

MONITORING WEATHER AND CLIMATE FROM SPACE



Evolution of the EUMETSAT Advanced Retransmission Service (EARS)

Anders Soerensen
EUMETSAT



EUMETSAT Advanced Retransmission Service (EARS)

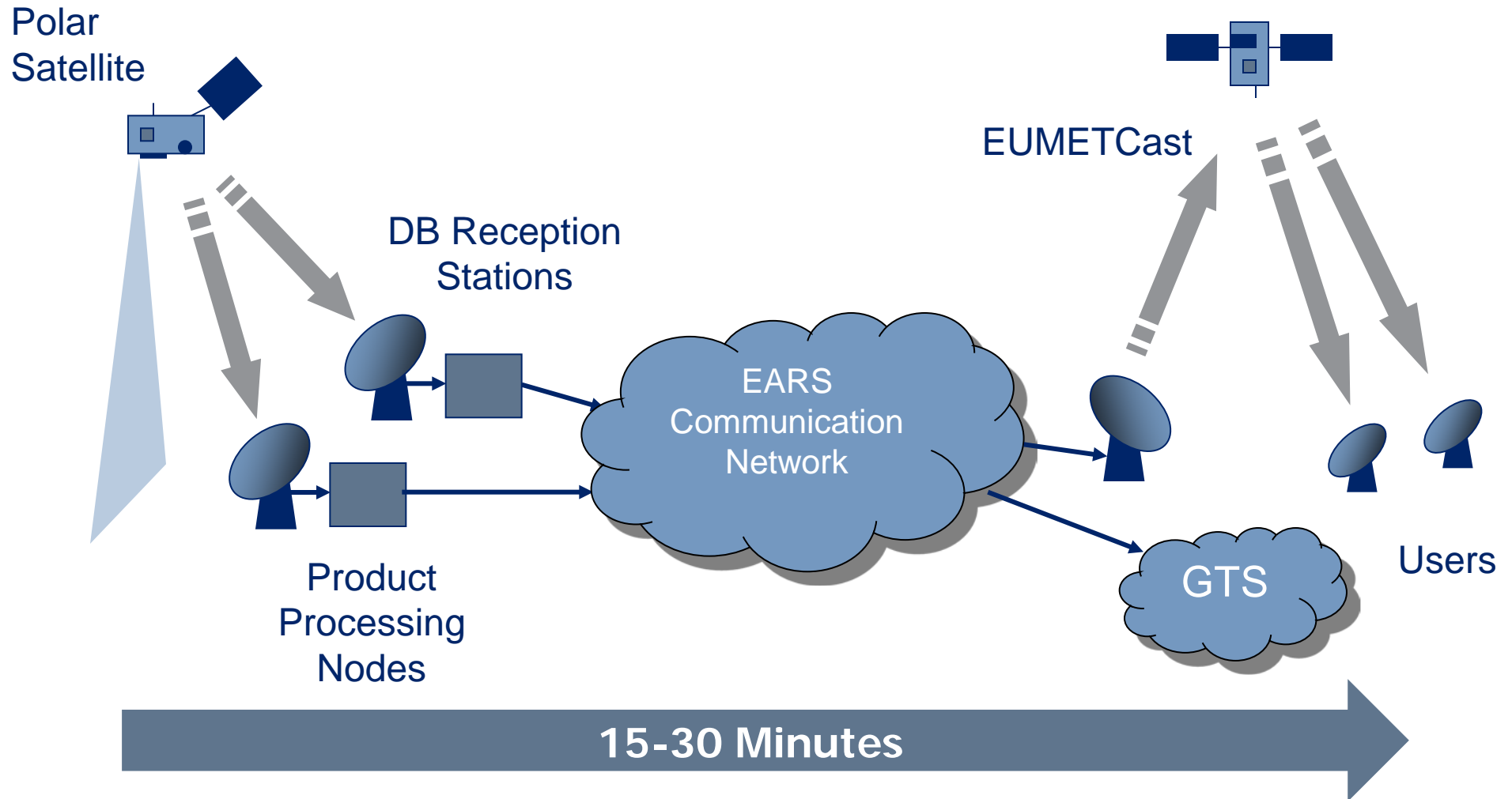
Objective

To provide Users with high timeliness regional data from Polar Orbiting Meteorological Satellites in support of Numerical Weather Prediction (NWP) and Nowcasting (NWC).

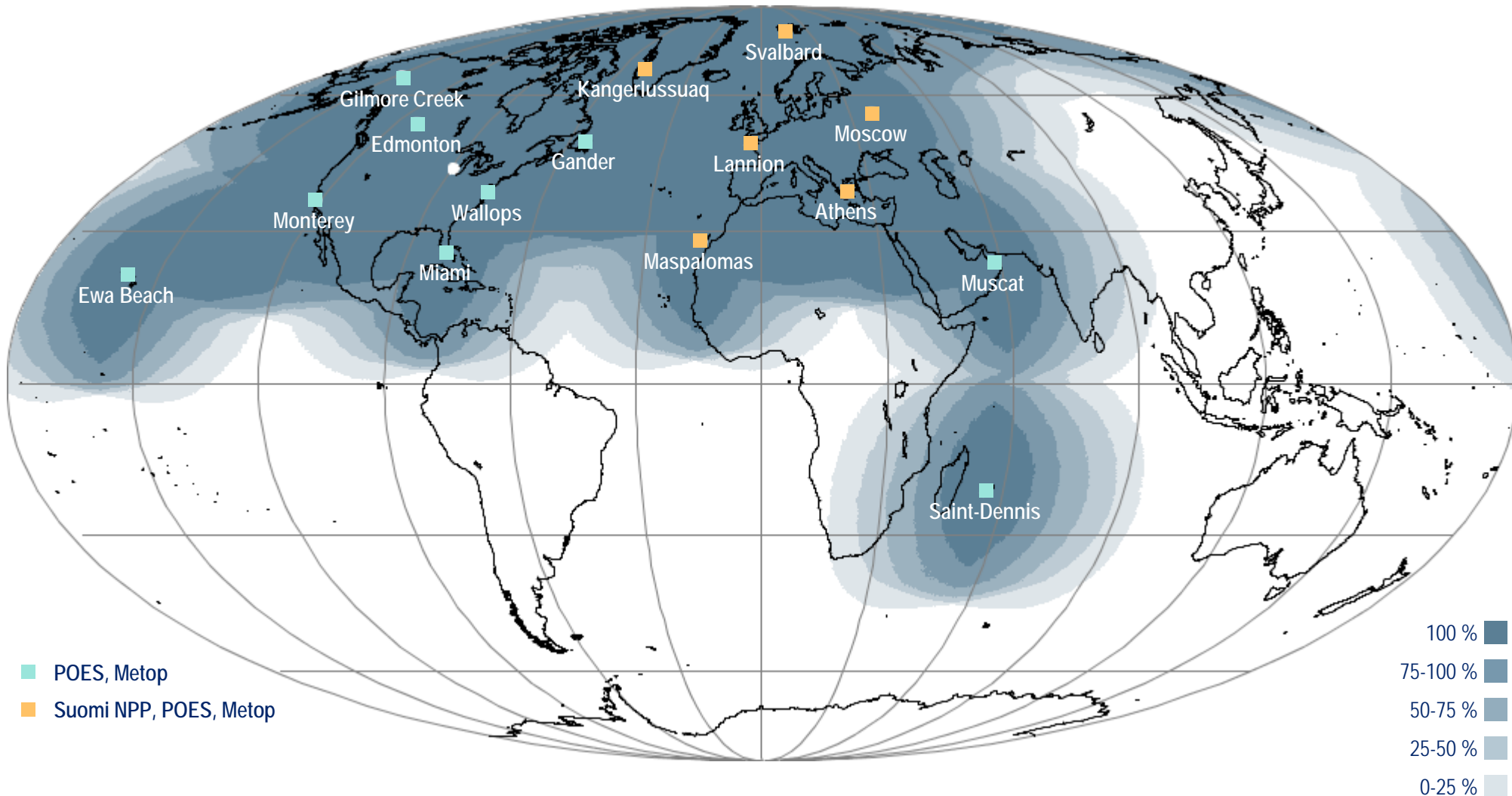
Principle

Achieved through a network of Direct Broadcast stations receiving, processing and distributing data to Users in near real time.

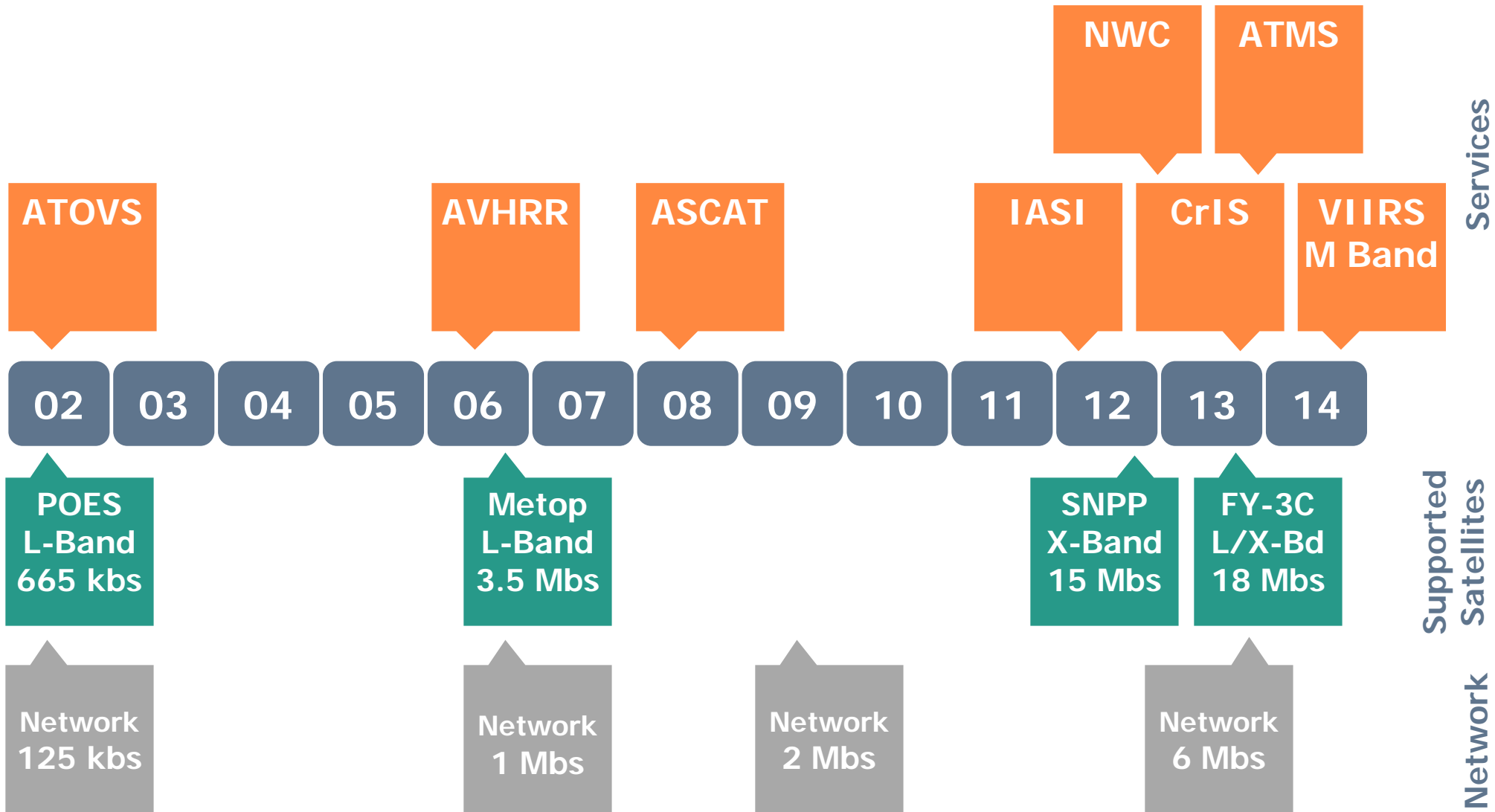
The EARS System



Current Geographical Coverage



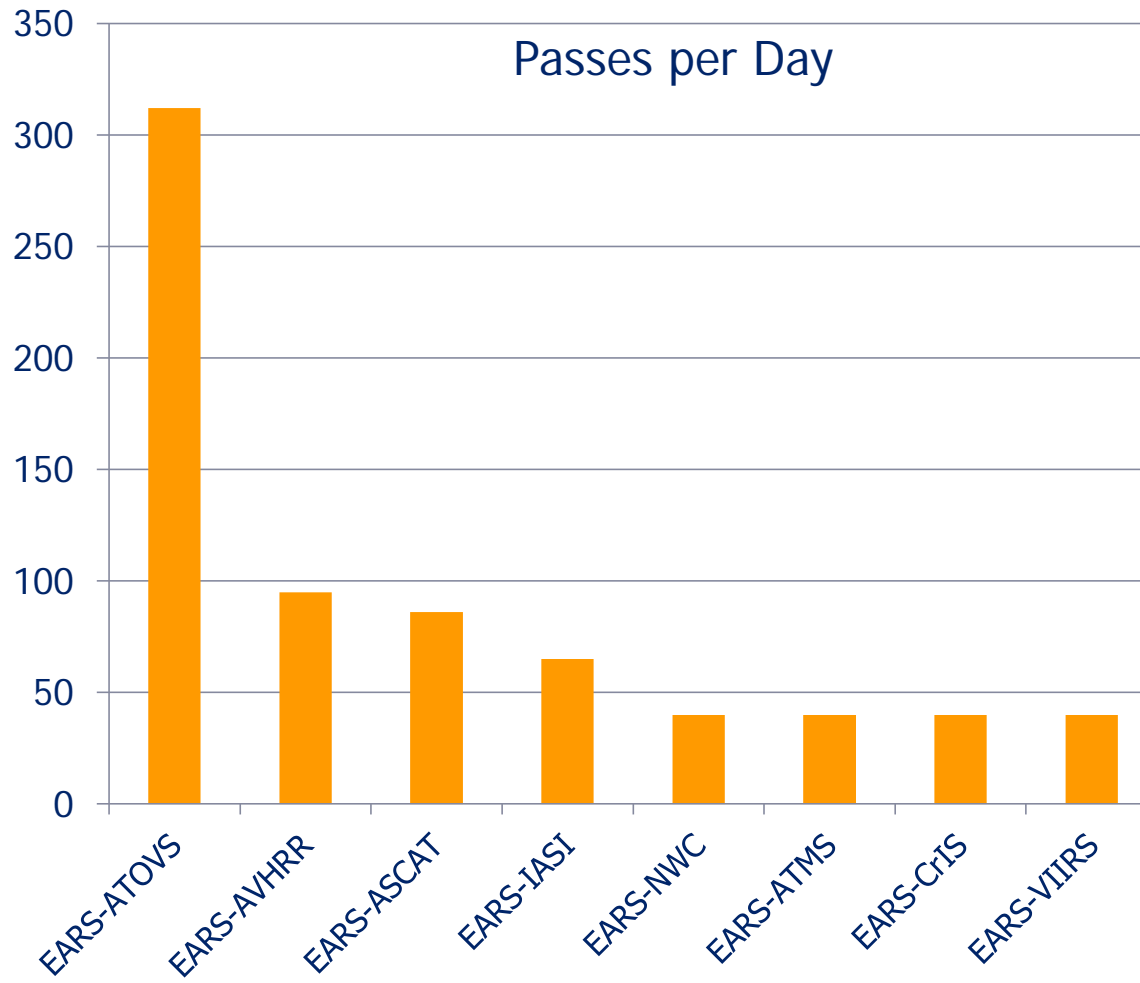
Past Evolution 2002-2014



EARS - Services in Numbers

	Daily Data Volume (MB)	Daily Data Volume (%)	Number of Registered Users
EARS-ATOVS	624	5%	1088
EARS-AVHRR	1341	11%	1435
EARS-ASCAT	129	1%	758
EARS-IASI	132	1%	241
EARS-NWC	1040	8%	202
EARS-ATMS	96	1%	188
EARS-CrIS	520	4%	187
EARS-VIIRS	8610	69%	146
Total	12492	100%	

EARS – Acquired Passes Per Day



International Cooperation (1/3)

Processing Packages

Package	Service	Level	Provider
AAPP	ATOVS, AVHRR	Level-1	NWP SAF
OPS-LRS	IASI	Level-1	NWP SAF
RT-STPS	ATMS, CrIS, VIIRS	Level-0	NASA DRL
CSPP	ATMS, CrIS, VIIRS	Level-1	SSEC, UW-Madison
ASCAT PPF	ASCAT	Level-1 and -2	EUMETSAT, KNMI
PPS	NWC	Level-2	NWC SAF
FY3L1PP	VASS, MERSI	Level-1	CMA

SAF Satellite Application Facility

International Cooperation (2/3)

DB Station Operators

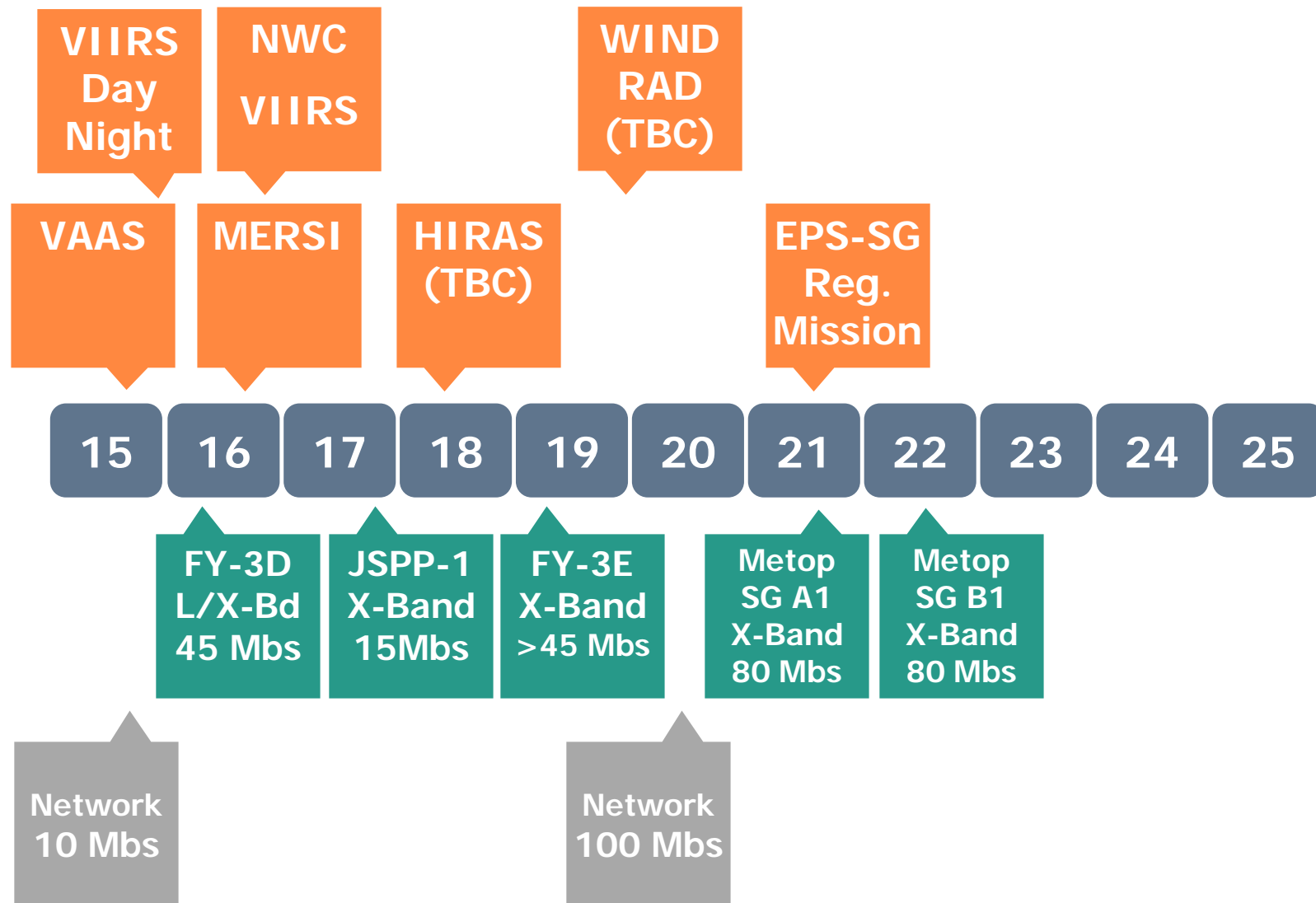
- Centre de Météorologie Spatiale – Météo-France (CMS)
- Danish Meteorological Institute (DMI)
- Hellenic National Meteorological Service (HNMS)
- Instituto Nacional de Técnica Aeroespacial (INTA)
- Kongsberg Satellite Services (KSAT)
- Meteorological Service of Canada (MSC)/Canadian Meteorological Centre (CMC)
- National Oceanic and Atmospheric Administration (NOAA)
- Directorate General of Meteorology and Air Navigation, Civil Aviation Affairs, Ministry of Transport and Communications, Sultanate of Oman (DGMAN)
- Russian Federal Service for Hydrometeorology and Environmental Monitoring (ROSHYDROMET)

International Cooperation (3/3)

Coordination and Guidelines

- **CGMS – The Coordination Group for Meteorological Satellites** (www.cgms-info.org):
 - Membership covers operators of meteorological and related R&D satellites and WMO;
 - Coordination includes: DB specifications, Satellite Orbits, Availability of Product Processing packages;
- **WMO** (www.wmo.int/pages/prog/sat/rars_en.php)
 - Coordination and guidelines for Regional ATOVS Retransmission Services (**RARS**), covering North and South America, Europe and Asia Pacific;
 - Recently Extended to X-band reception and new satellites under the name Direct Broadcast Network (**DBNet**).

Future Evolution 2015-2025



Services

Supported Satellites

Network

Extending EARS-VIIRS with the Day/Night Band (1/3)

- The EARS-VIIRS Service is currently providing the 16 VIIRS Moderate resolution channels (M-Band).
- In response to user request, new extension planned to include VIIRS Day/Night Band.
- The natural data rate of the VIIRS Day/Night Band SDR is 16 Mb/s, which is considered prohibitive for establishing such service.
- Data rate reduced by a combination of:
 - Storing geolocation data on Tie-Point grid only as for VIIRS M-Band Service (CVIIRS tool);
 - Storing Radiance using a tailored HDF5 Floating Point representation:
 - 12 bits Mantissa
 - Size of Exponent chosen dynamically depending on the actual range of radiance values in each granule
 - 1 bit Sign
 - Applying standard compression.

Extending EARS-VIIRS with the Day/Night Band (2/3)

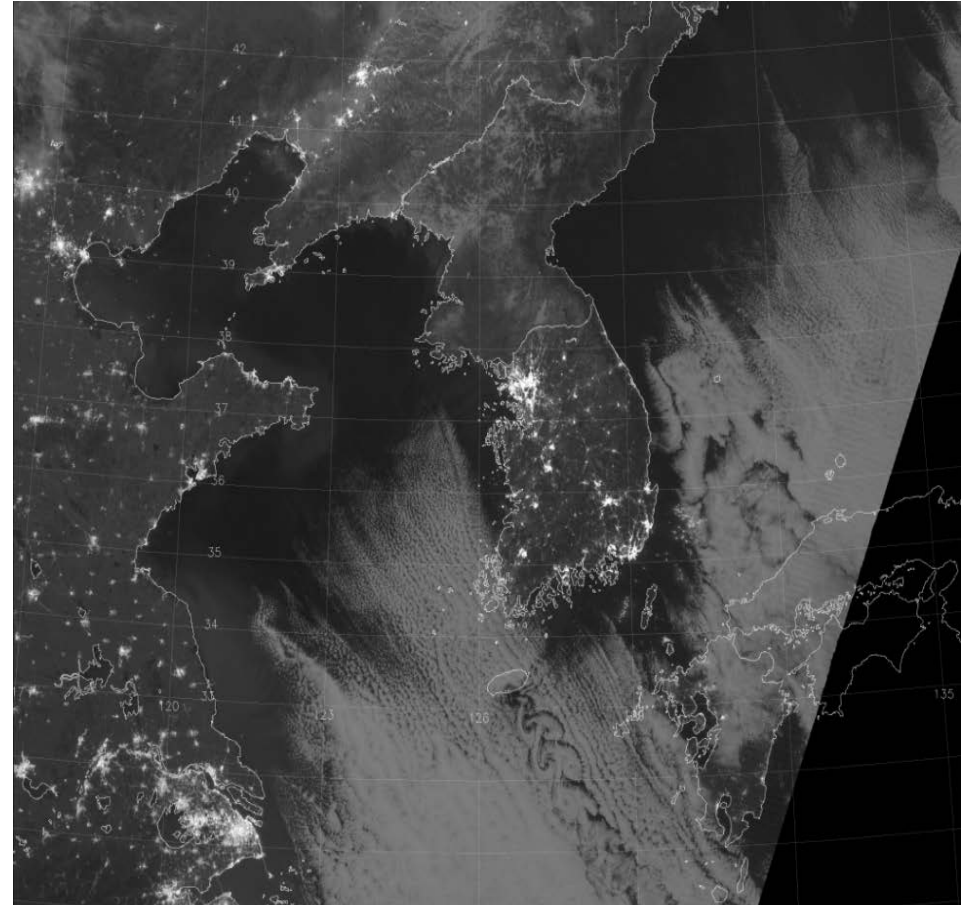
Communication Bandwidth Reduction:

	Radiances	Geolocation Data	Total	
	Mb/s	Mb/s	Mb/s	Fraction of Original
Original Format No Compression	1.39	15.02	16.41	100.0%
Original Format Compression	1.05	4.97	6.02	36.7%
Compact Format No Compression	0.65	0.15	0.80	4.9%
Compact Format Compression	0.53	0.09	0.62	3.8%

Extending EARS-VIIRS with the Day/Night Band (3/3)

Planned activities:

- New features need to be added to the Compact VIIRS SDR product format in order to support the VIIRS DNB.
- CVIIRS tool will be extended to permit users to reconstruct original VIIRS Day/Night Band SDR
- It is expected that the VIIRS Day/Night Band can be included in the EARS-VIIRS service on a trial basis by late 2015 or early 2016.



See of Japan - Day/Night Band image, taken 18:09 UTC 7 January 2015

New EARS FY-3 Service (1/2)

Selected FY-3 Instruments:

	Launch	2008	2010	2013	2015	2016	2018	2020	
	Orbit	10:15	13:40	10:00	14:00	06:00	14:00	06:00	
Instrument		FY-3 A	FY-3 B	FY-3 C	FY-3 D	FY-3 E	FY-3 F	FY-3 G	
Microwave Temperature Sounder		MWTS-I		MWTS-II					} ATOVS Type Sounders AMSU-A, MHS, HIRS ATMS
Microwave Humidity Sounder		MWHS-I		MWHS-II					
Infrared Atmospheric Sounder		IRAS							
Hyper Spectral Infrared Atmospheric Sounder					HIRAS				} Hyper Spectral Sounder CrIS, IASI
Visible and Infrared Radiometer		VIRR							} Imager AVHRR, VIIRS
Medium Resolution Spectral Imager		MERSI-I			MERSI-II				
Wind Radar						Wind RAD		Wind RAD	} Scatterometer (C+Ku) ASCAT (C)

Future Launch Dates and Orbits indicative, to be confirmed by CMA

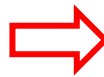
New EARS FY-3 Service (2/2)

	Launch	2008	2010	2013	2015	2016	2018	2020
	Orbit	10:15	13:40	10:00	14:00	06:00	14:00	06:00
Instrument		FY-3 A	FY-3 B	FY-3 C	FY-3 D	FY-3 E	FY-3 F	FY-3 G
Microwave Temperature Sounder		MWTS-I		MWTS-II				
Microwave Humidity Sounder		MWHS-I		MWHS-II				
Infrared Atmospheric Sounder		IRAS						
Hyper Spectral Infrared Atmospheric Sounder				HIRAS				
Visible and Infrared Radiometer		VIRR						
Medium Resolution Spectral Imager		MERSI-I		MERSI-II				
Wind Radar						Wind RAD		Wind RAD

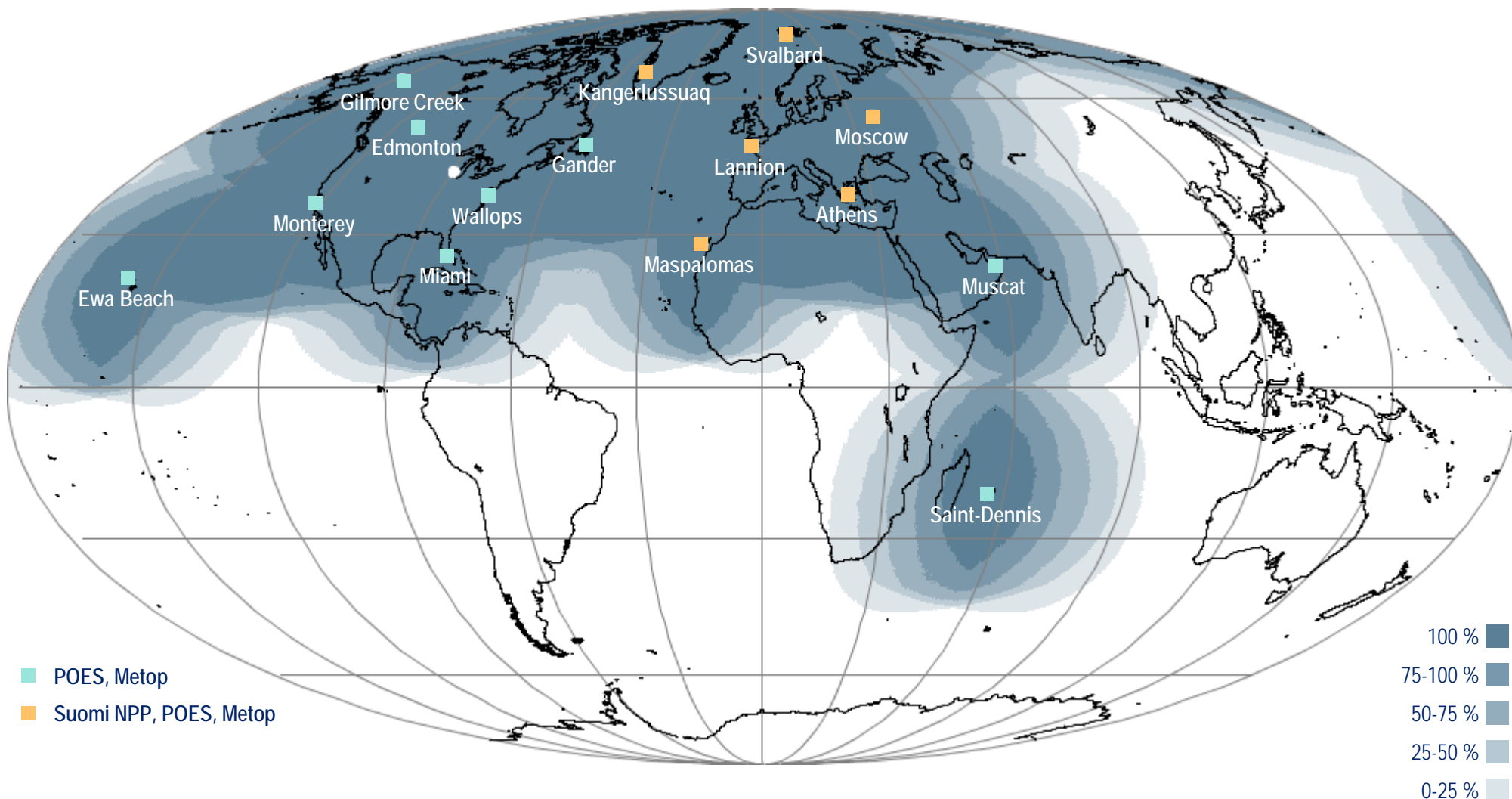
**Regional
FY-3 Sounder Service
EARS-FY3**

**Regional
FY-3 MERSI Service
EARS-MERSI**

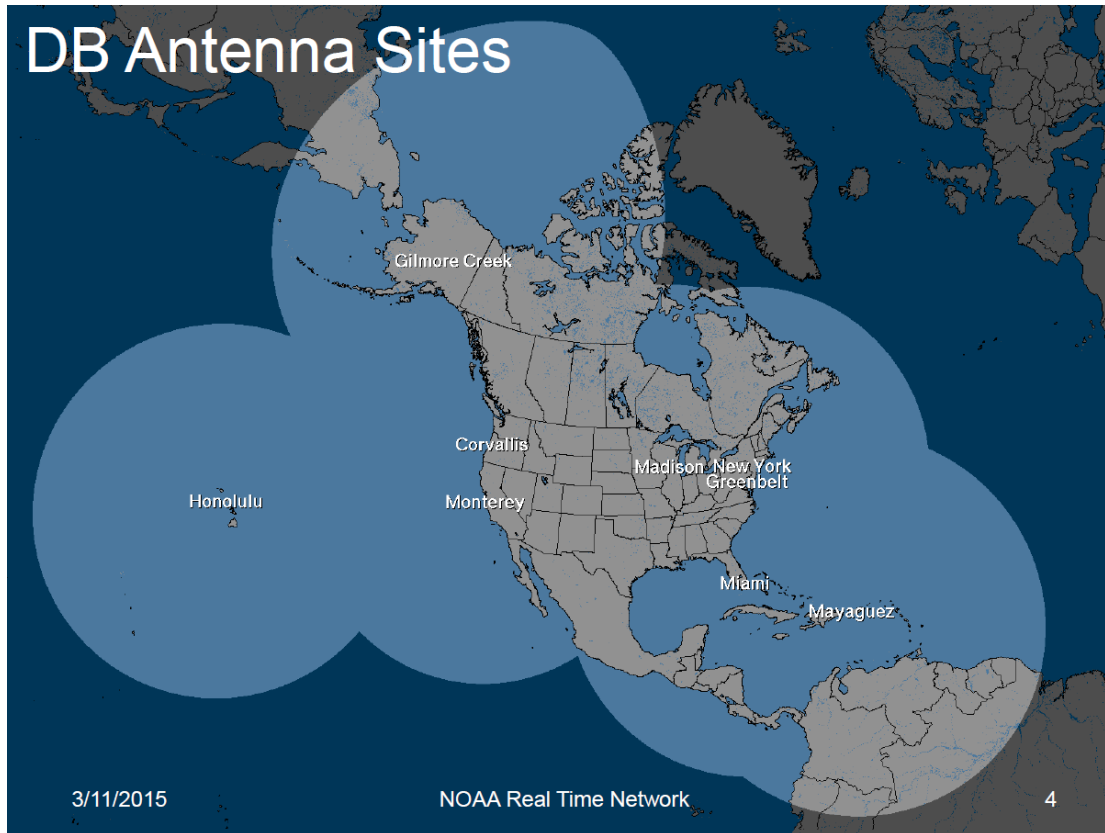
Future Launch Dates and Orbits indicative, to be confirmed by CMA



Extending the L/X-Band Coverage (1/2)

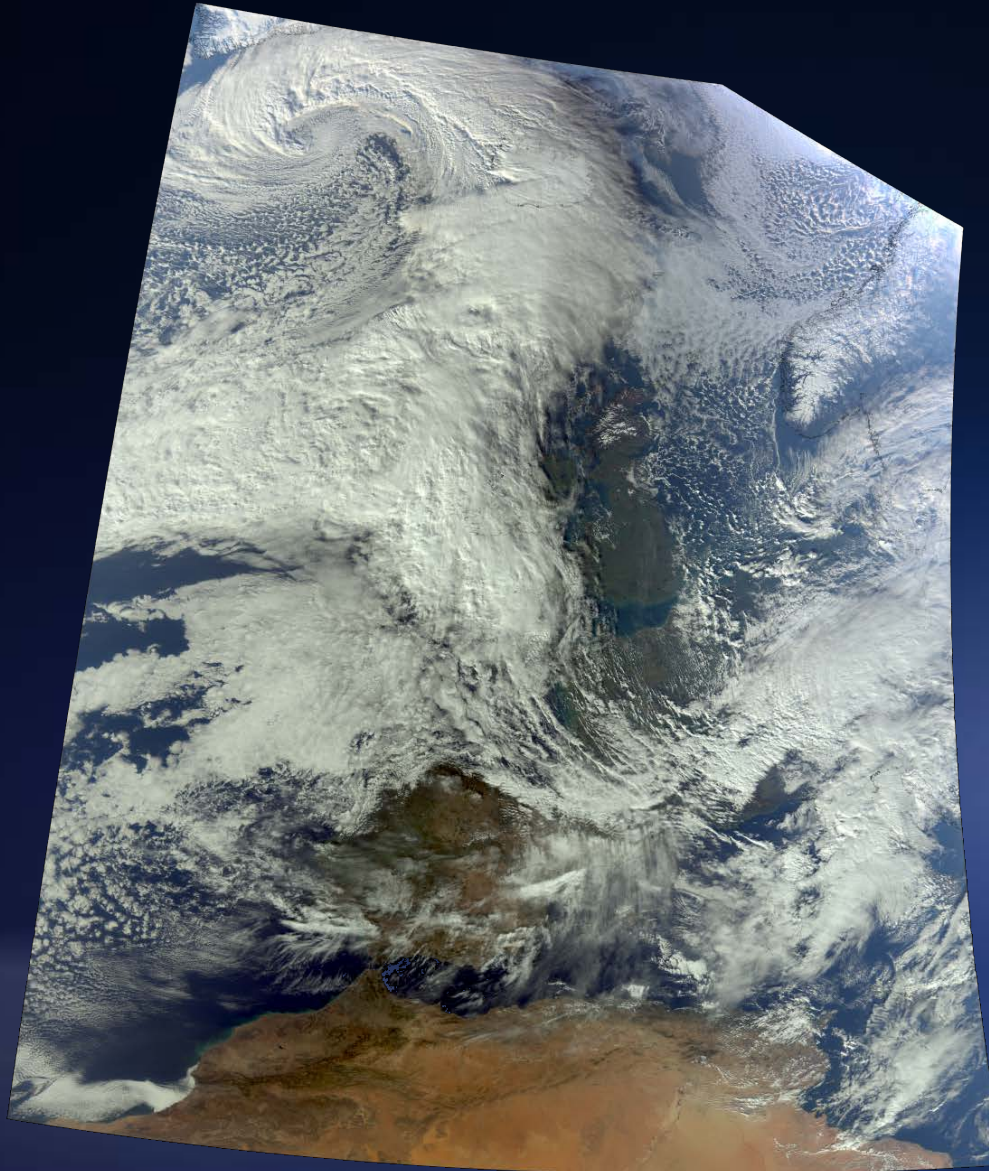


Extending the X-Band Coverage (2/2)

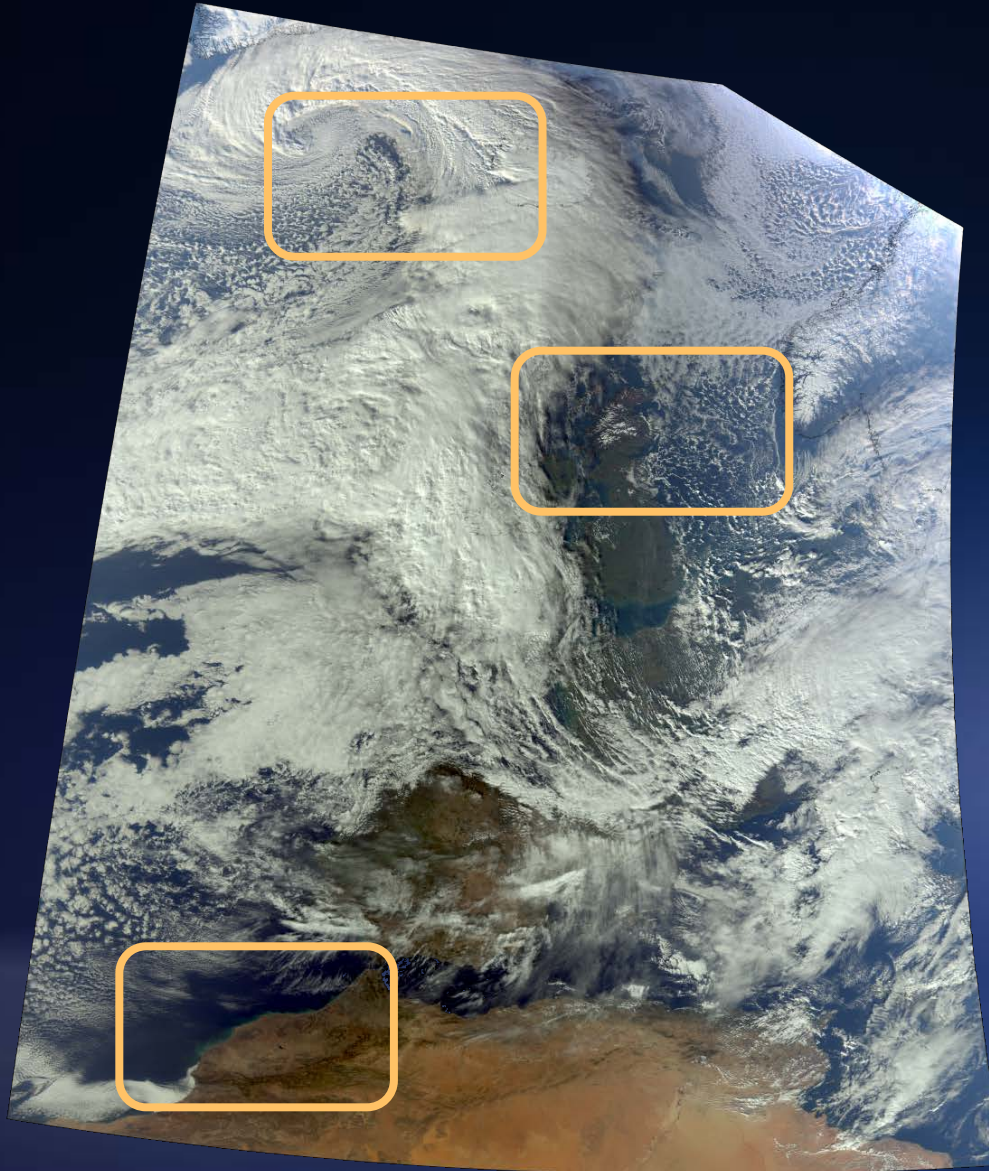


- **NOAA Real Time Network (NOAA/SSEC)**
- **Exchange with EUMETSAT is planned to provide additional data to European users, in particular from:**
 - **Suomi NPP**
 - **Metop**

EARS-VIIRS 10 November 2013

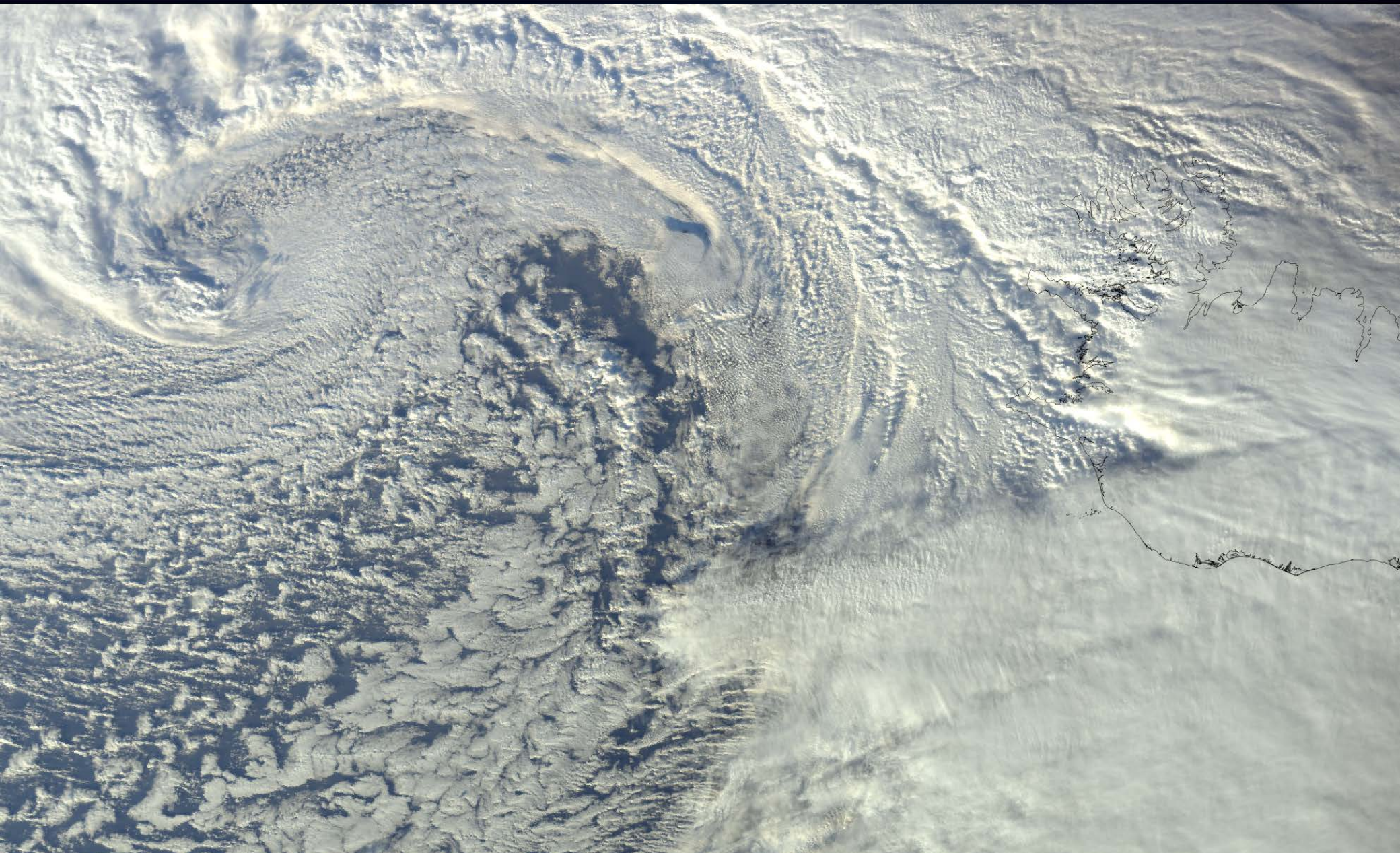


EARS-VIIRS 10 November 2013



EARS-VIIRS 10 November 2013

Iceland



EARS-VIIRS 10 November 2013

Scotland



EARS-VIIRS 10 November 2013

Morocco



Thank you for your attention!