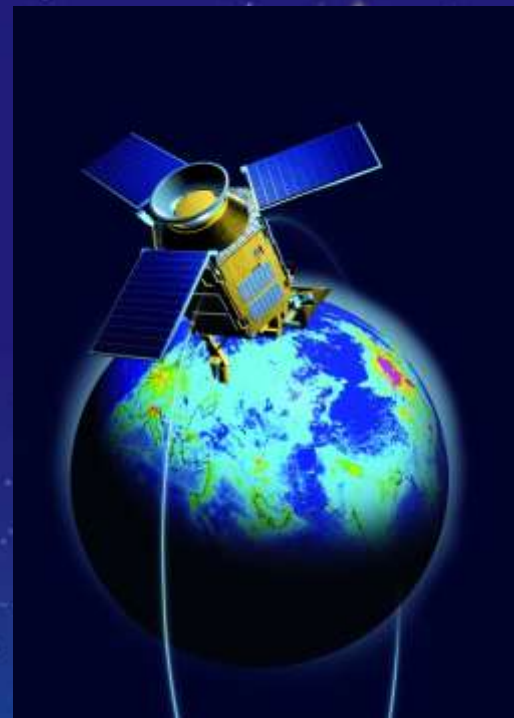


Sentinel 5 Precursor From EOEP to GMES

Dr Nicolas Lévêque
S5P Systems Engineer & Payload Interface Manager

NCEO / CEOI Conference 2012, Nottingham

Sentinel 5 Precursor



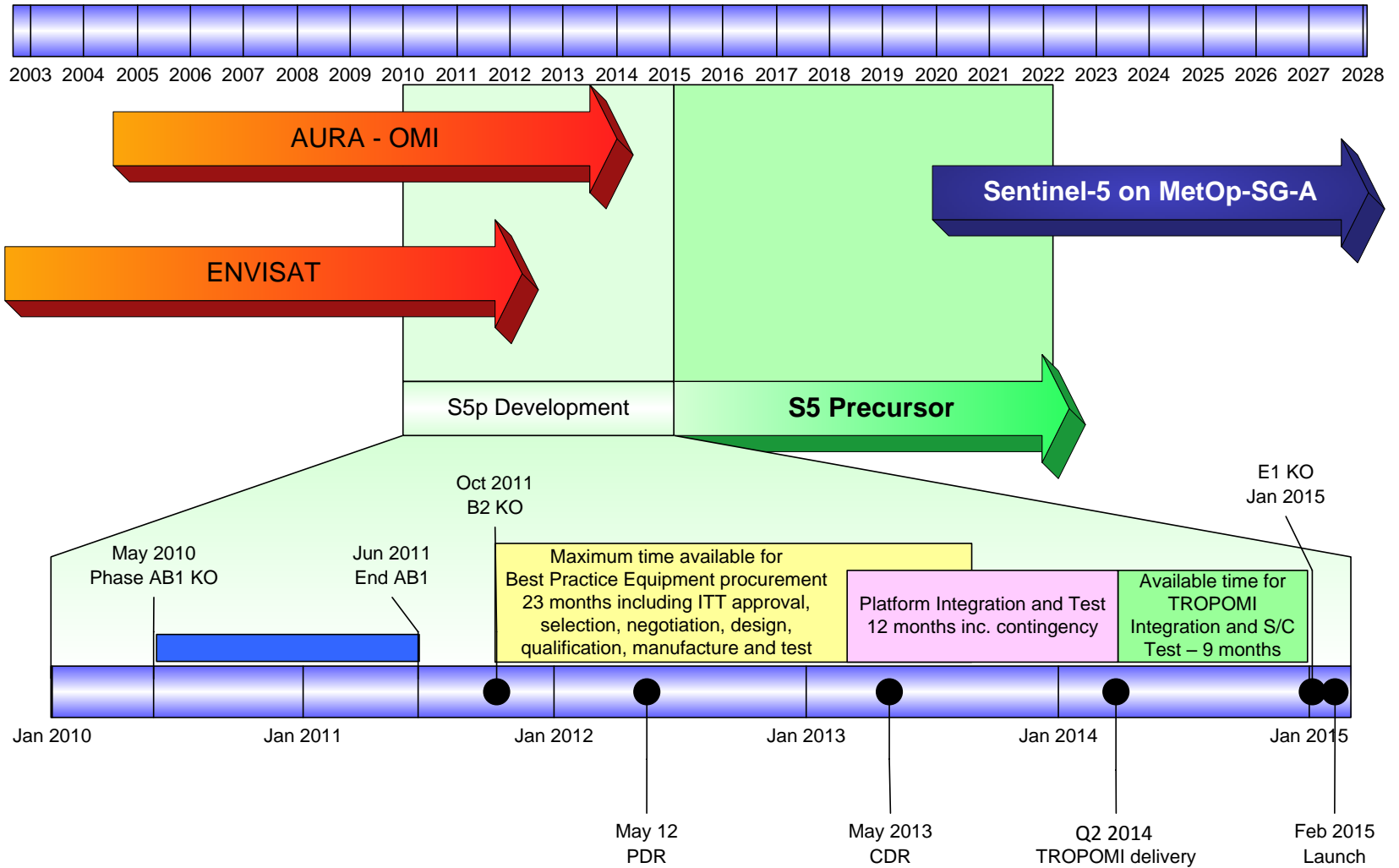
All the space you need



Overview

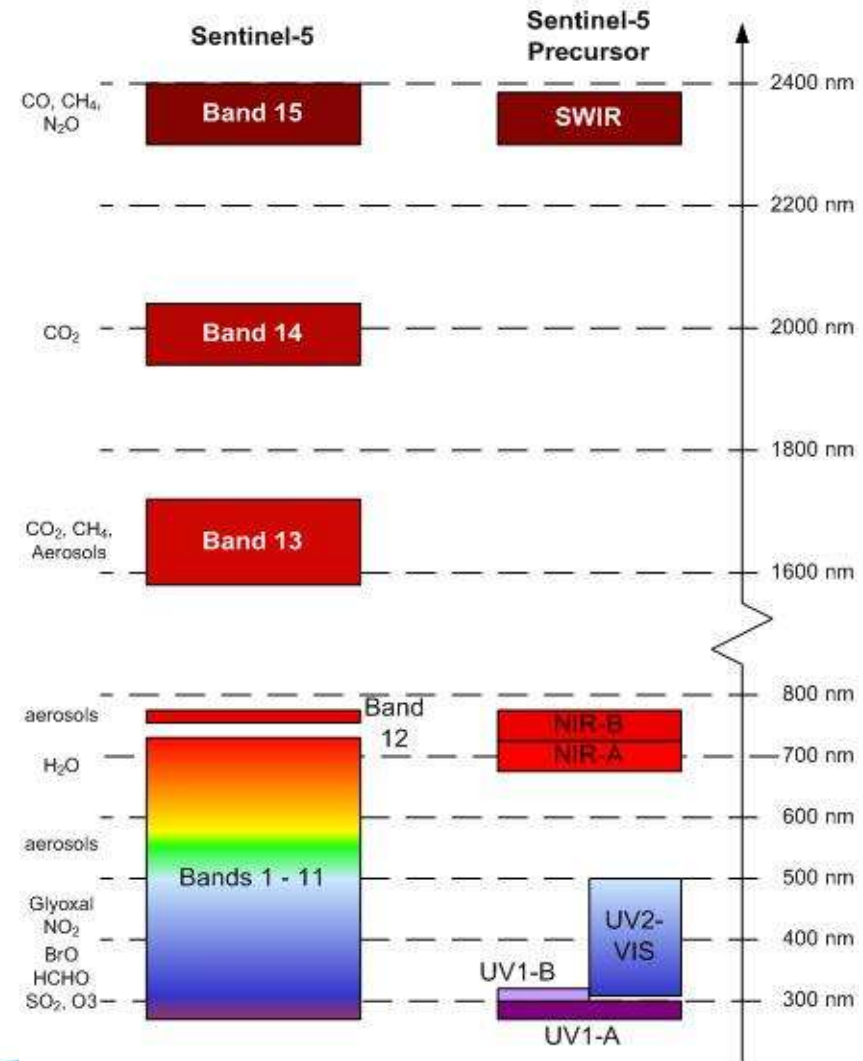
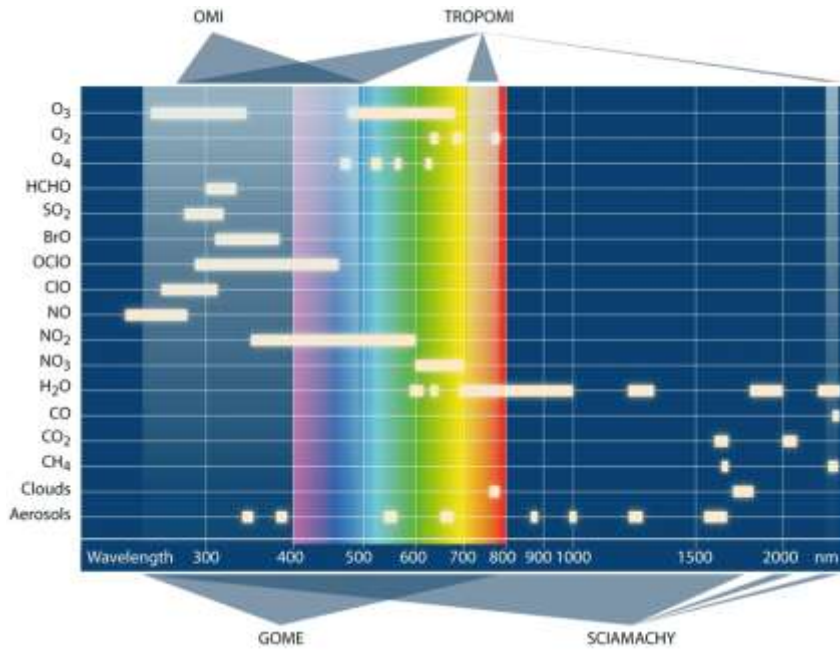
- An atmospheric chemistry mission in the frame of the GMES Space Component Programme
- The S5P system comprises:
 - the spacecraft,
 - the TROPOMI payload (jointly funded by ESA and the Netherlands),
 - a basic ground segment
 - the launch and in-orbit commissioning
- TROPOMI is a UV-VIS-NIR-SWIR imaging spectrometer providing atmospheric chemistry measurements at high temporal and spatial resolution:
 - A global observing system for climate change and air pollution
 - Monitoring tropospheric composition
 - Filling the data gap in the next decade
 - Understanding the composition of the troposphere and its variability
 - Mapping of anthropogenic and natural emissions on a global scale

A gap-filler mission...



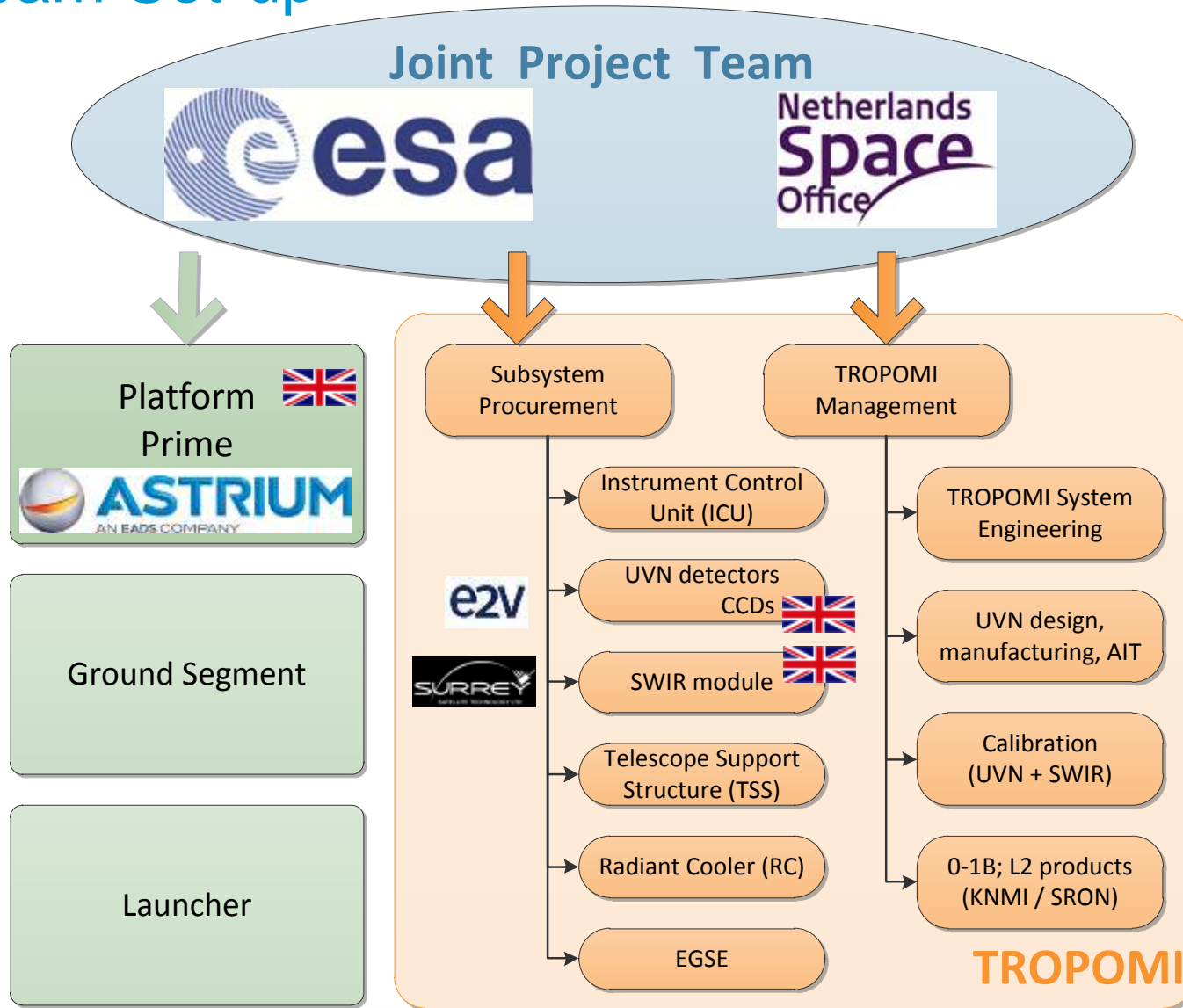
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A gap-filler mission... and more!



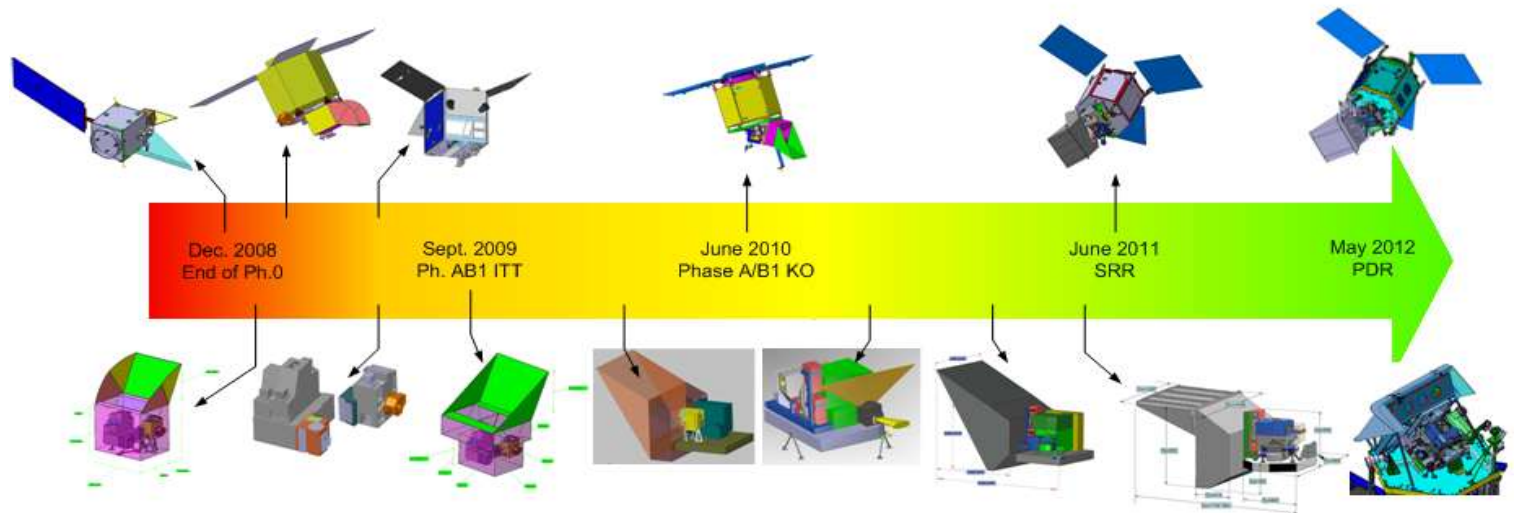
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Team Set-up



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Platform and Payload Evolution



		Phase 0	Sep 2009 (AB1 ITT)
Design Originator		Astrium SAS	Dutch Space
Mass		150 kg	171 kg
Power		65 – 136 W	180 – 209 W
Detector Temperature	UVN	210, 230, 250 K	230 or 250 K
	SWIR	160 K	135 K
Radiator Area		0.2 m ²	0.75 m ²
Data Volume		65 Gbit	92 Gbit

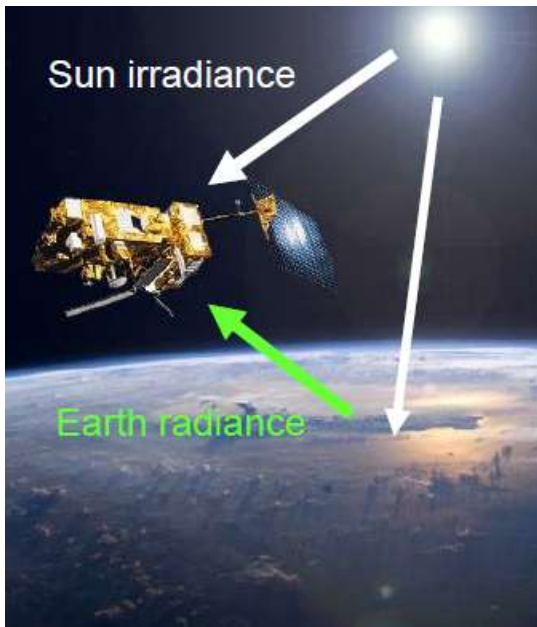
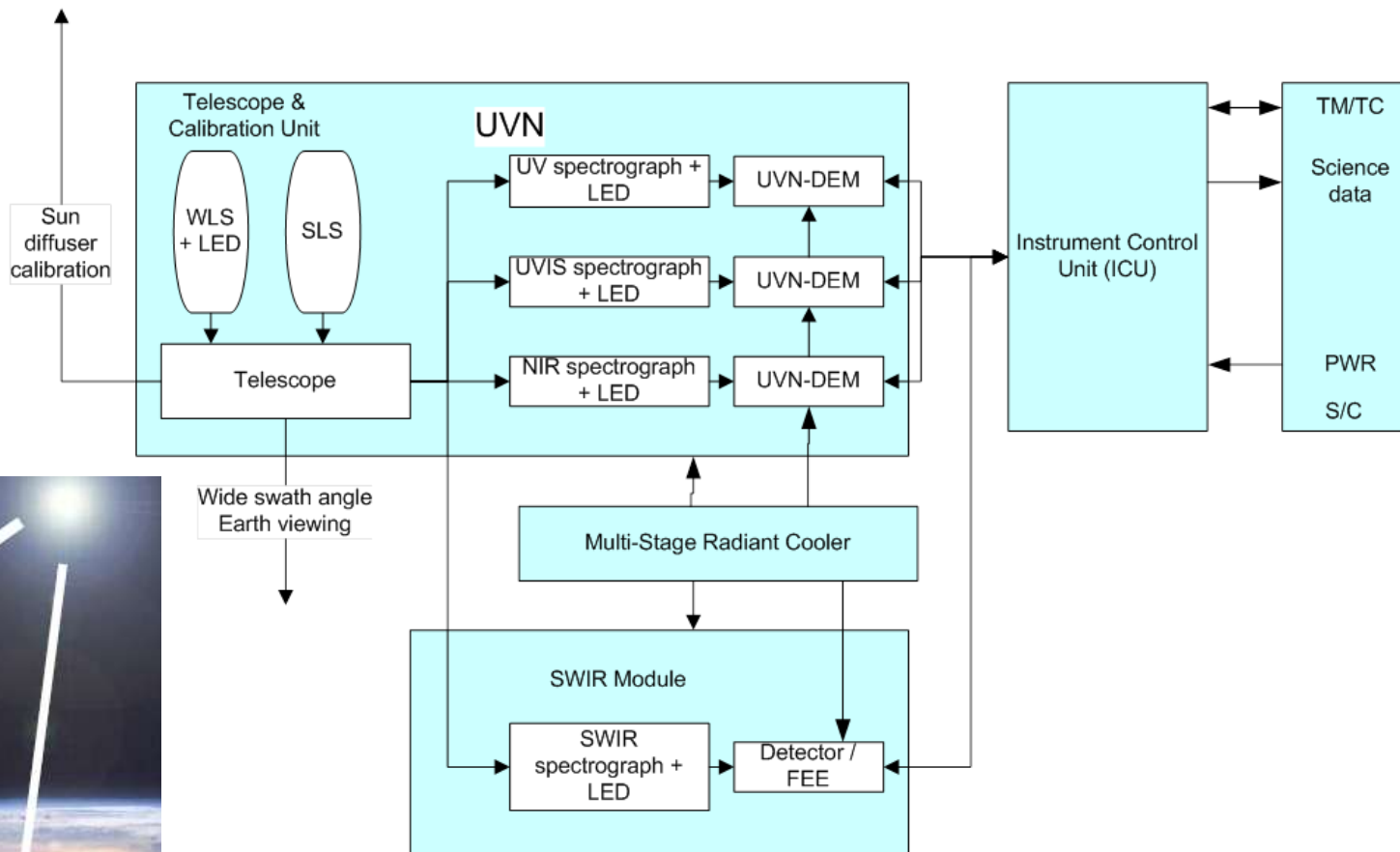
April 2011	March 2012
Dutch Space	Dutch Space
230 kg	235 kg
164 – 382 W	164 – 382 W
219 K	219 K
135 K	135 K
1.5 m ²	1.5 m ²
120/139 Gbit	139 Gbit

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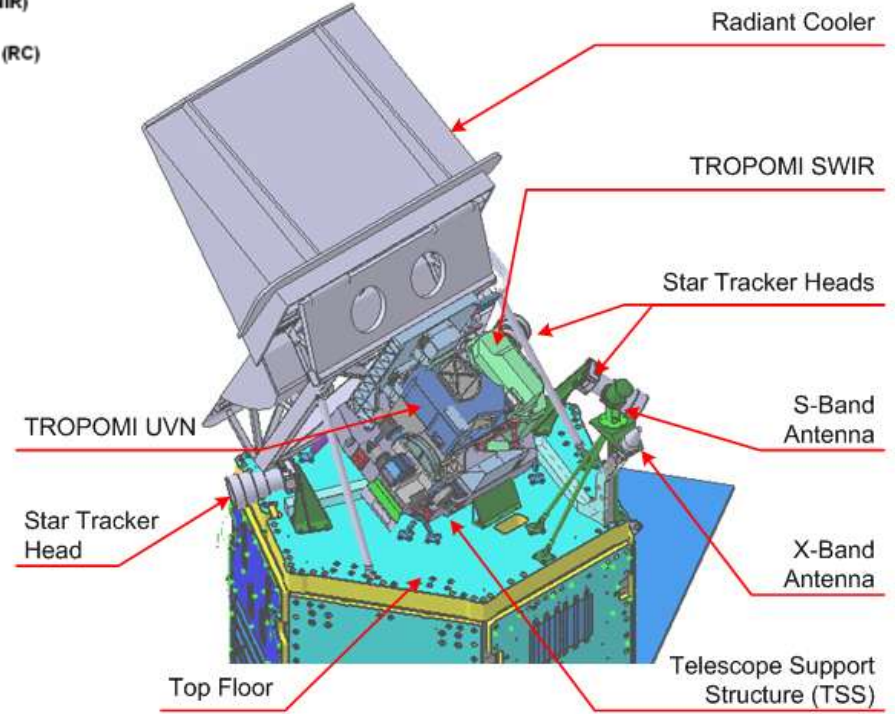
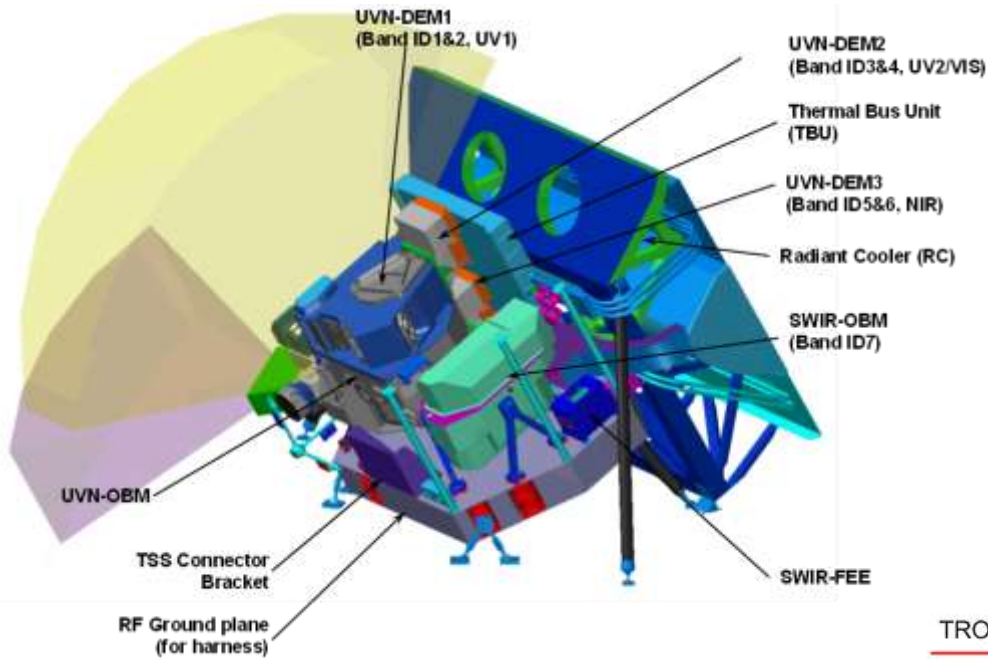
THE TROPOMI INSTRUMENT

TROPOMI functional diagram



$$\text{earth reflectance} = \frac{\text{Earth radiance}}{\text{Sun irradiance}}$$

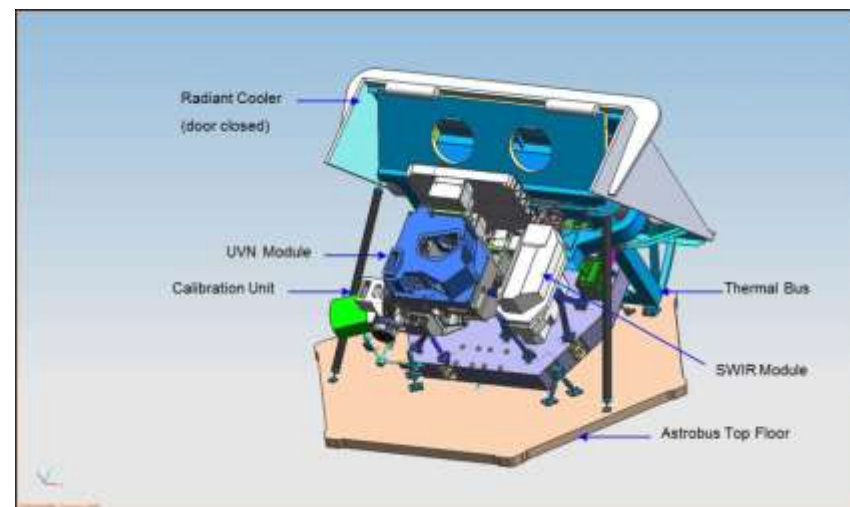
TROPOMI Configuration



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TROPOMI characteristics

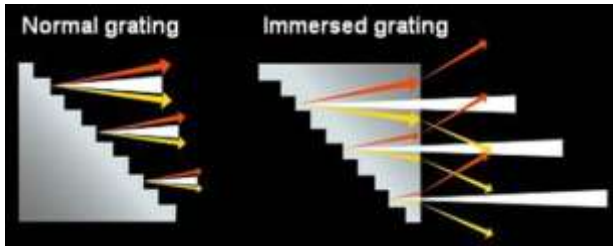
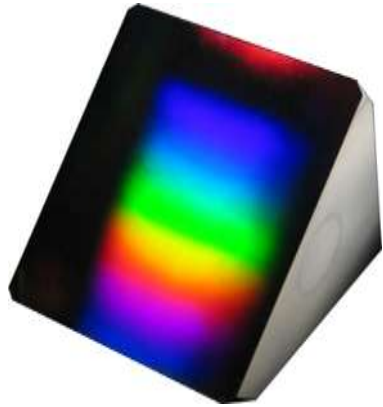
Property	Value
Mass TROPOMI Instrument	206.6 kg
Mass Instrument Control Unit	17.4 kg
Overall Instrument dimensions (stowed)	1.40 x 0.65 x 0.75 m
Average operational power	170 W
Science data rate	139 Gbit/orbit



Detector	Band ID	Spectral properties [nm]			Spatial sampling [km ²]
		Range	Resolution	Sampling	
UV	1	270-300	1.0	0.065	21 x 28
	2	300-320	0.5	0.065	7 x 7
UVIS	3	310-405	0.55	0.2	7 x 7
	4	405-500	0.55	0.2	7 x 7
NIR	5	675-725	0.5	0.1	7 x 7
	6	725-775	0.5	0.1	7 x 1.8
SWIR	7	2305-2385	0.25	<0.1	7 x 7

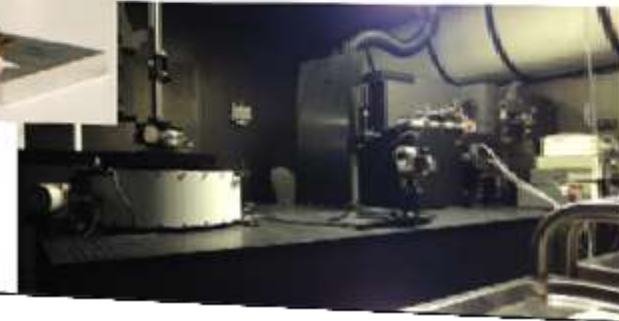
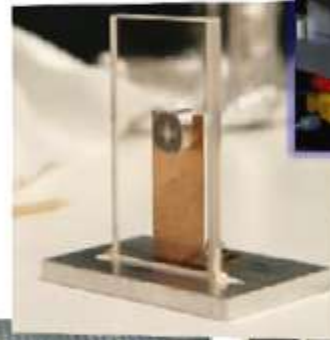
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TROPOMI Technology



Breadboards

- Diffusor
- Grating
- Telescope
- UV2VIS/NIR slit
- Scrambler
- Mounts
- Coatings



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SATELLITE OVERVIEW



A heritage platform for a low-cost mission

- Strong heritage from Spot 6/7 and Seosat (Ingenio)
- There are many benefits in developing other EO missions in the same way as S5P



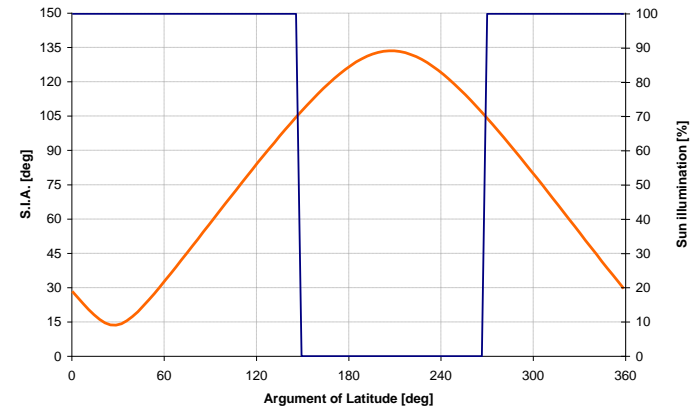
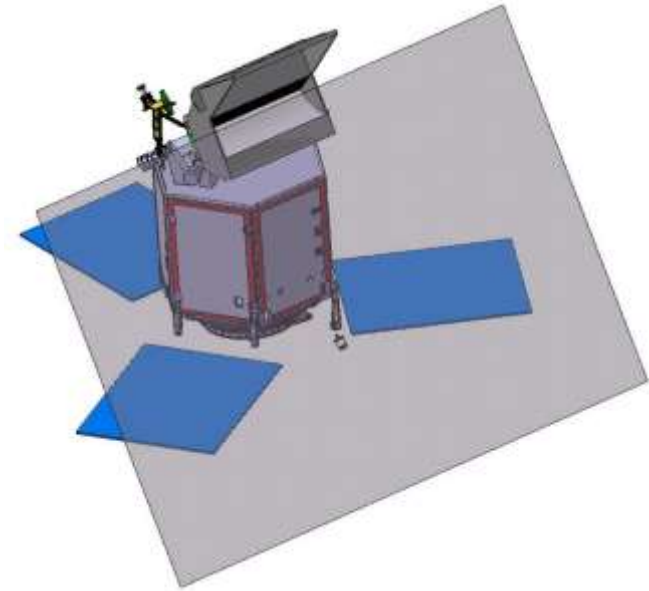
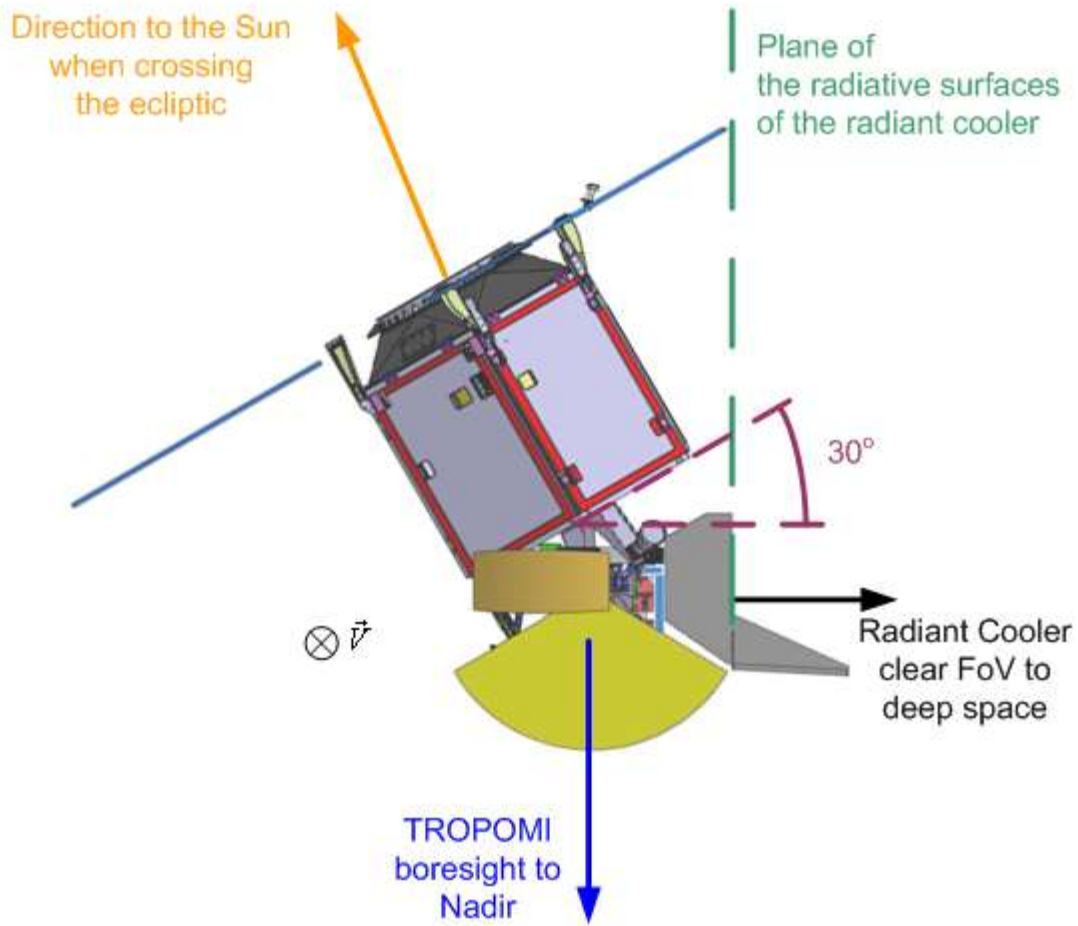
Spot 6 first image: Bora-Bora

Images credits:
Astrium-GEO



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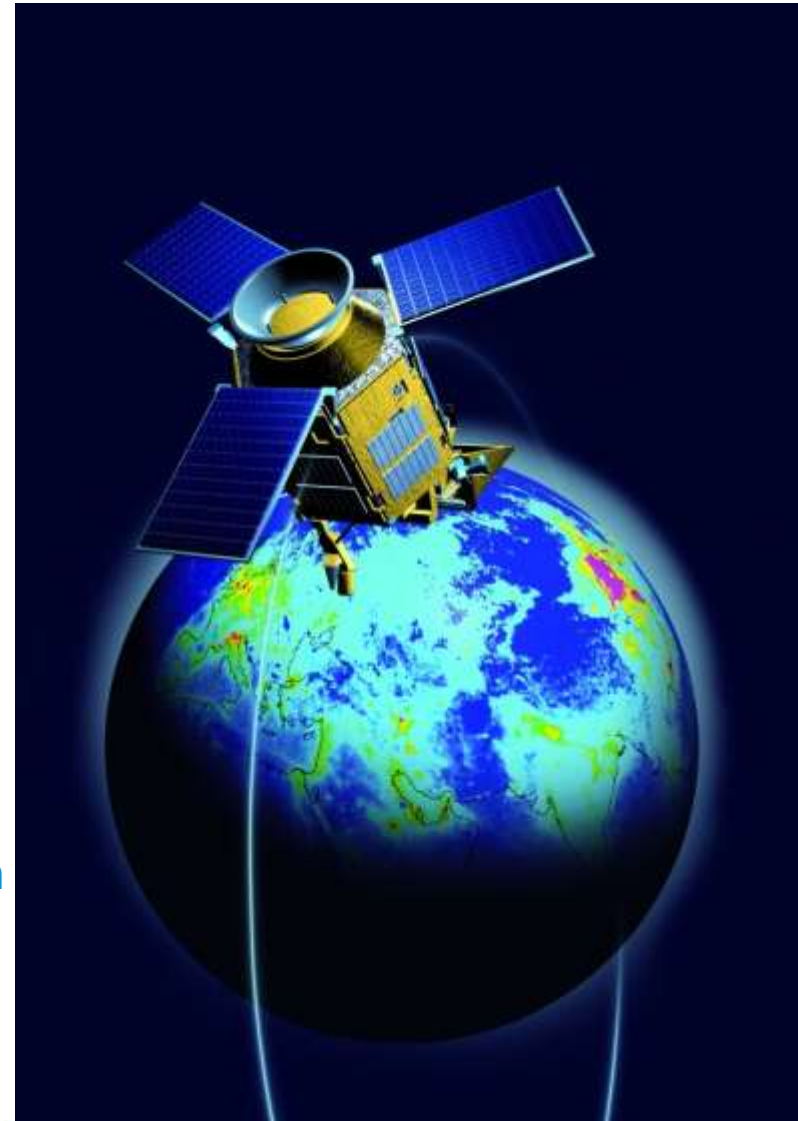
TROPOMI – Impact on Satellite Configuration



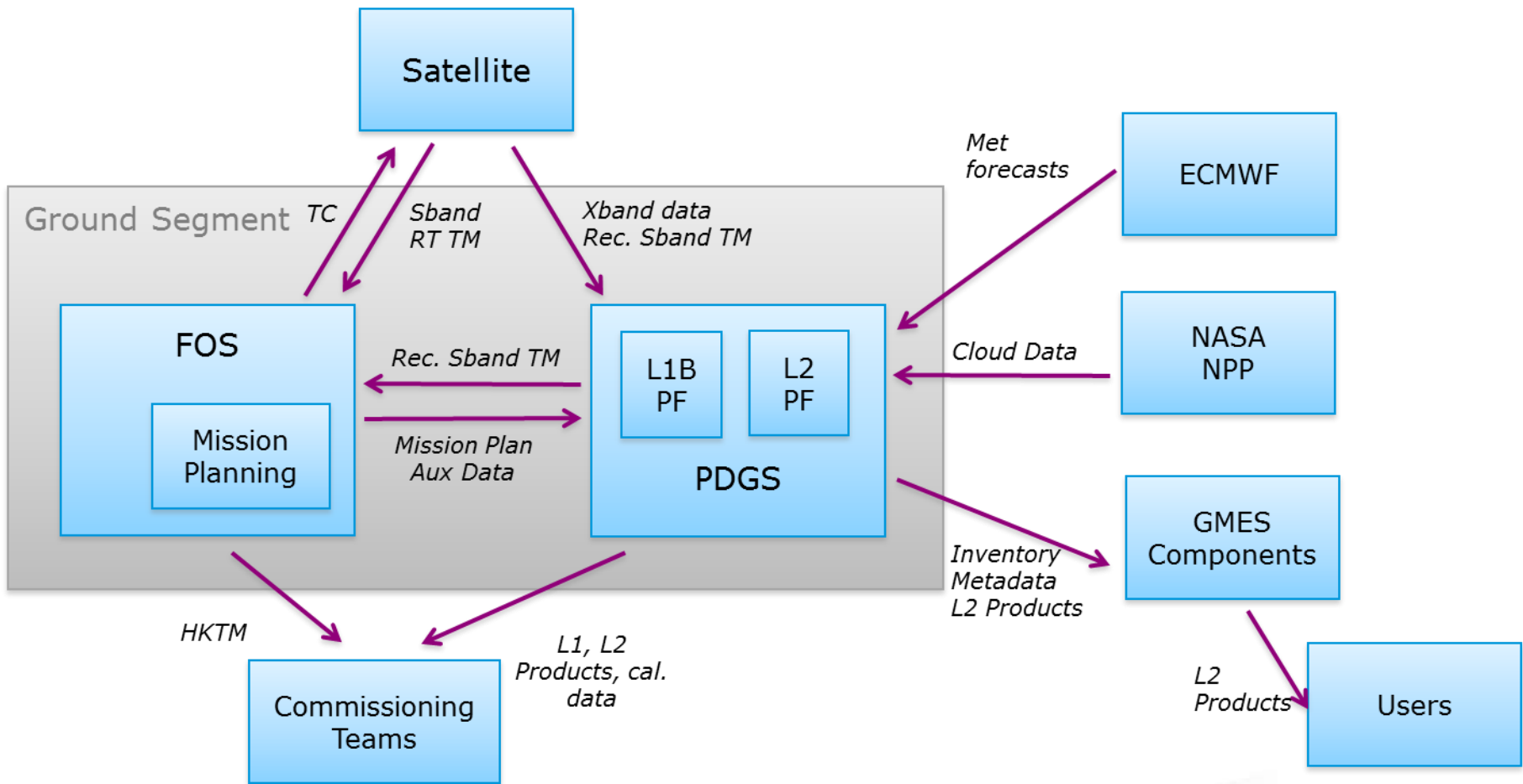
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Mission Characteristics

- 825 km SSO, 13:35h LTAN
- Platform: 1.7m dia., 1.6m height
- Mass: ~980kg
(incl. TROPOMI ~220kg)
- Solar Array peak power: ~1500W
(three fixed solar panels)
- Average power:
 - ~410W measurement,
 - ~550W calibration & downlink
- Mass Memory: 480 Gbits EOL
- TT&C S-band: 64kbps up / <582 kbps down
- Payload Data downlink X-band: 270Mbps



S5P ground segment



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- Harry Förster (Netherlands Space Office)
- The TROPOMI Team at Dutch Space
- Mike Cutter (SSTL)

THANK YOU