IceBridge, NASA



Divergent desired capabilities

	Solid Earth	Geohazard
Coverage	Global Access	Localized
Data Latency	Not a priority	1 - 3 hours
Amplitude/ Polarization	Not a priority	<ul style="list-style-type: none">• Need amplitude for several applications• Single-pol sufficient



Workshop Outcomes: Ecosystems Radiometric Observables

Biomass change, forest and crop extent, inundations

Measurement parameters:

- **Spatial resolution: 100 m or better**
- **Temporal sampling: 12 days to 3 months**
- **Classification accuracy: 80% or better**

Methods:

**Cross-Pol; Full Polarimetric; HH backscatter contrast;
Polarimetric backscatter contrast**

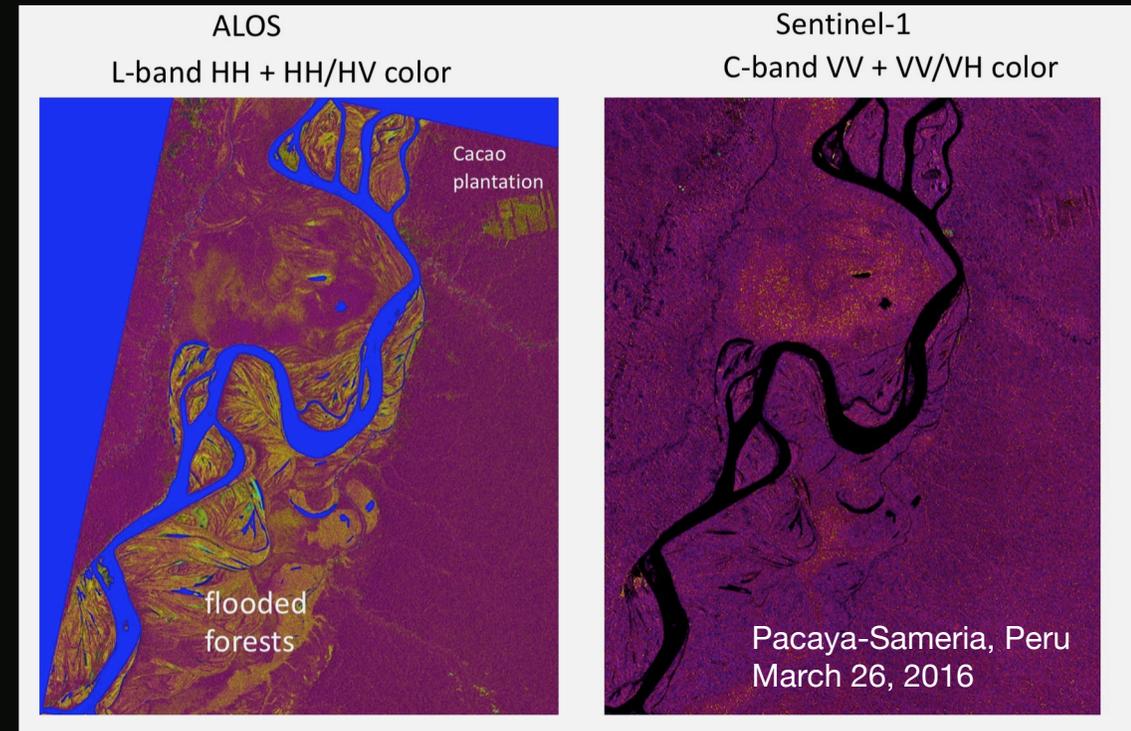
Soil moisture

Measurement parameters:

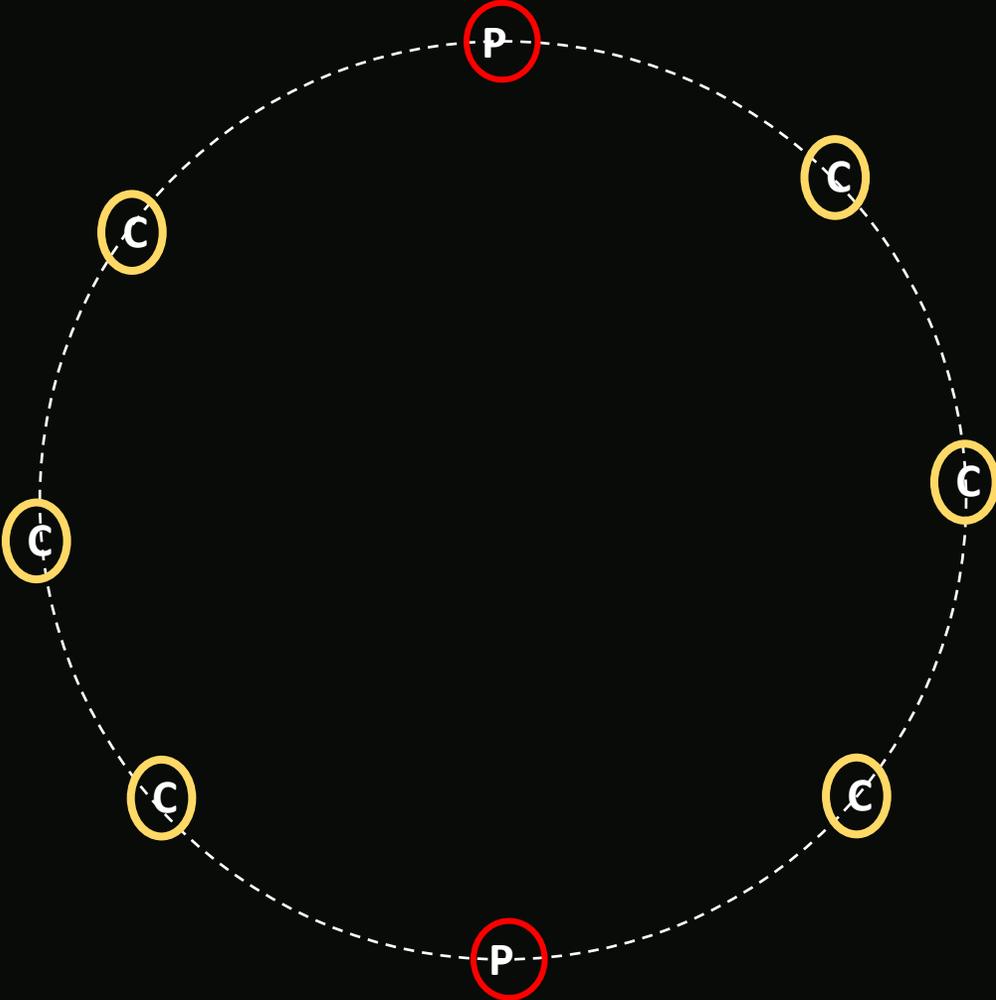
- **Spatial resolution: 1 km or better**
- **Coverage: Global**
- **Temporal sampling: Seasonal**

Methods:

Full Polarimetric or Quasi-quad pol Backscatter



First Architecture Concepts



P: Parent (NISAR light)
C: Child (Single frequency; phase only obs.)