

Surface Deformation and Change (SDC) Study

Science and Applications Traceability Matrix (SATM)

Phase II

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Definitions

Geophysical Observable: The geophysical parameter to be detected in order to pursue the related Earth Science/Applications objective.

DS Importance: The importance of the Science and Application Objective according to the Decadal Survey.

SDC Necessity: The relative importance of the Geophysical Observable to help achieve the Science and Application Objective.

Bands: Number and range of wavelengths (or frequencies) of the electromagnetic waves transmitted and/or received by the instrument. These bands often have different degrees of penetration for clouds, precipitation, vegetation, and interactions with the Earth's surface and thus vary in their research and application potential.

Polarization: The direction of travel of an electromagnetic wave, which can be vertical (V) or horizontal (H). See next slide for more details.

Horizontal Spatial Resolution: A measure of the smallest object that can be resolved by the sensor, or the ground area imaged, or the linear dimension on the ground represented by each pixel. This is the measurement spatial resolution, not the instrument resolution.

Revisit Time: The desired time interval between collection of observations with the same characteristics (viewing angle, resolution, etc.) over a specific location.

Latency: The desired time interval between an observation being collected by the sensor and the delivery of a given data product to the scientific user or application user community. Latency may differ between delivery of 'raw' information (Level 0) and higher-level products requiring multiple observations or ancillary data.

Accuracy: Difference between a measurement and the true value. Can be measured by a percentage difference from the true value, a distance from the true value, as a rate over time compared to the true rate over time, etc.

Coverage/Continuity: The geographical regions and repeat time provided by uninterrupted collection of observations over a period of time.

Comments/Other: Additional important information not covered by the other columns.

Definitions (continued)

Polarization: The direction of travel of an electromagnetic wave, which can be vertical (V) or horizontal (H). Single polarization (pol): transmits and receives a single polarization, typically the same direction (VV) or (HH). Dual polarization: transmits in one polarization but receive in two (HH, HV) or (VH, VV). Quad polarization: transmits and receives two polarizations (HH, HV, VH, and VV). Certain polarizations and bands are preferable for specific applications.

Polarization Taxonomy:

Quad: Quad pol required. Can be a substitute for quasi quad, any dual pol, any single pol.

Quasi-Quad: quasi-quad pol required. Can be a substitute for dual pol and single pol

Dual Pol: HH/HV or VV/VH perfectly substitutable

HH/HV-preferred: HH/HV is preferred, but VH/VV can substitute

VH/VV-preferred: VH/VV is preferred, but HH/HV can substitute

HH/HV-required: HH/HV required and VV/VH not substitutable

VH/VV-required: VH/VV required and HH/HV not substitutable

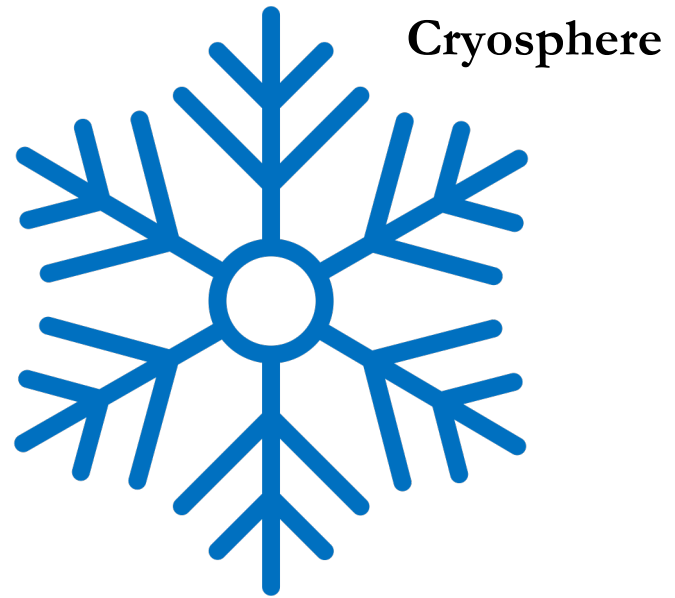
Single pol (any): HH and VV are substitutable

HH-preferred: HH preferred, but can substitute VV

VV-preferred: VV preferred, but can substitute HH

HH-required: HH required, VV not substitutable

VV-required: VV required, HH not substitutable



Cryosphere: Geophysical Observables and Attributes

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/Continuity	General Comments
			Baseline in white Threshold in orange							
Mean flow of fast flowing outlet glaciers, grounded and floating (>50 m/yr) (C-1c and S-3a)	Most Important	Most Important	L-band (S-band probably acceptable)	H-H V-V	100 m 300 m (product need)	Weekly Monthly (product resolution)	1 Month 3 Months	2 m/yr 10 m/yr	All major land ice >50 m/yr 75 % of above	- Large scale mosaics
Mean flow of slow flowing ice-sheet interiors (<50 m/yr) (C-1c and S-3a)	Most Important	Very Important	L-band (S-band maybe?)	H-H V-V	500 m 2 km (product need)	3-Months Annually (product resolution)	1 Month 3 Months	0.1 m/yr 0.3 m/yr	All major land ice <50 m/yr 75 % of above	- Need 3D mapping
Mean flow of large mountain glaciers (C-1c and S-3a)	Most Important	Very Important	L-band (S-band probably acceptable)	H-H V-V	50 m 100 m (product need)	Twice monthly 2 months	1 Month 3 Months	1 m/yr 10 m/yr	All large mountain glaciers 75 % of above	
Strain rates at shear margins (grounded ice and ice shelves >250 m/yr) (C-1c and S-3a)	Most Important	Most Important	L-band (S-band probably acceptable)	H-H V-V	100 m 250 m (product need)	Weekly 1 Month	1 Month 3 Months	0.01 /yr 0.025 /yr Horizontal Precision Product need	Strain rates at shear margins (grounded ice and ice shelves >250 m/yr) 75 % of above	- Relative precision is going to be driven by the native resolution of the SAR acquisitions for phase unwrapping
Strain rates associated with fracture, calving and ice mélange (in fjords, in fractures, in front of ice shelves) (C-1c and S-3a)	Most Important	Most Important	L-band (S-band probably acceptable)	H-H V-V	10 m 100 m (product need)	daily 10 days	2 days 3 Months	0.001 /yr 0.01 /yr Horizontal Precision Product need	fracture, calving and ice mélange (in fjords, in fractures, in front of ice shelves) 75 % of above	- High accuracy can be achieved by stacking data over months to year periods of time.
Geometry (i.e., imagery) of ice mélange (C-1c and S-3a)	Most Important	Important	L-band (S-band probably acceptable)	H-H V-V	5m 30 m (product need)	Daily 10 days	1 Month 3 Months	5 m Horizontal 10 m Horizontal	ice mélange (in fjords, in fractures, in front of ice shelves) 75 % of above	



Cryosphere: Geophysical Observables and Attributes (*continued*)

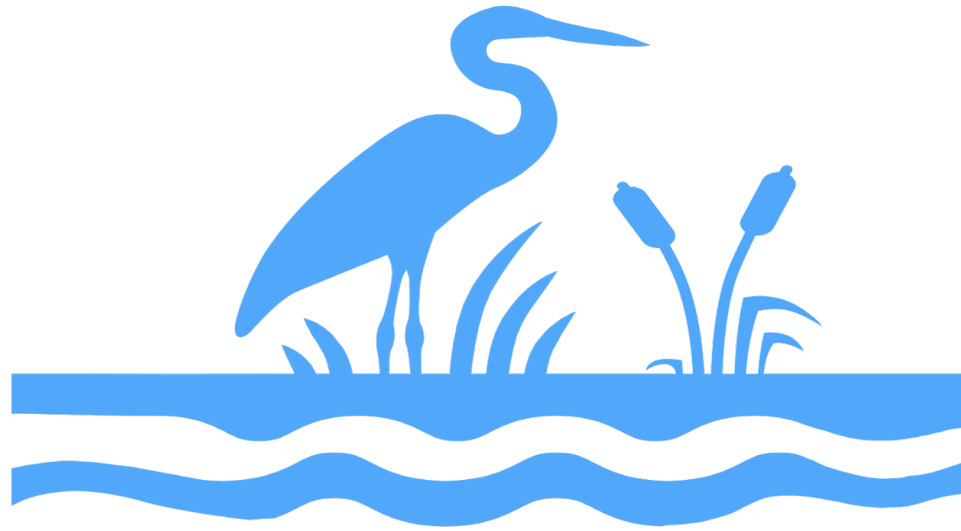
Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/ Continuity	General Comments
Tidal flexure in the grounding zones (30 km upstream and all floating land ice) displacement (C-1c and S-3a)	Most Important	Most Important	L-band (S-band probably acceptable)	H-H V-V	25 m 100 m (product need)	6 hours (select) Weekly (all)	1 Months 3 Months	20 mm 40 mm Vertical Accuracy Between Acquisitions	30 km upstream and all floating land ice	- Revisit accuracy of vertical
grounding zone velocity variability (50 km upstream and downstream and all tidewater glaciers) (C-1c and S-3a)	Most Important	Most Important	L-band (S-band probably acceptable)	H-H V-V	25 m 100 m (product need)	6 hours (select) Weekly (all)	1 Months 3 Months	5 m/yr 10 m/yr	50 km upstream and downstream and all tidewater glaciers 75% of above	- Tidal and melt modulated ice velocity
Vertical displacement of sub-glacial lake drainage and filling (C-1c and S-3a)	Most Important	Important	L-band (S-band probably acceptable)	H-H V-V	25 m 100 m	Twice weekly 1 Month	1 Week 3 Months	20 mm 40 mm Vertical Accuracy Between Acquisitions	All major land ice > 100 km ² 75% of above	



Cryosphere: Geophysical Observables and Attributes (*continued*)

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/ Continuity	General Comments
Circumpolar fine scale sea ice motion & deformation [motion product] (C-8a, C-8b, and C-8c)	Very Important	Most Important	L-band (Could be combined with C-band)	Single pol (any)	1 km 5 km (product res)	12 Hours 2-day	6-24 hours 1 Month	10 m/day 100 m/day (both poles)	90N to 78S 85N to 75S	- If Arctic pole hole is open in summer in a decade then need 90N
Sea ice ridge and lead evolution, polynya formation, brine formation, and heat flux [motion product] (C-8a, C-8b, and C-8c)	Very Important	Most Important	L-band (Could be combined with C-band)	Single pol (any)	100 m 500 m (product res)	3-hours 1-day	7-day 1 Month	2 m/day 10 m/day (relative)	90N to 78S 85N to 75S	- Tidal aliasing at 6, 12 and 24 hrs
Marginal/coastal sea ice zone mechanics and fluxes [motion product] (C-8a, C-8b, and C-8c)	Very Important	Most Important	L-band (Could be combined with C-band)	Single pol (any)	100 m 500 m (product res)	3-hours 1-day	7-day 1 Month	2 m/day 10 m/day (relative)	90N to 78S 85N to 75S	- Resolving vorticity is important for
Wavelength and direction [height?] (C-8a, C-8b, and C- 8c)	Very Important	Most Important	L-band (Could be combined with C-band)	Single pol (any)	500 m 1 km (product res)	12 hours 1-day	7-day 1 Month	10 m 20 m	90N to 78S 85N to 75S	Could be targeted -
Sea ice formation and distribution: Leads, flow size, ridges, ice type, ice age [feature classification] (C-8a, C-8b, and C-8c)	Very Important	Very Important	L-band (Could be combined with C-band)	Single pol (any)	10 m 100 m	12 hours 2-day	6-24 hours 1 Month	TBD	90N to 78S 85N to 75S	

Ecosystems





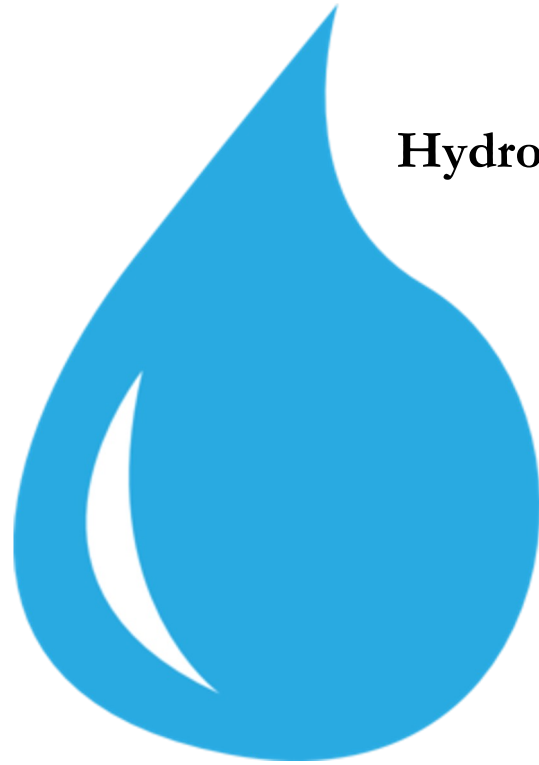
Ecosystems: Geophysical Observables and Attributes

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/ Continuity	General Comments
			Baseline in white Threshold in orange							
Absolute Soil Moisture (E-1d)	Important	Very Important	L-band S-band	QP/QQP HH	≤ 20 m 50 m	3-6 Days	1-3 Days	6% accuracy in non-forested regions	Global	
Relative Soil Moisture (E-3a)	Most Important	Most Important	L-band S-band	QP/QQP HH	≤ 20 m 50 m	3-6 Days	1-3 Days	6% accuracy in non-forested regions	Global	
Freeze/Thaw Boundary Dynamics (Frozen/Not Frozen) (C-3c)	Important	Very Important	L-band S-band	QP/QQP HH	≤ 20 m 50 m	7-14 Days	7 Days	80% classification accuracy	Global	Water Storage/Supply
Vegetation Structure (canopy height & vertical distribution) (E-1b)	Most Important	Most Important	L-band S-band	HH/HV VV/VH	≤ 20 m 50 m	≤ 14 Days	14 Days	The greater of 20% or 5m vertical error.	Global	Timber Stocks and management
Above ground vegetation biomass & biomass change (E-4a)	Important	Most Important	L-band L-band	HH/HV VV/VH	≤ 20 m 50 m	7 Days <14 Days	14 Days	20 Mg/ha for areas of biomass <100 Mg/ha	Global	Timber Stocks
Change in land cover due to flooding, wildfire, wind, insects, anthropogenic (E-5b)	Important	Most Important	L-band S-band	HH/HV HH	≤ 20 m 50 m	≤ 14 Days	14 Days	80% Extent Accuracy at 1 ha	Global	Hazard Monitoring – Flooding, Wildfire, Severe Storms, Ecological, Anthropogenic



Ecosystems: Geophysical Observables and Attributes (*continued*)

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/ Continuity	General Comments
			Baseline in white Threshold in orange							
Agriculture Crop Classification and Coverage (Active Crop Area) (H-2c)	Most Important	Very Important	L-Band S-band	QP/QQP VV/VH	≤ 10 m ≤20 m	≤7 days ≤10 days	1- 3 days	85% or better Classification Accuracy 80% or Better	Global	Food Security and Supply
Estimating Crop Productivity and Yield (H-2c)	Most Important	Very Important	L-band S-band	QP/QQP VV/VH	≤ 10 m ≤20 m	≤7 days ≤10 days	1-3 days	85% or better Classification Accuracy 80% or Better	Global	Food Security and Supply
Classification of rice and aquaculture (H-2c)	Most Important	Most Important	L-band C-band	HH/HV HH	≤ 10 m ≤20 m	<7 Days <14 Days	14 Days	80% Extent Accuracy at 1 ha	Global	Food Security and Supply
Measure inland and coastal wetlands areas (H-4a)	Very Important	Most Important	L-band S-band	HH/HV HH	≤ 20 m 50 m	<7 Days <14 Days	14 Days	80% Extent Accuracy at 1 ha	Global	Coastal flooding and storm vulnerability Flood Mapping/prediction
Measure relative water level changes in wetlands (E-5a)	Important	Most Important	L-band S-band	HH/HV HH	≤ 20 m 50 m	<7 Days <14 Days	14 Days	80% Extent Accuracy at 1 ha	Global	Coastal flooding and storm vulnerability Flood Mapping/prediction
Energy balance (soil moisture) (W-3a)	Very Important	Important	L-band S-band	QP/QQP	1 km	Sub-Daily-Daily	1 Week	0.04 m ³ /m ³	Global	Surface and root-zone soil moisture. Root-zone soil moisture is modeled using surface estimates. Vegetation information from quad pol is desired.
Weather prediction (soil moisture) (W-2a)	Most Important	Important	L-band S-band	QP/QQP	1-10 km	Sub-Daily-Daily	1-2 Days	0.04 m ³ /m ³	Global	Surface and root-zone soil moisture. Root-zone soil moisture is modeled using surface estimates.



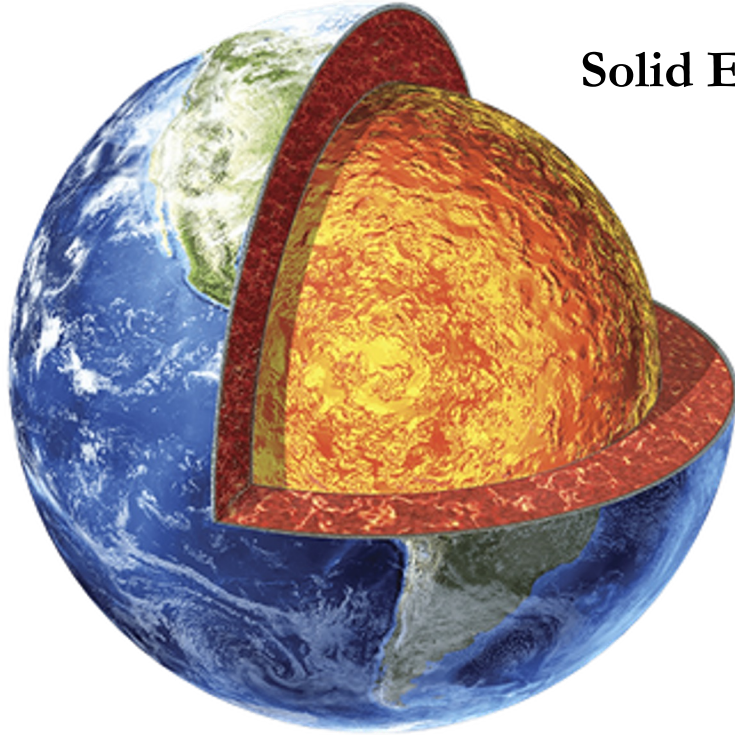
Hydrology

Hydrology: Geophysical Observables and Attributes

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Utility	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/Continuity	General Comments
			Baseline in white			Threshold in orange				
Recharge rates (Groundwater subsidence) (H-2c)	Most important	High	L-band InSAR	Single pol	Aggregated 100 m (multi-look) Aggregated 200 m (multi-look)	3-7 days 11-14 days	1-2 days	1 cm (tradeoffs with noise) 2-3 cm (tradeoffs with noise)	Global	Combine with GRACE-FO for mass change, long continuous record needed
Inundated area (H-4a, H4b)	Very important	High	L-band SAR	Dual or quad	3 m 10 m	Subdaily* (operational) 11-14 days*	< 2 hr 1-2 days*	1 cm 2-3 cm	Global	Flood extent from SAR backscatter (land/water masks for open water situations) <i>(*Temporal resolution in combination with other satellites. Operational temporal requirement dropped in threshold)</i>
Inundated area (H-4a, H4b)	Very important	High	L-band InSAR	Dual or quad	3 m 10 m	Subdaily* (operational) 11-14 days*	< 2 hr 1-2 days*	1 cm 2-3 cm	Global	Flood extent/water level change through InSAR coherence and amplitude change <i>(*Temporal resolution in combination with other satellites. Operational temporal requirement dropped in threshold)</i>
SWE (H-1c)	Most important	Medium	L-band	VV	1km desired 10-20 m in mountains 4 km min 100 m in mountains	3-7 days 11-14 days*	~ 1 week	10% (max ~1-2 deg phase noise) 20% (max ~1-2 deg phase noise)	Global; esp. deep snow in Mountains	Depth/SWE change retrieval through InSAR phase change. In-situ and modeling phase, initial density estimate. Spatial resolution priority over revisit
SWE (H-1c)	Most important	Medium	X- and Ku-band	VV/VH (preferred) or HH/HV	1km desired 100 m in mountains 4 km min 100 m in mountains	3-7 days 11-14 days	~ 1 week	10% (max 0.1 dB SNR) 20% (max 0.1 dB SNR)	Global; Mountains	Snow depth retrieval from multi-freq, multi-pol backscatter. Modeling for initial microstructure estimate. Spatial resolution priority over revisit

Hydrology: Geophysical Observables and Attributes (*continued*)

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Utility	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/Continuity	General Comments
Weather prediction (soil moisture) (W-2a)	Most important	Low	L-band	Quad	1-10 km desired 10 km	Sub-daily to Daily	1-2 days	0.04 m ³ /m ³	Global	Surface soil moisture to be used in initialization of weather models (low latency required)
Recharge rates (soil moisture) (H-2c)	Most important	Low	L-band	Quad	200 m - 1 km desired 10 km	3-7 days	~1 week	0.04 m ³ /m ³	Global	Surface and root-zone soil moisture. Root-zone soil moisture is modeled using surface estimates.
Latent heat flux (soil moisture) (H-2a)	Very important	Low	L-band	Quad	200 m - 1 km desired 10 km	Sub-daily to Daily 3-7 days	~1 week	0.04 m ³ /m ³	Global	Surface soil moisture
Energy balance (soil moisture) (W-3a)	Very important	Low	L-band	Quad	1 km desired 10 km	Sub-daily to Daily	~1 week	0.04 m ³ /m ³	Global	Surface soil moisture that varies with radiative forcing (i.e. sub-daily)
Drought monitoring (soil moisture) (H-4c)	Important	Medium	L-band	Quad	1-10 km desired 10 km	Weekly 11-14 days	~1 week	0.06 m ³ /m ³	Global	Surface and root-zone soil moisture. Root-zone soil moisture is modeled using surface estimates.
Fire prediction (fuel load/soil moisture) (H-4d)	Important	Low	L-band	Quad	200 m - 1 km desired 10 km	3-7 days 11-14 days	~1 week	0.06 m ³ /m ³	Global	Vegetation information from quad pol is desired.



Solid Earth



Solid Earth: Geophysical Observables and Attributes

SE: refers to general Solid Earth observables.

GH: refers to Geohazards.

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/ Continuity	General Comments
Volcanic Systems and Hazards • Land surface deformation (S-1a)	Most Important	Most Important	L-band, S-band	Single pol (any)	10 m (SE) 30 m	Daily (SE) 10 days	Not a Priority (SE)	At least 2 components of land surface deformation and strain localization (e.g., surface fracturing) over length scales ranging from 10 m to 100s of km and a precision of 1 mm at a sampling frequency related to the volcanic activity. Regionally- sampled global coverage. ---- Vertical: 1 mm Horizontal: 1 cm Vertical: 1 cm Horizontal: 5 cm	Global (SE)	GH: Would like the ability to task measurements at sub- daily frequency during volcanic crises. Frequent revisit time will capture complex dynamics of magma migration in volcanic systems.
(S-2b)	Very Important	Very Important			10 m (GH) 30 m	Sub-Daily- (GH) 10 days	1-3 Hours (GH)		Localized (GH)	



Solid Earth: Geophysical Observables and Attributes (*continued*)

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/Continuity	General Comments
Earthquake Cycle and Hazards • Land surface deformation (S-1b) (S-2c)	Most Important	Most Important	L-band, S-band	Single pol (any)	50m, 10m near faults (SE)	Daily 10 days	Not a Priority (SE)	At least 2 components of land surface deformation 10 m to 1000 km resolution and precision of 1-10 mm at a sampling frequency related to seismic/tectonic activity. Ideally, resolution of 1 mm/week. Need more than 10 years of observations to measure interseismic deformation	Global (SE)	Would like 3D measurements for resolving overlapping processes. Frequent revisit time will discriminate between different physical models of fault ruptures, postseismic processes, transient slip. GH: Daily observations and low latency would improve response time for damage maps post-earthquake
	Very Important	Most Important			100 m, 30 m near faults 10 (GH) 30 m					



Solid Earth: Geophysical Observables and Attributes *(continued)*

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/Continuity	General Comments
			Baseline in white Threshold in orange							
Landslides Hazards • Land surface deformation (S-1c)	Very Important	Most Important (SE)	L-band, S-band	Single pol (any)	10 m	Sub-Daily	Not a Priority (SE)	At least 2 components of land surface deformation at <50 m spatial resolution and 1 mm/yr at a temporal frequency <seasonal --- Vertical: 1 mm/yr Horizontal: 3 mm/yr	Global (SE)	Would like 3D measurements for estimating landslide thickness with rheological models. 10 year long time series to achieve ~1 mm/yr accuracy. High temporal and spatial resolution will capture transient landslide movement, linkages to precipitation
		Important (GH)			30 m	10 days			Hours-Days (GH)	
Rapid Transient Deformation after Disasters (S-2a)	Most Important	Most Important	L-band, S-band	Single pol (any)	100 m 10 m	Weekly Daily	<2 Days <3 Hours (crisis)	<1 cm per observation (monitor) <5 cm per observation (crisis & post-event)	Localized	
Sea Level Rise • Vertical motion of land along coastlines (S-3b)	Most Important	Most Important	L-band, S-band	Single pol (any)	50 m 10 m (specific areas) --- Baseline: 10 m Threshold: 50 m	6 Days 10 days	Not a Priority	5-10 mm vertical precision <50 mm horizontal precision 1 mm/yr accuracy 1 mm/yr	Global Coastlines	Need to achieve 1 mm/yr with 10-year time series. Continuity with NISAR for long time series is important for measuring small, slow changes in rates. High temporal resolution, long time series can reduce uncertainty in



Solid Earth: Geophysical Observables and Attributes (*continued*)

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/Continuity	General Comments
			Baseline in white Threshold in orange							
Landscape Change – Quantify global decadal landscape change <ul style="list-style-type: none"> Land Surface Deformation Soil Moisture (S-4a)	Most Important	Very Important	L-band, S-band	Single pol (any)	10 m 50 m	Weekly 2 weeks	Not a Priority	5-10 mm vertical, 10-50 mm horizontal precision 10 mm vertical 50 mm horizontal precision	Global	Higher spatial resolution would likely be more important than higher temporal resolution.
Energy Change – Effect of Convection <ul style="list-style-type: none"> Plate motion and deformation (S-5a)	Very Important	Important	L-band	Single pol (any)	100 m 200 m	Monthly Monthly	Not a Priority	10 mm vertical, 100 mm horizontal precision 10 mm vertical, 100 mm horizontal precision	Global	Steady velocity measurement of convection scale features - vertical measurement, epeirogenic uplift.
Groundwater Flow and its impact on geological processes and water supply <ul style="list-style-type: none"> Land surface deformation (S-6a)	Very Important	Most Important	L-band, S-band	Single pol (any)	10 m 30 m	Daily 10 days	Not a Priority	1 cm/yr 1 cm/yr for vertical, 2-3 mm/yr for horizontal	Global	Continuity with NISAR for long time series is important for seeing decadal scale changes. Three dimensional measurements for resolving overlapping processes. Frequent revisit time, long time series will constrain mechanics of confined aquifers and their interaction with fault structures.



Solid Earth: Geophysical Observables and Attributes (*continued*)

Geophysical Observable (Relevant Sci./App. Objective)	DS Importance	SDC Necessity	Recommended Bands	Recommended Polarization	Horizontal Spatial Resolution	Revisit Time	Latency	Accuracy	Coverage/ Continuity	General Comments
			Baseline in white Threshold in orange							
Measure Fluxes in and out of groundwater system (S-6b)	Important	Most Important	L-band, S-band	Single pol (any)	10 m 30 m	6-12 Days 10 days	Not a Priority	5 - 10 mm vertical precision <50 mm horizontal precision 1 mm/yr accuracy, 2-3 mm/yr horizontal	Overactive reservoirs, managed watersheds, other watersheds of interest	
Deformation from fluid fluxes in shallow aquifers (S-6c)	Important	Most Important	L-band, S-band	Single pol (any)	5 m 30 m	Weekly 10 days	Not a Priority	Spatiotemporal distribution of subsidence/uplift: 3 mm/yr vertical, 2-3mm/yr horizontal	Overactive reservoirs	
Vertical surface deformation – impact of human activities and water flow on earthquakes (S-6d)	Important	Very Important	L-band, S-band	Single pol (any)	5 m 30 m	Weekly 10 days	Not a Priority	Spatiotemporal distribution of subsidence/uplift: 3 mm/yr vertical, 2-3 mm/yr horizontal	Global	5 m spatial resolution was not well understood by Solid Earth R&A group in 2019 workshop.
Discovery & Management – Map energy, mineral, agricultural and natural resources for improved management (S-7a)	Important	Important	L-band, S-band	Single pol (any)	30 m 50 m	Weekly 10 days	Not a Priority	Subsidence/uplift at 1 cm vertical 1 cm/yr 2-3 mm/yr horizontal	Global	