Status of Sentinels Observation Scenarios
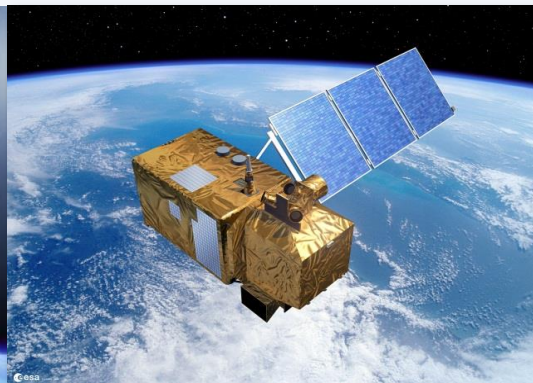
Meeting with Austrian Partners, 27 May 2014

Main objectives of the Sentinel operations strategy

- Provide in priority data to Copernicus services and for utilisation by ESA / EU Member States according to their specified requirements

- Ensure systematic and routine operational activities:
  - ✓ with a high level of automation
  - ✓ with pre-defined operations to the maximum extent possible

- Establish a conflict free operations profile, in particular with the elaboration of pre-defined mission observation scenarios

Sentinel-1
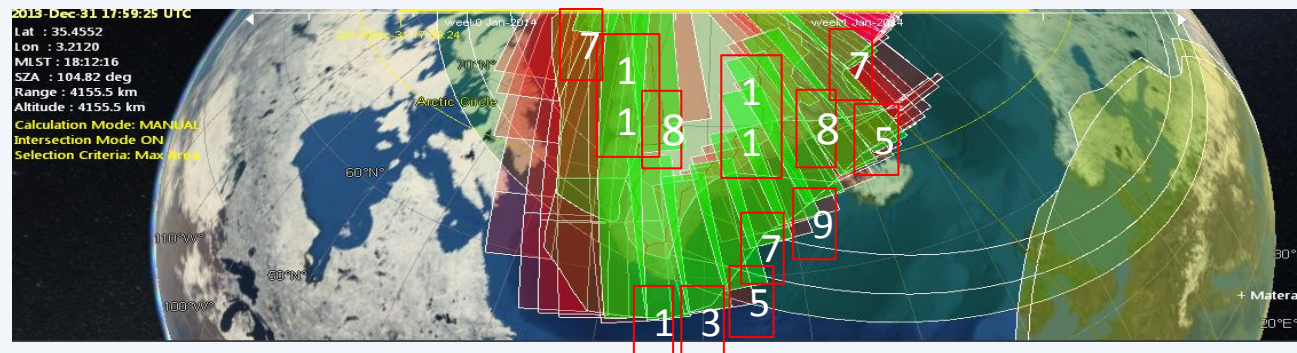
In line with the Sentinel operations strategy objectives:

→ Implement a pre-defined and conflict-free observation plan, aiming at fulfilling, to the best extent, the observation requirements from:
- the Copernicus services
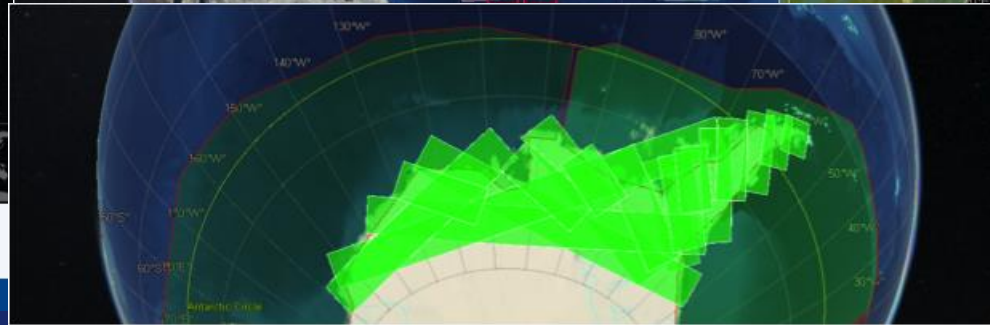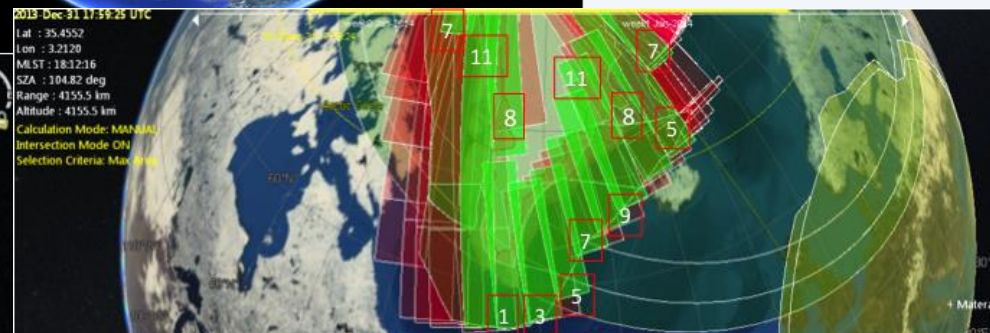- the use by ESA / EU Member States

→ In addition, on best effort basis:
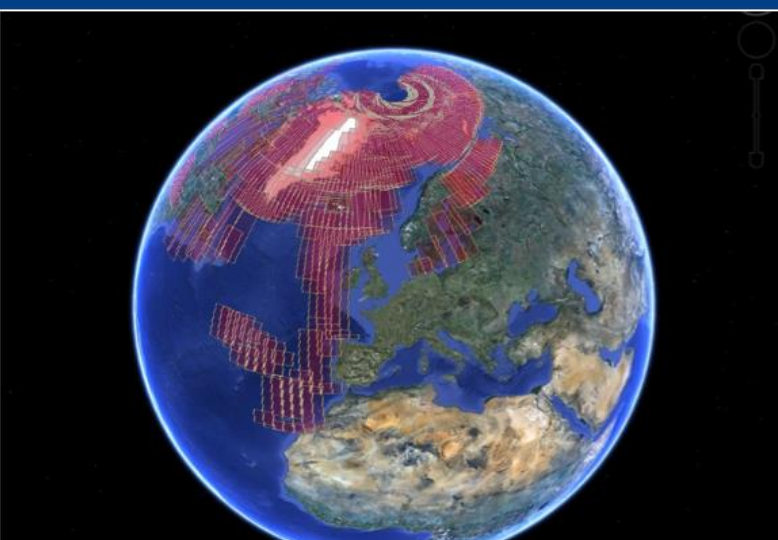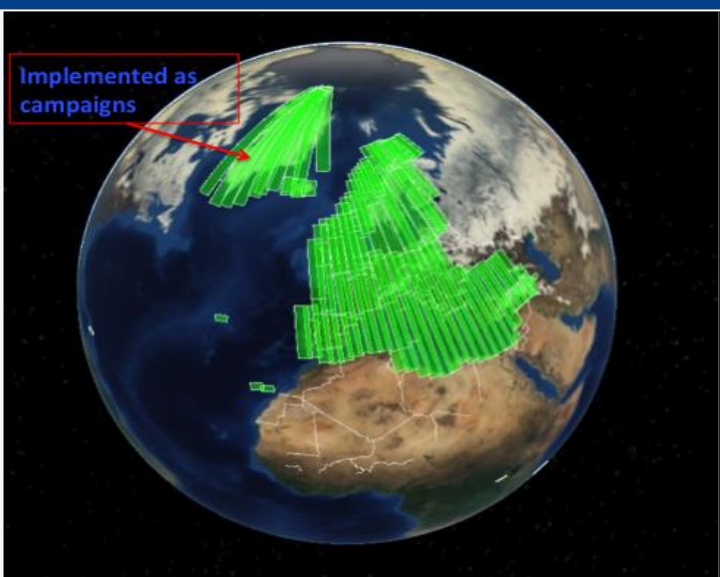- ensure continuity of ERS/ENVISAT
- implement requirements from the science community
- contribute to international cooperation activities.

→ Need to find *a priori* the solutions on the potential conflict among users (e.g. different SAR operation modes / polarisation required over same geographical area)
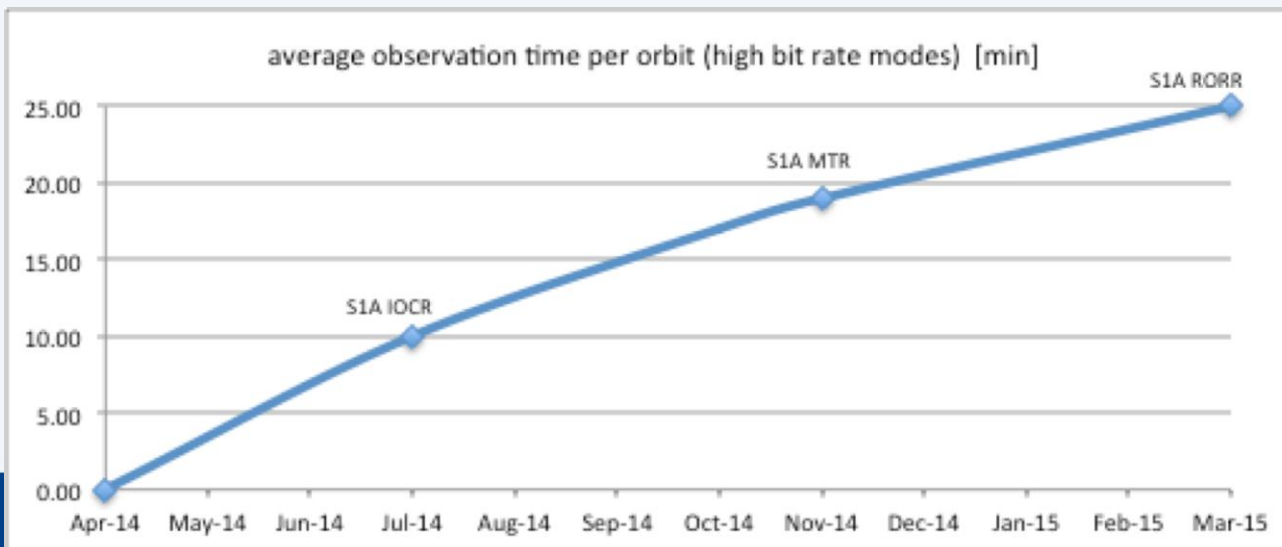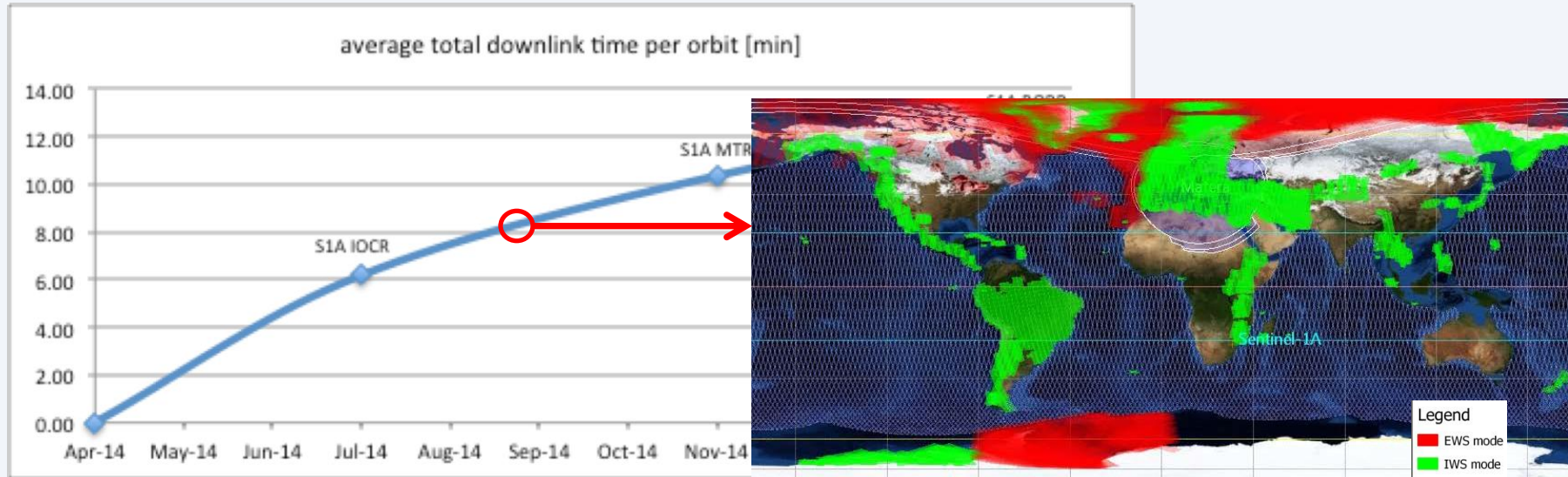
Collecting the Sentinel-1 observation requirements

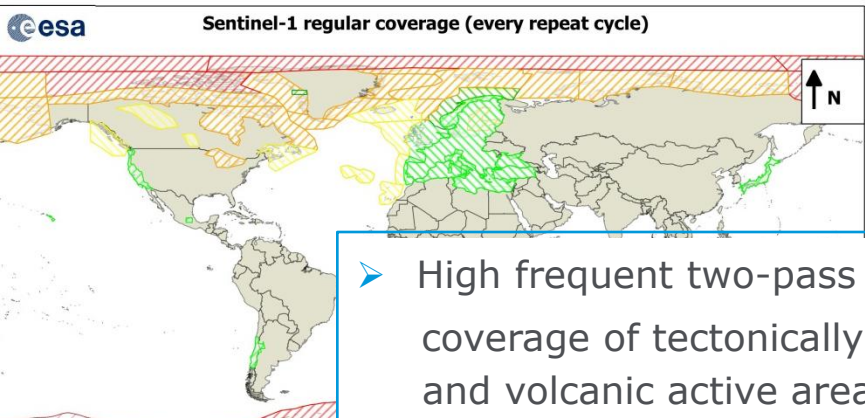| Group	Source of Requirements
Copernicus services and Copernicus use	- Extrapolation of Copernicus Data Access Data Warehouse requirements - Direct discussions with Copernicus services and EU Agencies (e.g. EMSA)
National services and use by ESA and EU Member States	- Discussions with Member States Delegations - Reply to Collaborative Ground Segment questionnaire (in the framework of the GOCG)
Scientific use, on-going projects, continuity of ERS/ENVISAT	- Recommendations from scientists at key SAR workshops (FRINGE, SEASAR), and others ESA organised workshop (e.g. SEN4SCI, Cryosphere, Int. Forum on Geohazards, etc.) - ESA GSE Projects (e.g. Polar View, MARISS, Terrafirma, GMFS, etc.) - Glob-series projects, CCI, SEOM, etc. - Extrapolation of ERS/ENVISAT projects
International Initiatives, International cooperation	- GEO/CEOS (e.g. FCT, GFOI, Geo-hazard Supersites), IGOS, FAO, REDD, PSTG, IICWG, GCOS, CliC, TIGER, DRAGON, etc. - Requests from international partners (e.g. US (NOAA / NASA / USGS), Australia, China, etc.)
Other use including use for commercial value-adding	EARSC, etc.

Sentinel-1 gradual capacity increase (ramp-up) driven by data download & sensing time capacities

average total downlink time per orbit [min]

average observation time per orbit (high bit rate modes) [min]

Sentinel-1 regular coverage (every repeat cycle)

Sentinel-1 regular coverage (bi-cyclic) for tectonics and volcanoe monitoring

SENTINEL-1 MONTHLY ACQUISITION ZONES FOR A FIRST GLOBAL REFERENCE COVERAGE (DRY CONDITIONS)

Legend

SENTINEL-1 BRM ZONES (Ramp up)

ALL YEAR	(EUROPEAN COVERAGE)	MAY	(BRM-DRY CONDITIONS)	NOV	(BRM-DRY CONDITIONS)
JAN	(BRM-DRY CONDITIONS)	JUN	(BRM-DRY CONDITIONS)	DEC	(BRM-DRY CONDITIONS)
FEB	(BRM-DRY CONDITIONS)	JUL	(BRM-DRY CONDITIONS)	JUN/JUL	(ICE FLOW - AUSTRAL WINTER)
MAR	(BRM-DRY CONDITIONS)	AUG	(BRM-DRY CONDITIONS)	JUL/AUG	(ICE FLOW - AUSTRAL WINTER)
APR	(BRM-DRY CONDITIONS)	SEP	(BRM-DRY CONDITIONS)	JUL-SEP	(ICE FLOW - NORTHERN SUMMER)
		OCT	(BRM-DRY CONDITIONS)	Campaigns	(EUROPEAN SMALL REMOTE ISLANDS)

➢ Consistent European coverage

➢ Sea-ice, sea-state, maritime surveillance

➢ Major risk areas (tectonic and

➢ High frequent two-pass coverage of tectonically and volcanic active areas
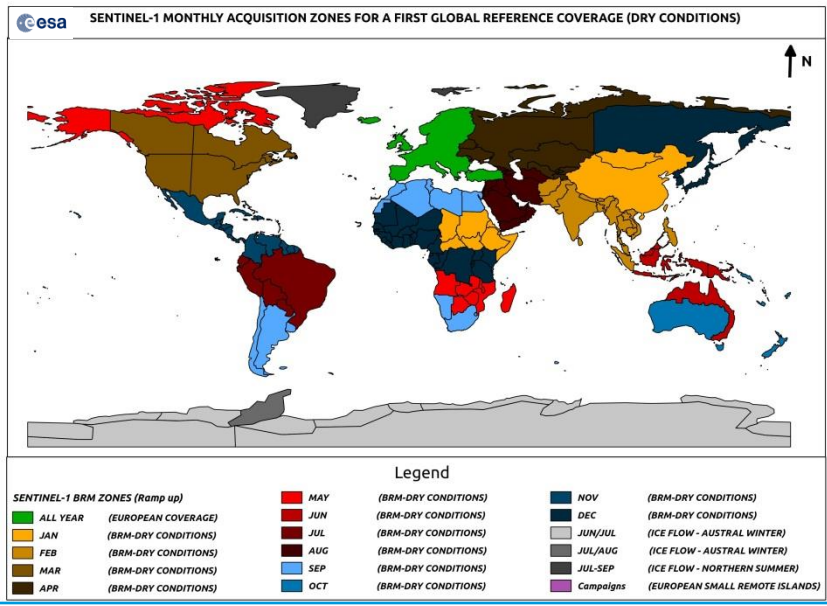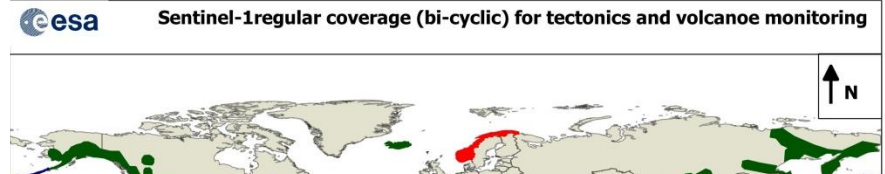
➢ Zonal global background mapping

➢ Drought zo... global clim... to countryw... coverages

➢ IWS mode,

➢ One pass

➢ Following ... trigger floo...

➢ Various further requests for smaller local to regional zones to be acquired

 ➢ during repetitive campaigns (e.g. ice-shields)

 ➢ with medium frequency

 ➢ with seasonality

 ➢ to be gradually intro-duced into the routine observation scenario

ESA Presentation | Johannes Roeder / Pierre Potin | ESRIN | 26/0...

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More details at: https://sentinel.esa.int/web/sentinel/missions/sentinel-1/observation-scenario

Sentinel-2

Sentinel-2 - Main facts

- Spacecrafts: 2 operating in twin configuration

- Spectral bands: 13 (VIS–NIR–SWIR spectral domains)

- Spatial resolution: 10m / 20m / 60m

- Swath: 290 km

- Orbit: Sun-synchronous at 786 km (14+3/10 revs per day), with LTDN 10:30 AM

- Multispectral Instrument: operating in pushbroom principle, filter based optical system, low noise image compression techniques

- Lifetime: 7.25 years, extendable to 12 years

- **Launch: currently planned not before 30 April 2015**
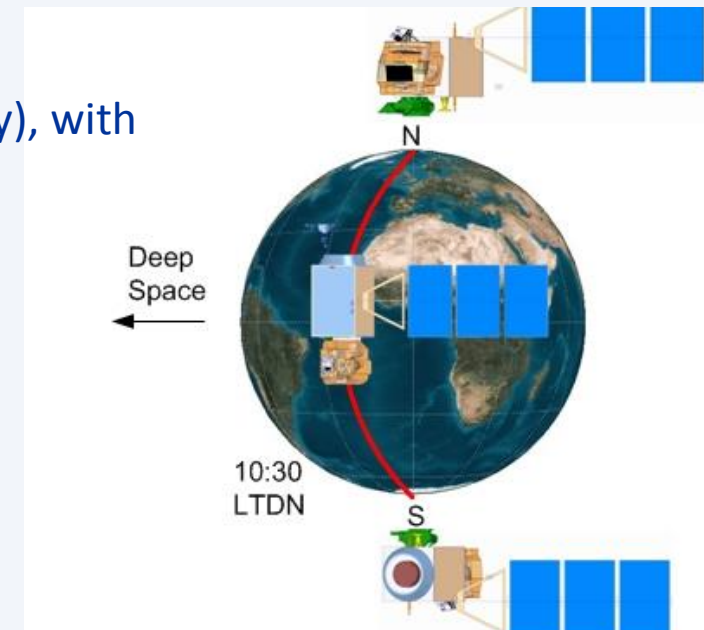
**Systematic acquisition and systematic processing of Level-1B/1C data**:

- All land surfaces between 56deg South and 84deg North latitude
- Major islands (greater than 100 km2 size), EU islands and all the other small islands located at less than 20km from the coastline
- Mediterranean Sea, all inland water bodies and all closed seas
- Specific acquisition campaigns as required

- **10-day revisit with 1 satellite**
- **5 day revisit with 2 satellites**
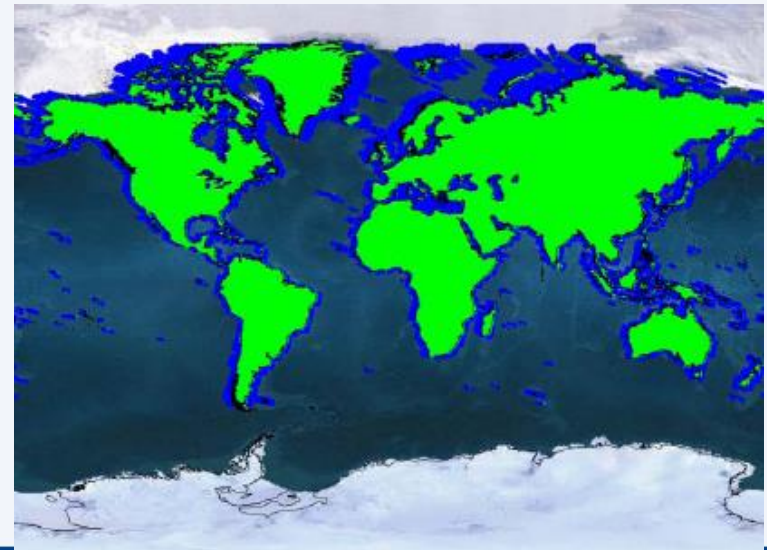
There will be gradual ramp-up until the Full Operational scenario is reached

EFFECTIVE COVERED AREA AT THE BEGINNING OF RAMP UP PHASE 1

derived from simulated swath - cleared for lead in/out datatakes
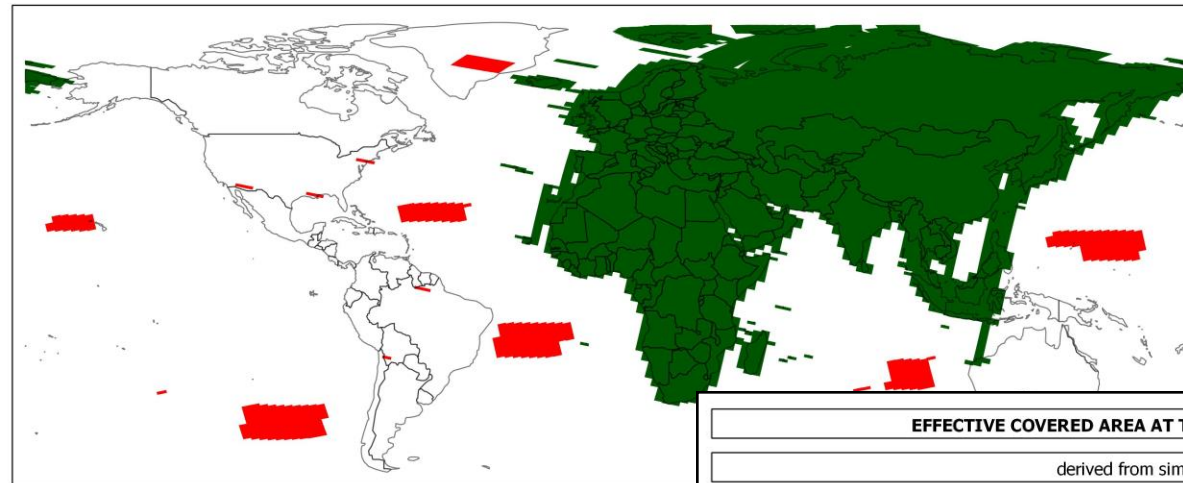
Start of ramp-up phase:

- Assuming availability of 2 downlink stations out of 4
- Ensuring coverage of global Cal/Val needs
- Ensuring COPERNICUS CORE datasets needs for Europe/Africa systematically
- Ensuring maximum coverage/orbit length for GRI generation

EFFECTIVE COVERED AREA AT THE END OF THE RAMP UP PHASE (FULL OPERATIONALITY)

derived from simulated swath - cleared for lead in/out datatakes
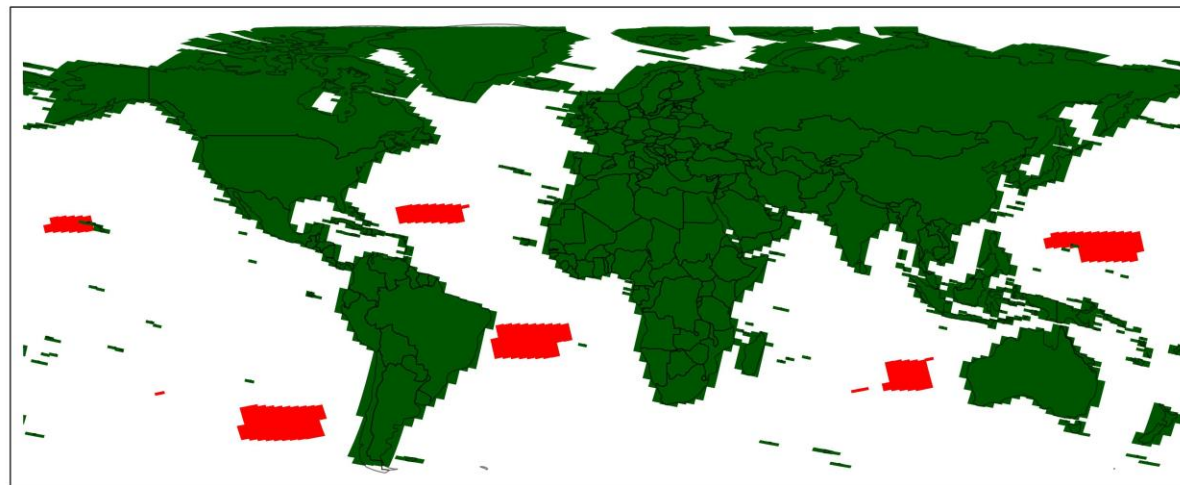
End of ramp-up

Legend

Acquisition Area

- Regular
- Calibration Purposes (outside the regular acquisition area)

Additional observation requirements have been received from Copernicus Services, Member States (collaborative GS), the science community, etc.:

- Night-time observations

- Antarctica coverage

- Coverage of oceans or coral reefs on global scale

- Coverage of coastal waters (beyond the MRD coast region coverage)

- …

Those requirements are technically simulated and assessed by ESA.

Additional observation requirements have been received from Copernicus Services, Member States (collaborative GS), the science community, workshops etc…….e.g.:

- ✓ Coverage of oceans

- ✓ Coverage of coral reefs on global scale

- ✓ Night-time observations

- ✓ Antarctica coverage

- ✓ Coverage of coastal waters (beyond the MRD coast region coverage)

…such requirements are taken onboard for mission planning simulations. ***Their inclusion will follow the process between European Commission and ESA to handle the evolution of the Copernicus Space Component.***
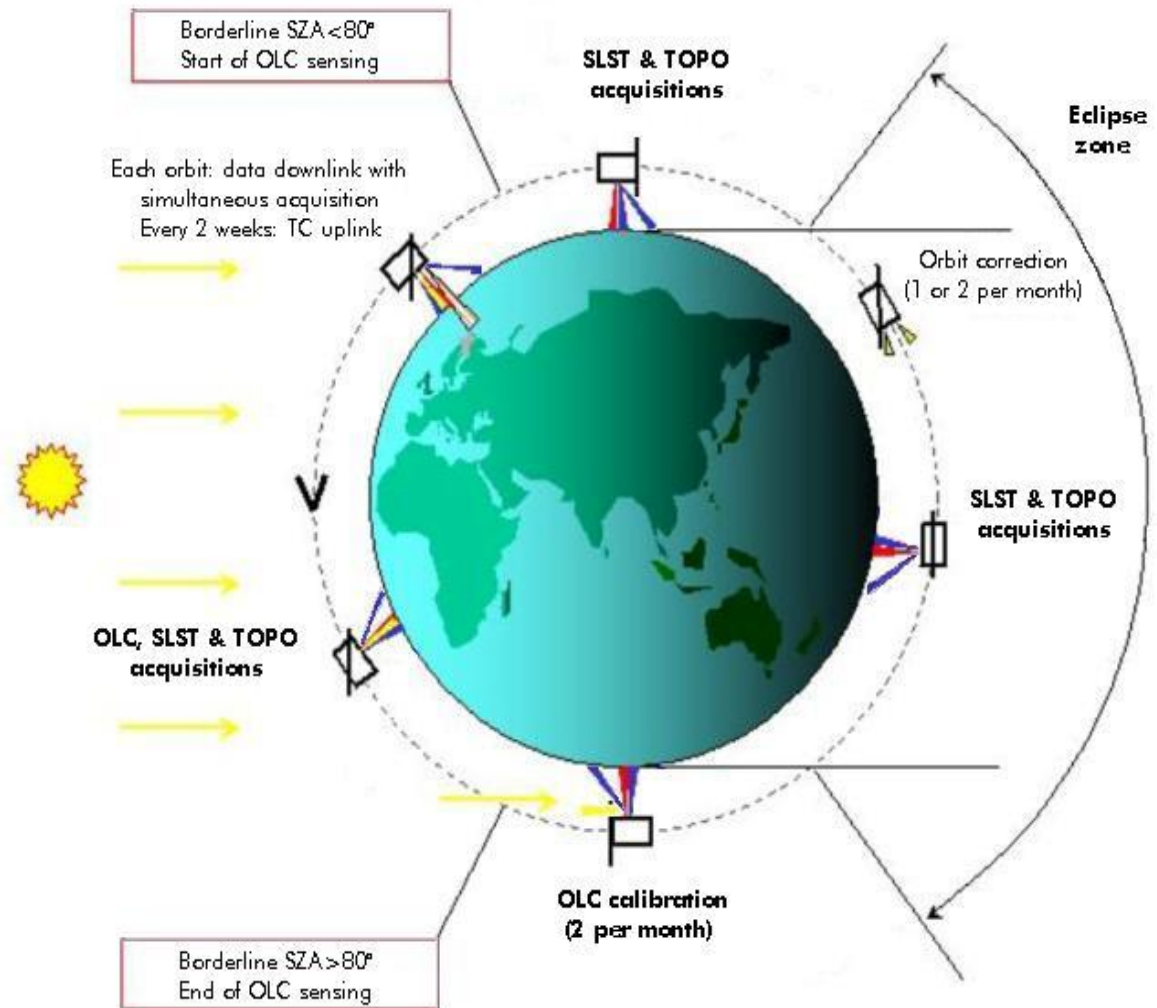
Sentinel-3

Data will be acquired **systematically** based on a pre-set nominal mission scenario, as defined in the HLOP:

- Operations for OLCI and the visible channels of the SLSTR are based on specific solar illumination conditions (SZA < 80deg)
- MWR acquires data over the whole orbit.
- SRAL acquires data over the whole orbit with a pre-defined, automatically performed split between Low Resolution Mode (LRM) and SAR mode.

Sentinel–3: revisit time and coverage

Topography Mission:
ground track repeatability, dense spatial sampling

Optical missions:
Short Revisit times for optical payload, even with 1 single satellite

Ground tracks after 1 complete cycle (27 days)

		Revisit at Equator	Revisit for latitude > 30°	Spec.
Ocean Colour (Sun-glint free, day only)	1 Satellite	< 3.8 days	< 2.8 days	< 2 days
	2 Satellites	< 1.9 days	< 1.4 days	
Land Colour (day only)	1 Satellite	< 2.2 days	< 1.8 days	< 2 days
	2 Satellites	< 1.1 day	< 0.9 day	
SLSTR dual view (day and night)	1 Satellite	< 1.9 days	< 1.5 days	< 4 days
	2 Satellites	< 0.9 day	< 0.8 day	

- **Near-Real Time (< 3 hr) availability of the L2 products**
- **Slow Time Critical (STC) (1 to 2 days) delivery of higher quality products for assimilation in models (e.g. SSH, SST)**