MICROWAT

Based on information provided by Craig Donlon, ESA and available at:

www.microwat.org

Microwat

Background

"All weather" SST recommended at CEOI Challenge Workshop in 2007.

Taken up by ESA resulting in study under "Support to Science element".

Objectives

To provide all weather (through-clouds) contemporaneous SST (Sea SurfaceTemperature) & OVW (Ocean Vector Wind) measurement with unprecedented spatial and radiometric resolutions.

Achieves spatial resolutions as high as 15 km, radiometric resolution increased by a factor of two.

Requirements

Driven by Eumetsat post-EPS expert group for ocean obs (Stammer et al, 2007)

Microwat mission objectives

Air-sea interaction

- understand the physical and bio-chemical air-sea interaction processes,
- understand internal waves and the mesoscale in the ocean, its relevance to heat and energy transport, and its influence on primary productivity
- quantify marine ecosystem variability, and its natural and anthropogenic physical, biological and geochemical forcing

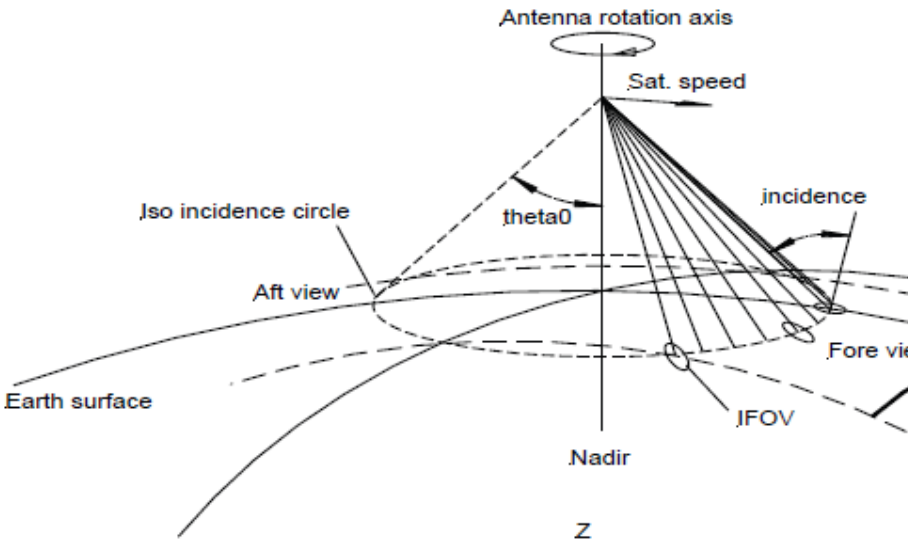
Ocean and atmosphere modelling and prediction

- accurate knowledge of the contemporaneous global OVW and SST distribution and temporal variation at finer spatial resolution

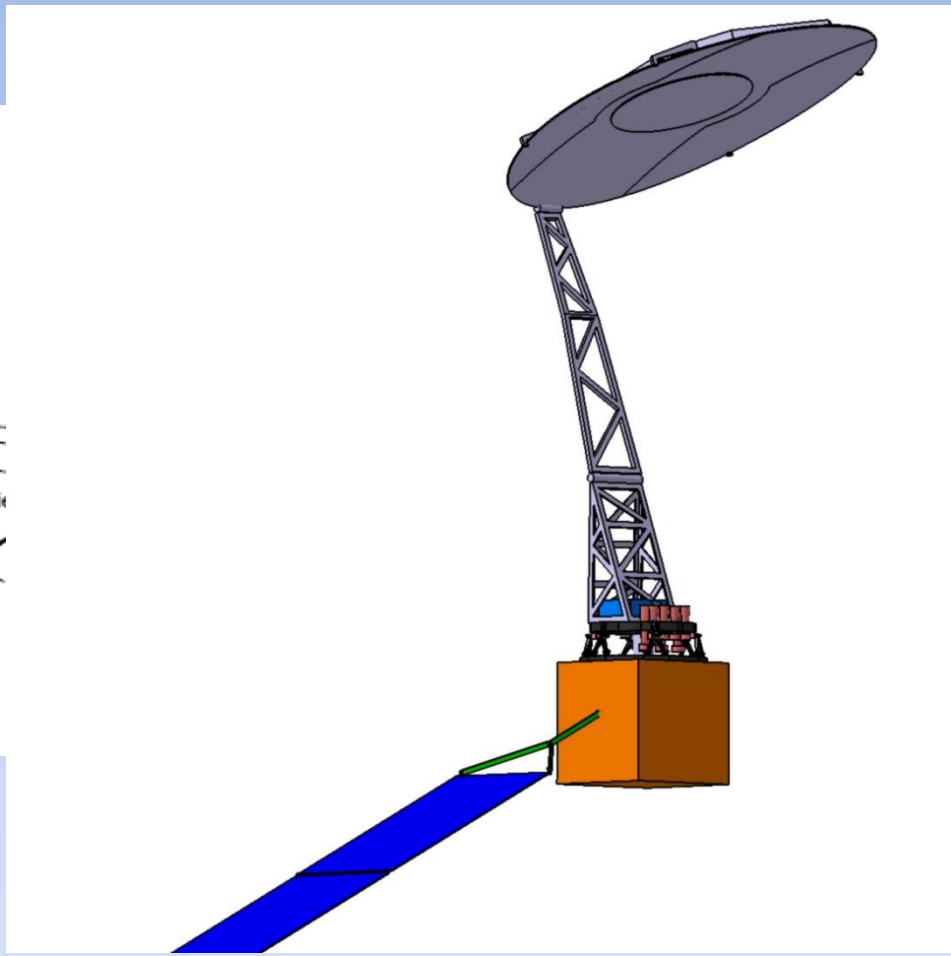
Climate applications

- understand land/ocean interactions in terms of natural and anthropogenic forcing
- provide reliable model- and data-based assessments and predictions of the past, present, and future state of the ocean

Microwat – observation geometry



Microwat observation geometry



Courtesy of Karl Atkinson, Astrium

Chief Attributes

- 2 main channels and one optional
  - 6.9 GHz V for SST
  - 18.7 GHz H&V for OVW
  - Optional 10.65 GHz H&V for SST
- Sampling of 15 x 15 km – potentially 10 km along-track.
- The incidence angle is 53 deg +/- 1.5 deg (minimum wind dependence for SST)

- Convoy flight with Metop/post-EPS (< 10 minutes)
- Complementary wind obs with ASCAT-type instrument; polarimetry can provide information particularly at high wind speeds.
- Can perform both wind inter-calibration (against ASCAT-type) and SST calibration (against infra-red on Metop).
- 58% overlap with ASCAT for maximum inter-calibration

- RFI detection and mitigation hardware is proposed for all concepts.

Microwat – main features

Microwat main features

Altitude (Km)	**817**	**Km**			
Incidence (deg)	53	deg			
Rotation rate (rpm)	6.6	rpm			
Antenna diameter	7x5	m	Scan angle Fore & Aftview	130	deg
Ground speed along	6.601	Km/s	Swath	1590	Km
Ground speed across	589.9	Km/s			
Channel frequency		**6.9**	10.65	**18.7**	GHz
3 dB beam width		0.46	0.46	0.46	deg
Across track pixel size		14	10	10	Km
Along track pixel size		16	16	16	Km
Arithm. Mean of 2 axis		**15**	13	**13**	Km
Main purpose		**SST**	SST	**OVW**	
Channel type		**Polarimetric**	V&H	**Polarimetric**	
Integration time over pixel		25.43	25.43	25.43	ms
System noise temp.		395	423	648	K
Channel bandwidth		700	100	200	MHz
NEDT		**0.12**	0.28	**0.31**	K

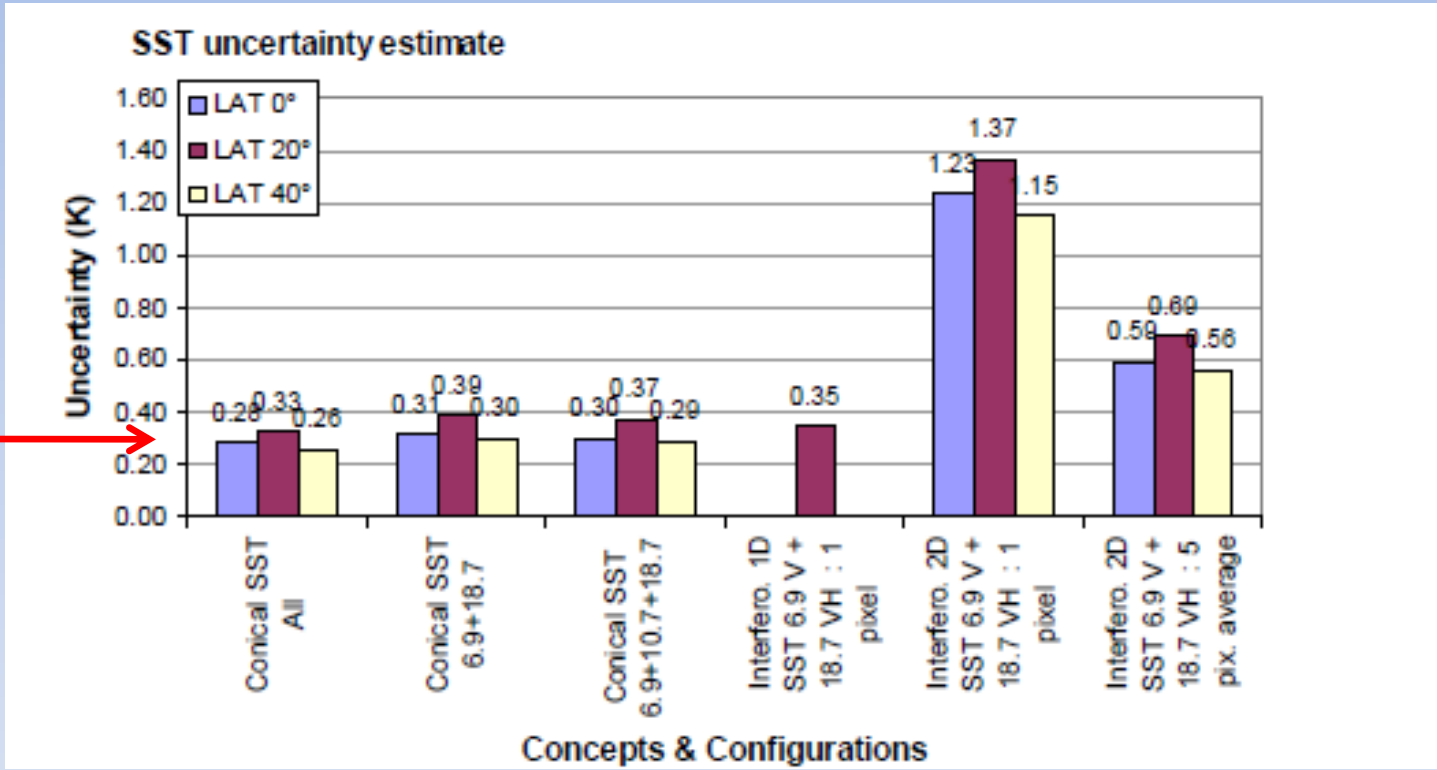
Antenna	Offset parabolic antenna : elliptical aperture size 7x5 m 3 solid pieces triptych.
Sampling	15x15 Km (lower grid possible by interpolation)
Dynamic range	2.7 - 350 K
RFI protection	Digital hardware implemented for RFI detection and mitigation at 6.9GHz & 18.7 GHz.

The instrument power consumption is 500W. The system power budget including margin is 1500 W.

The payload mass is 300 kg and the system mass is 1455 kg.

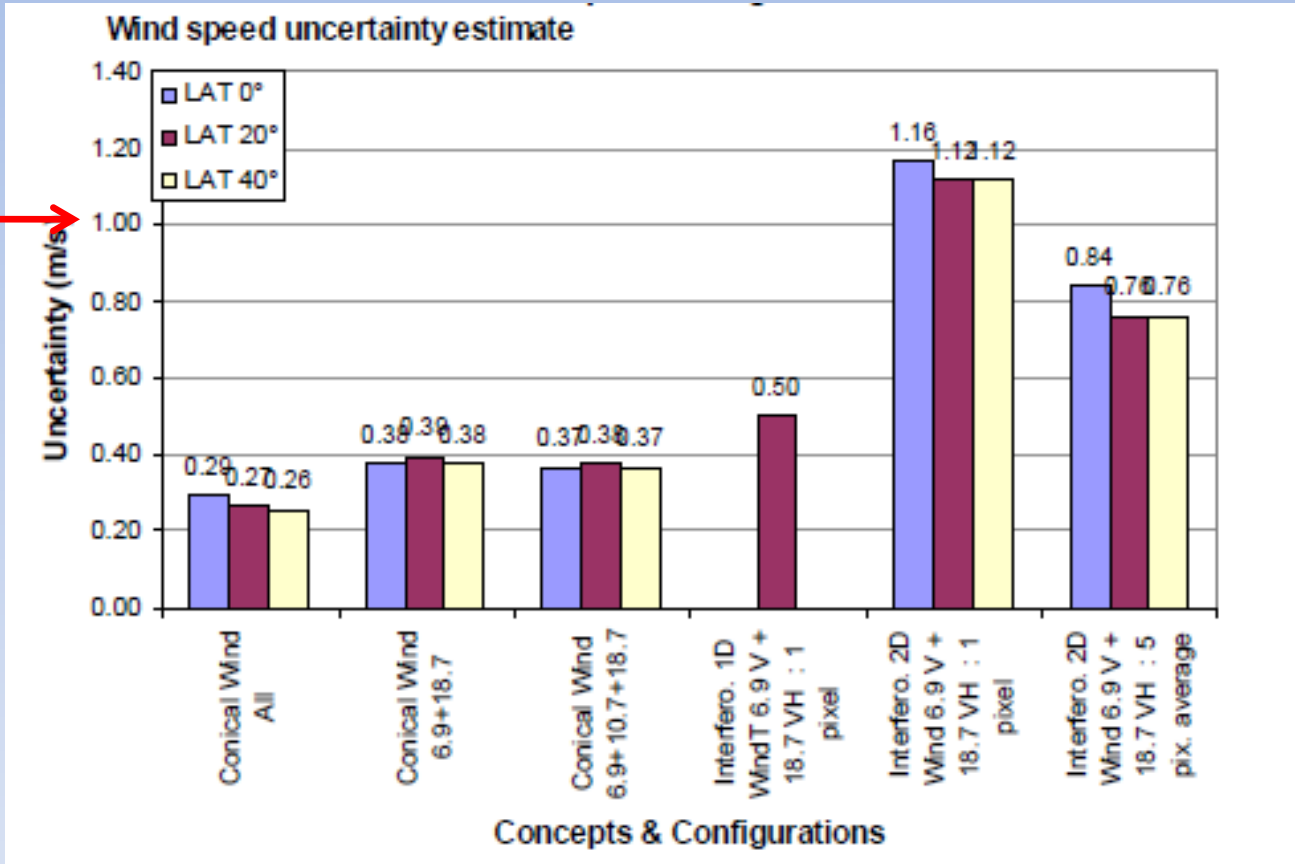
Microwat – SST performance

0.3 K goal

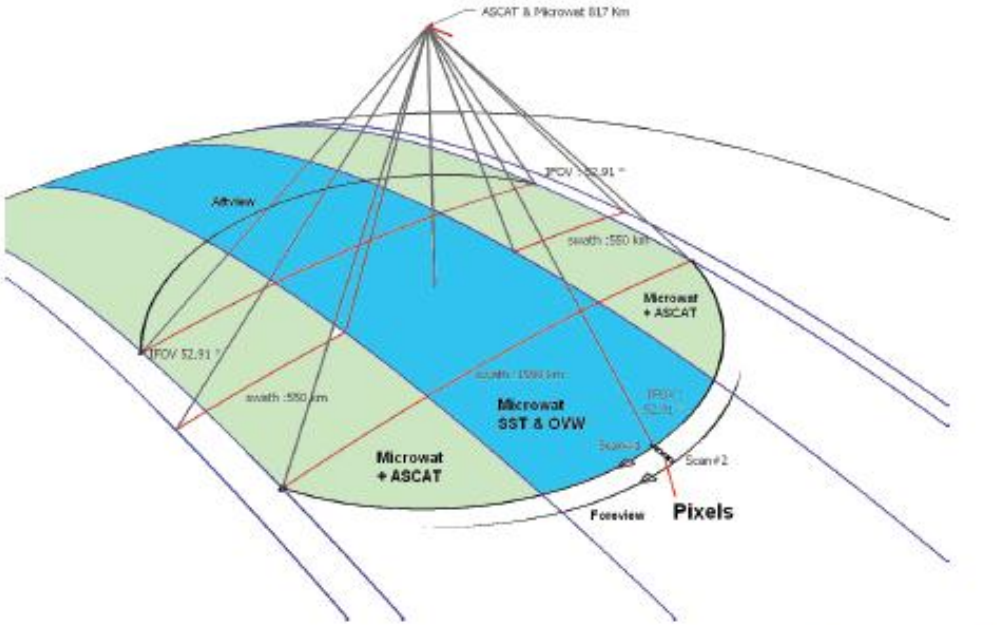


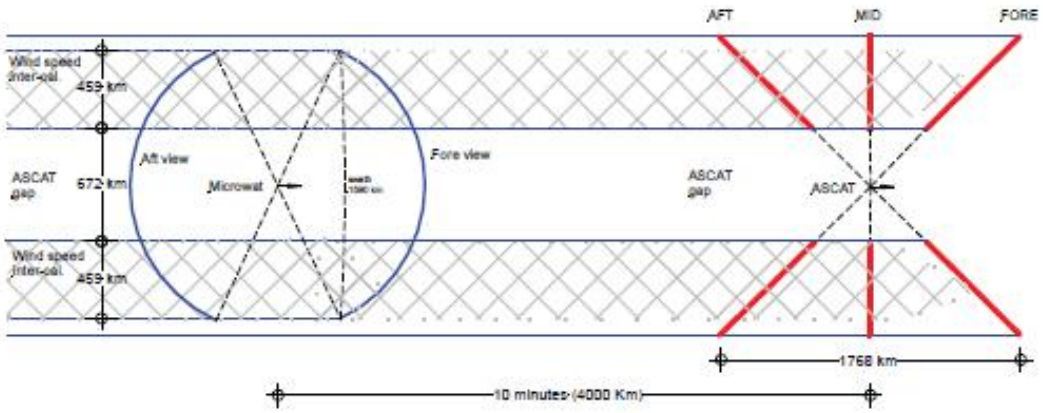
Microwat – OVW performance

1.0 m/s goal



Convoy flying



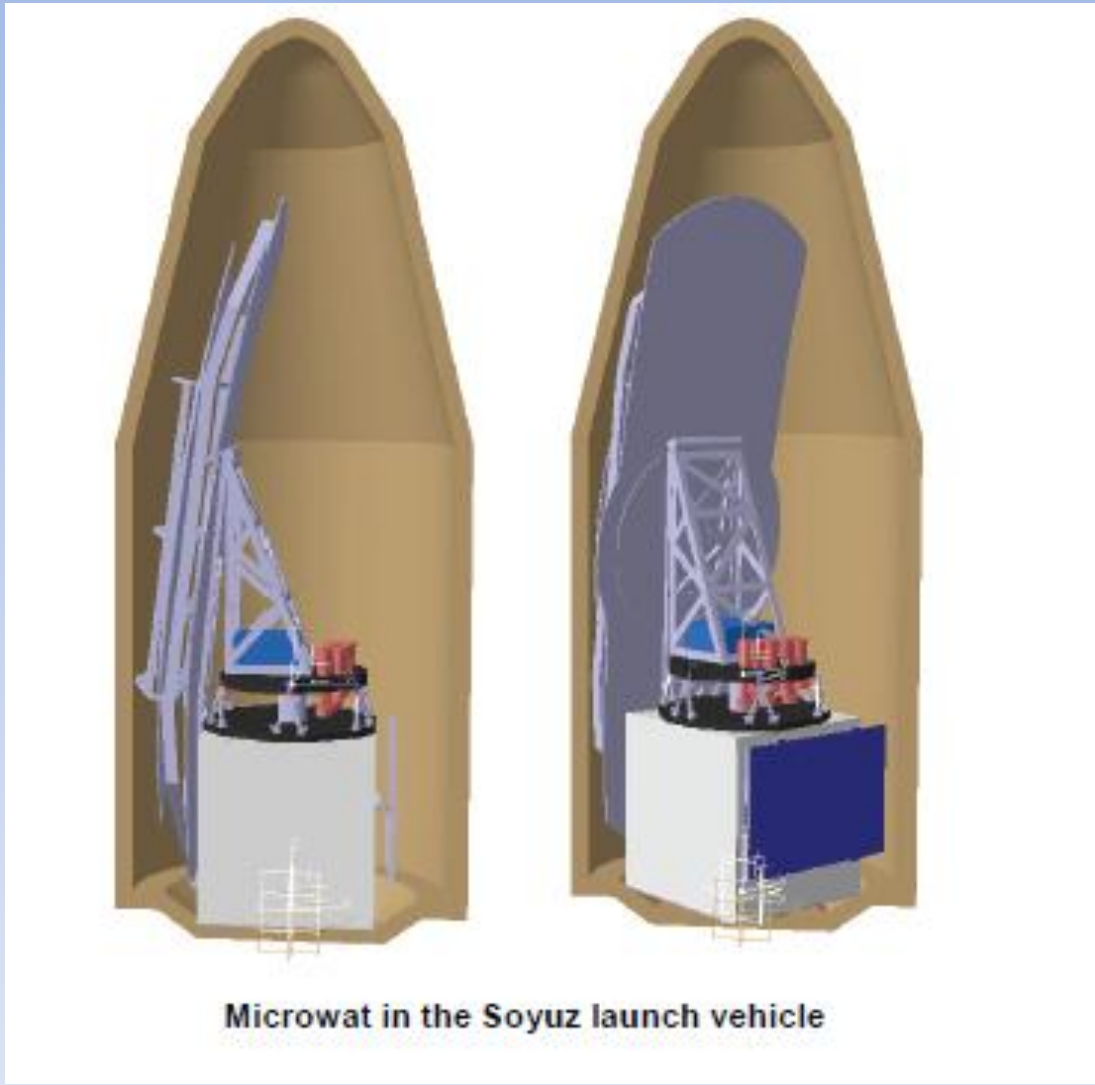


Metop/ASCAT and Microwat swaths superimposed:

Top: coverage

Bottom: real-time snapshot

Microwat



Microwat in the Soyuz launch vehicle