

## ARKTALAS Science Workshop

# Changes in the Arctic Ocean: Knowledge gaps and Impact of future satellite missions

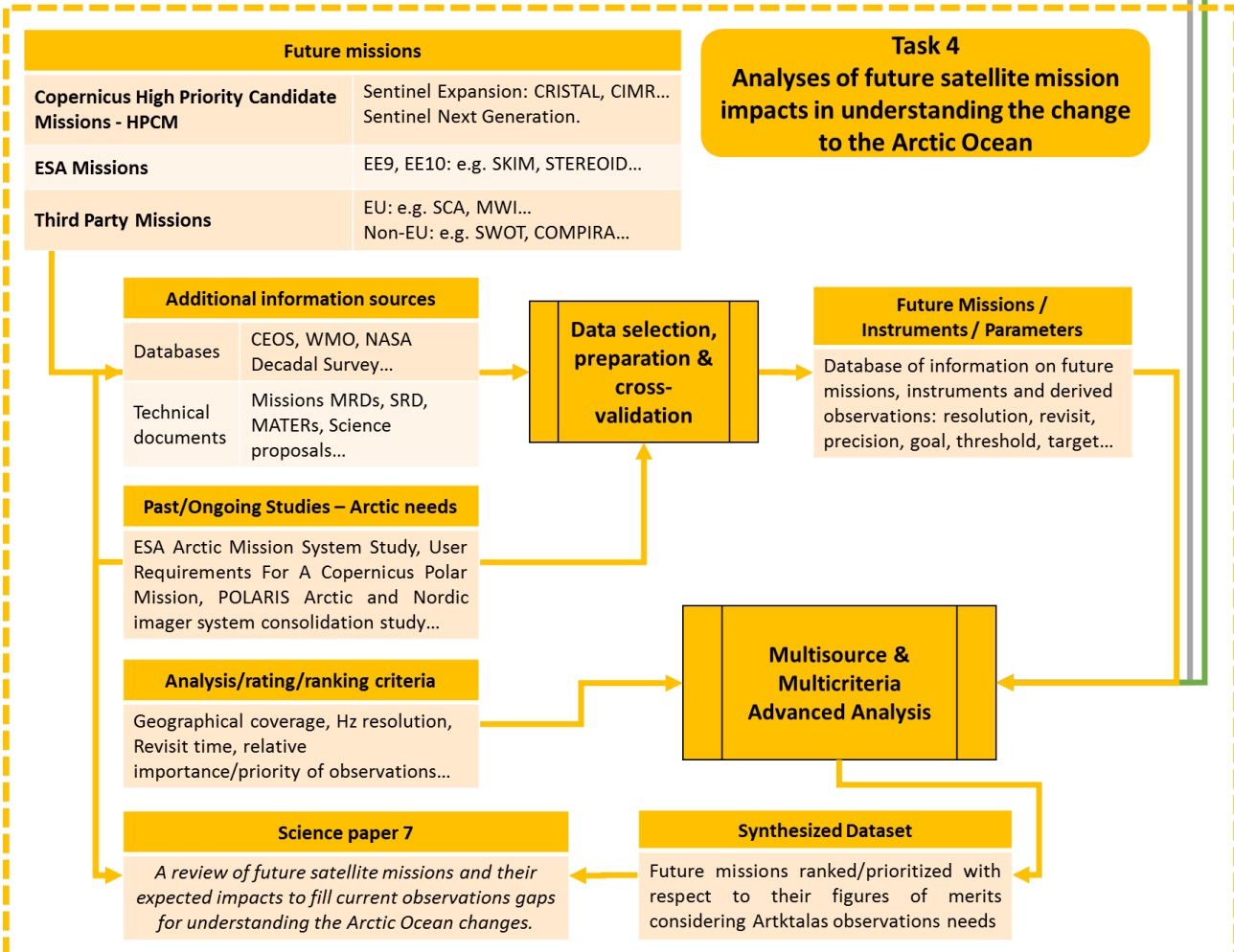
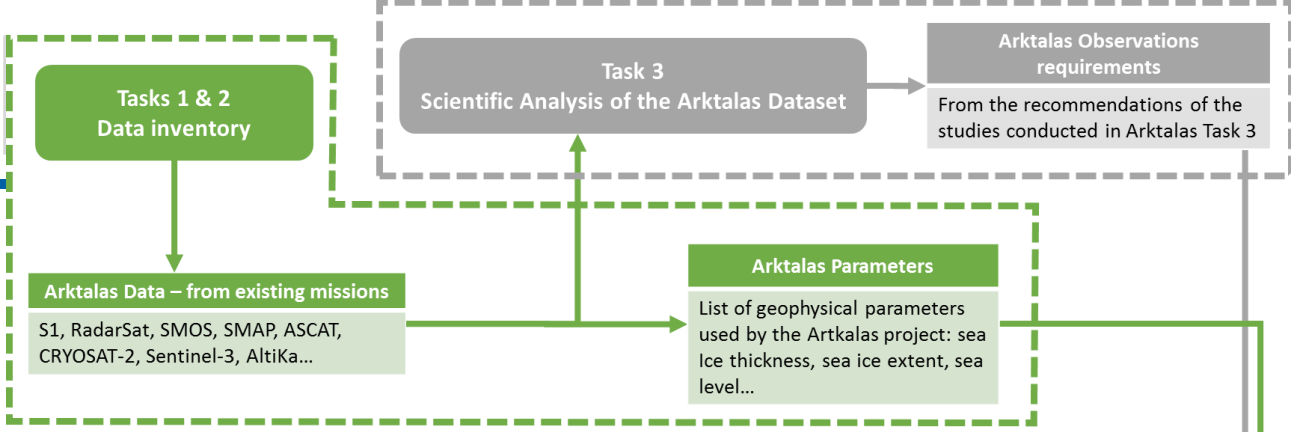
### Status of draft synthesis paper

UNIS, Longyearbyen, Spitsbergen

Wednesday 27 April 2022



# Methodology



but its authorization.

- **Collect information from missions and products documentation**
  - › Geophysical parameters of interest
  - › Existing missions & instruments
  - › Future missions (ESA and Third Party Missions)
  
- **Specific focus on**
  - › Arctic coverage
  - › Temporal availability
  - › Spatial and temporal resolution
  - › Size of swath (if any)
  - › Latency
  - › Level of accuracy, sources of uncertainties

- **Combine information with the needs and observation gaps identified within the project science studies**
  - › **Physical processes**
    - Arctic Ocean circulation
    - Sea Ice evolution
    - Arctic Amplification
    - Arctic storms
    - Ocean tides in the Arctic
  - › **Use of satellite products**
    - Direct analysis of Arctic Ocean processes, synergy between products/missions
    - Comparisons with in situ observations
    - Model validation
    - Data assimilation
  - › Associated geophysical parameters
  - › Arctic coverage
  - › Temporal availability
  - › Spatial and temporal resolution
  - › Latency
  - › Level of accuracy, sources of uncertainties
- **Identify filled/remaining gaps when considering future missions**
- **Produce synthesis paper**

- **Geophysical parameters of interest**

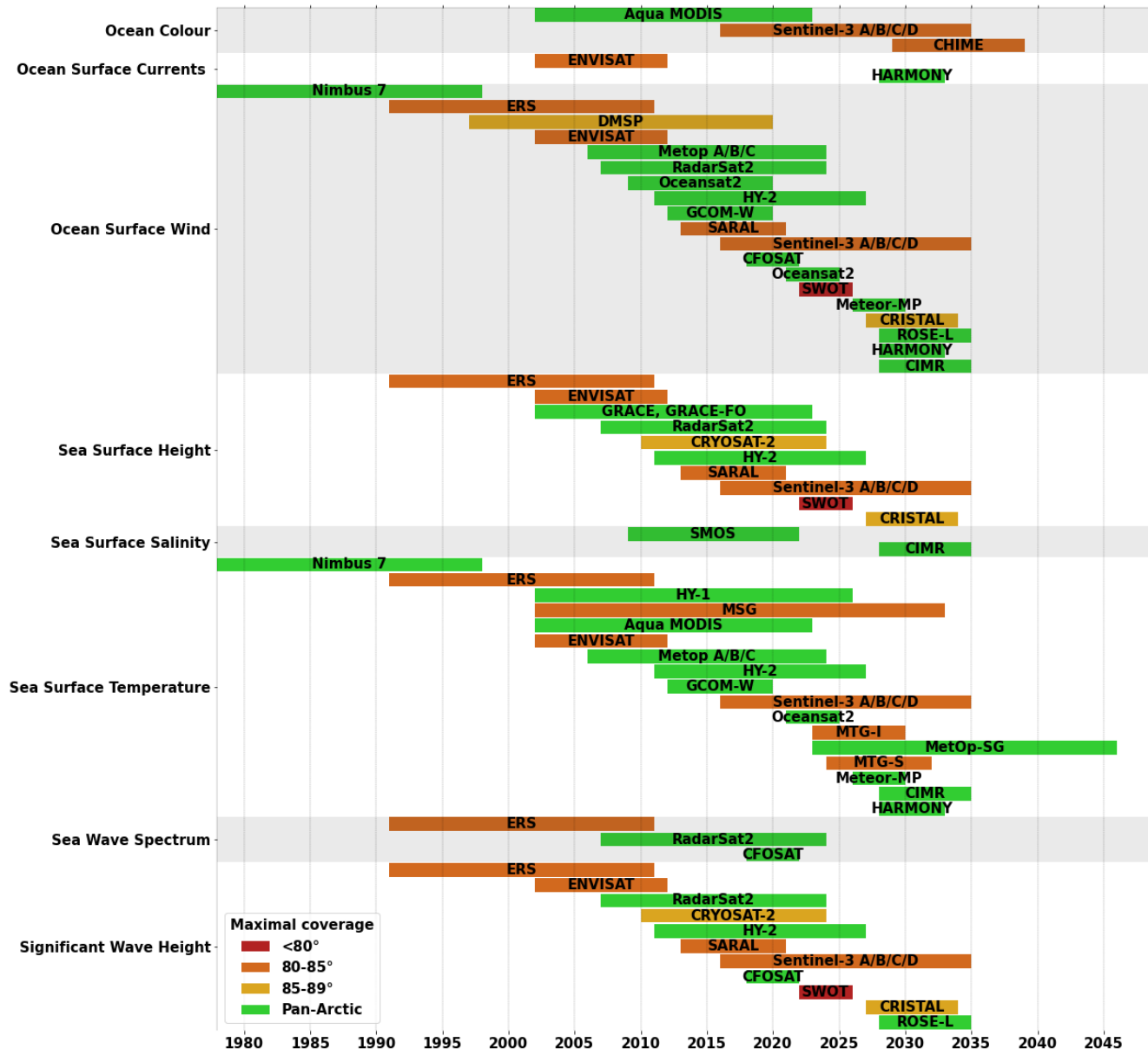
- › **Sea Ice parameters**

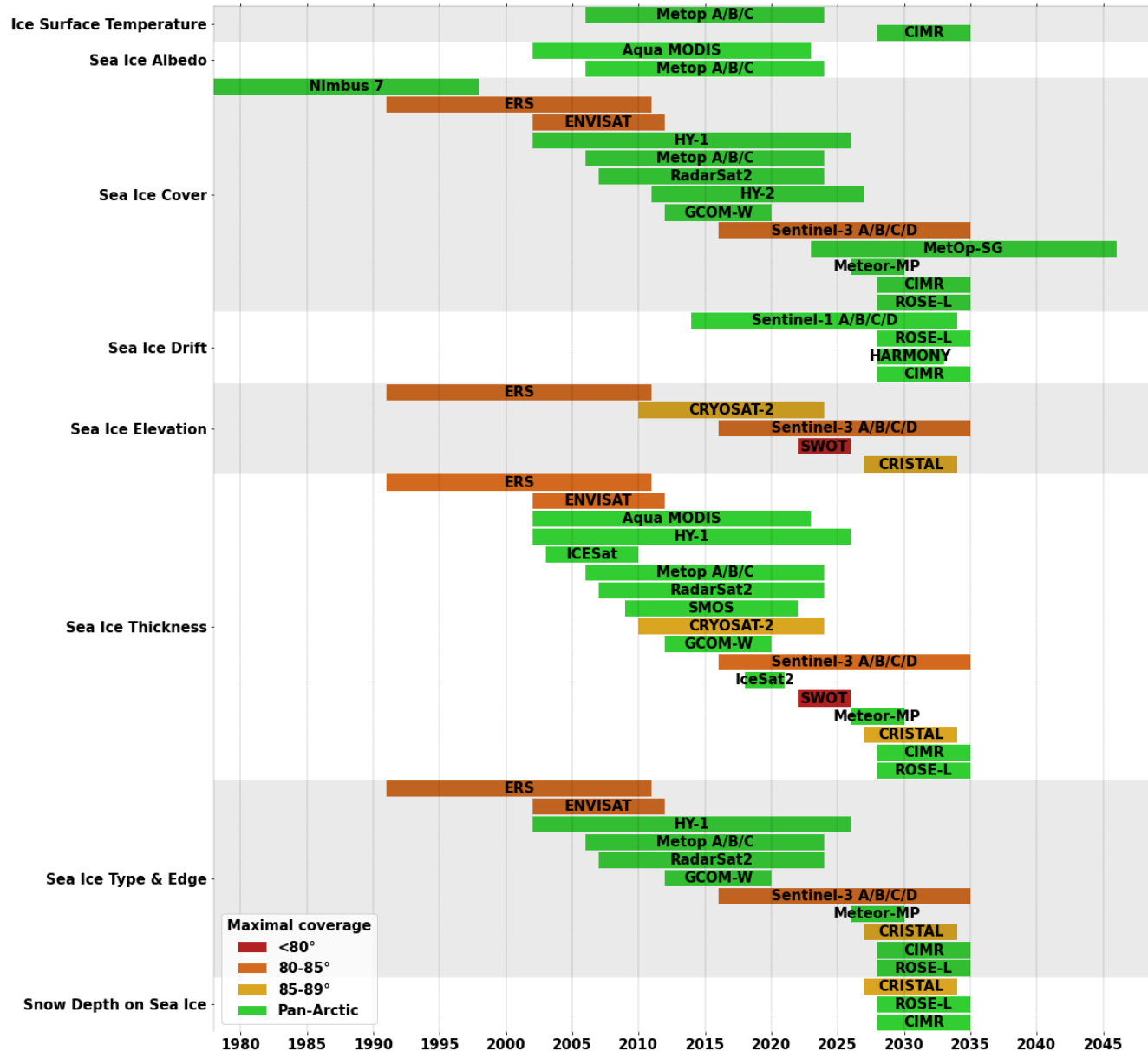
- Sea Ice Concentration
- Sea Ice Thickness
- Sea Ice Drift
- Ice Type and Ice Edge (location, concentration, type, leads, polynyas, ridges, decay stage, iceberg)
- Snow on Sea Ice
- Sea Ice Albedo
- Melt Ponds
- Ice Surface Temperature

- › **Ocean parameters**

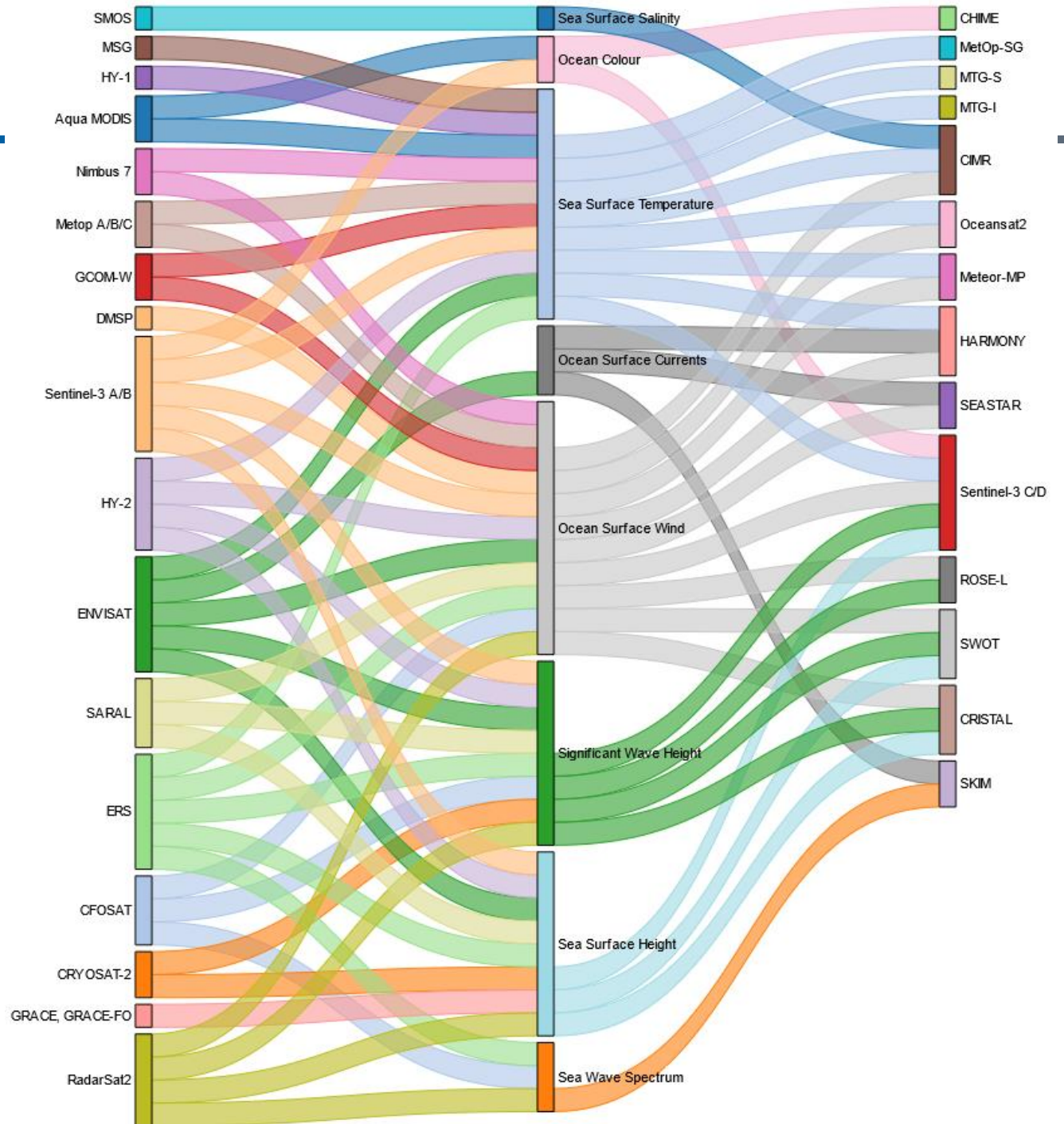
- Sea Surface Temperature
- Ocean Colour
- Sea Surface Salinity
- Sea Surface Height
- Ocean Surface Currents
- Ocean Surface Winds
- Sea State (significant wave height, wave spectra)

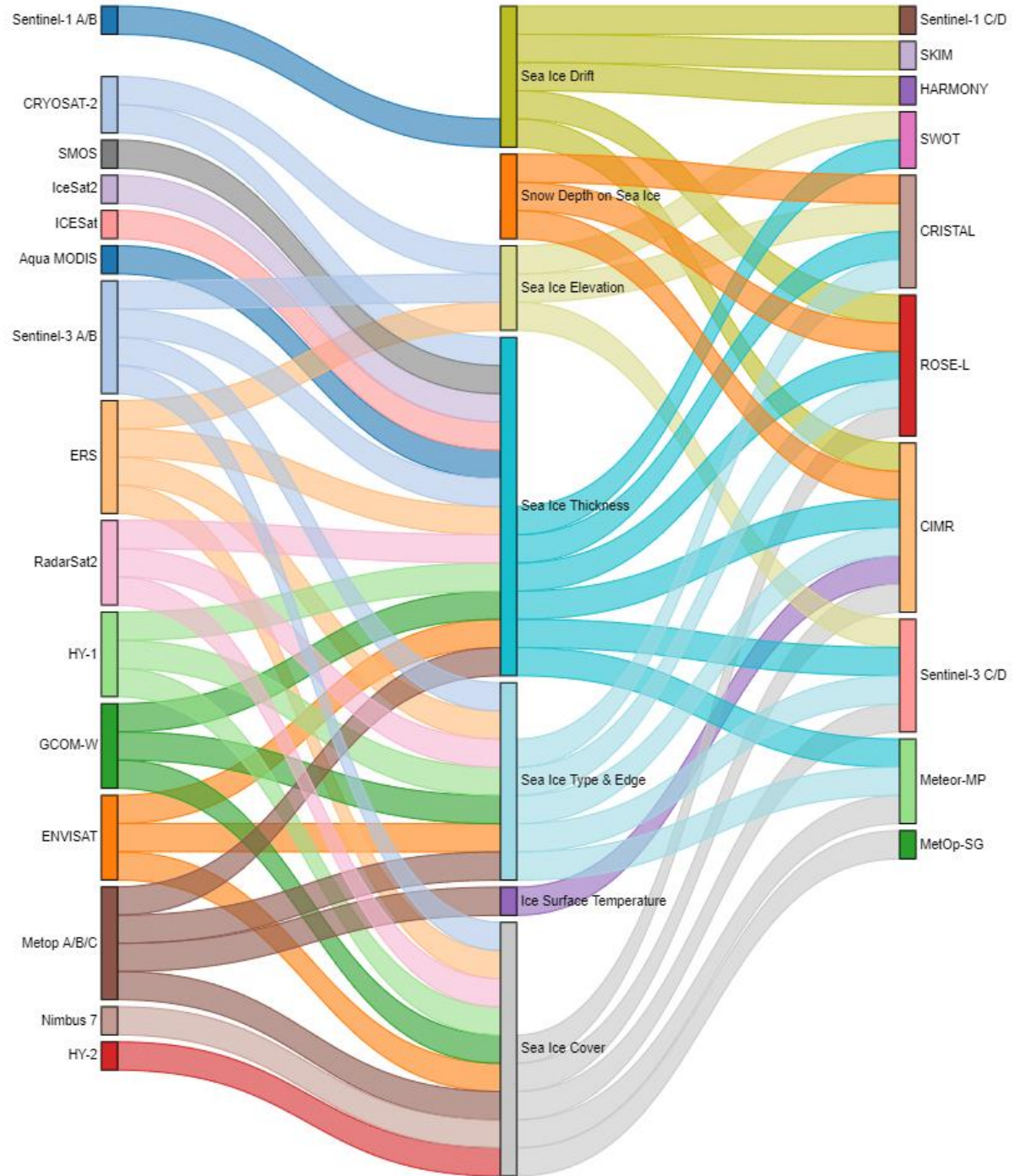












- **Identified current limitations**

- › **Satellite products temporal and spatial resolutions**

- Observation resolution (lack of high-resolution acquisition modes) and availability (impact of clouds, daylight, etc)
- Data processing: retracking in the presence of sea ice, gridding, temporal averaging, etc
- Different generations of instruments, with increasing resolution, but limitations for climate long-term studies
- Satellite data calibration and validation

- › **Geophysical parameters not currently measured**

- Snow depth over sea ice
- Ocean Surface Total Currents

- › **Lack of in-situ data**

- Collocation in space and time with satellite observations
- Location in regions of interest for studied processes (difficult to maintain instruments)
- Long time series, at high frequency

- › **Models limitations**

- Complex interaction between processes (sea ice, waves, currents, tides...)
- Not able to ingest observations at full resolution

- **Future missions' answers to these limitations**
  - › **Satellite products temporal and spatial resolutions**
    - Observation resolution (lack of high-resolution acquisition modes) and availability (impact of clouds, daylight, etc)
    - Data processing: retracking in the presence of sea ice, gridding, temporal averaging, etc
    - Lessons learned from new missions to reprocess previous data (ex: Sentinel-6 LRM/SAR interleaved modes)
  
    - Different generations of instruments, with increasing resolution, but limitations for climate long-term studies
    - Continuity of missions to build climate records: CHIME, CIMR, ROSE-L, HARMONY, etc...
  
    - Satellite data calibration and validation
    - Cross-comparison with other missions
  
  - › **Geophysical parameters not currently measured**
    - Snow depth over sea ice
    - CRISTAL
    - Ocean Surface Total Currents
    - SEASTAR, SKIM