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MEOS POLAR

A Cost Effective Direct Broadcast Terminal for Current and Future L- and X-Band Polar Orbiting Satellites

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Kongsberg Spacetec AS

ITSC-14 Beijing 25-31 May 2005

WORLD CLASS – through people, technology and dedication

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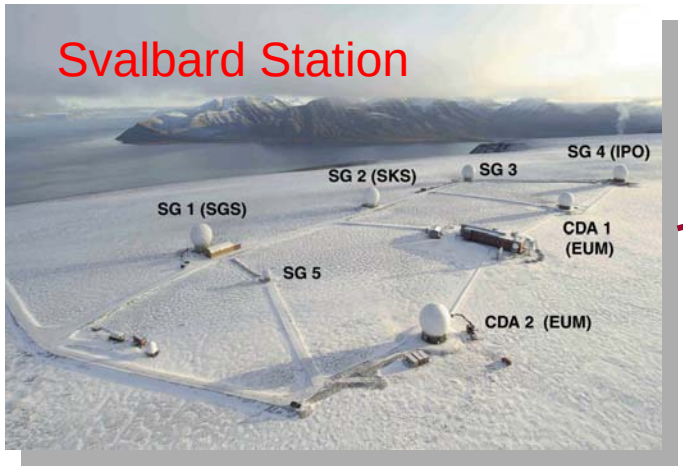
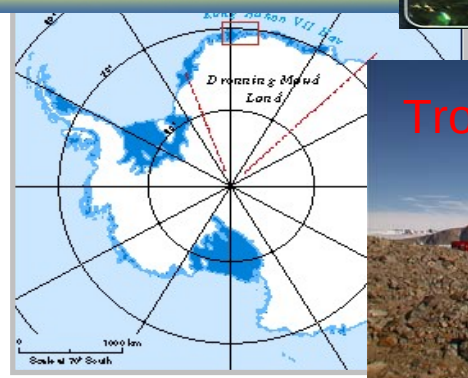

Svalbard Station
SG 4 (IPO)
SG 2 (SKS)
SG 3
SG 1 (SGS)
CDA 1
(EUM)
SG 5
CDA 2 (EUM)


Tromsø Station




TrollSat

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This talk is about getting access to the satellite data by DIRECT BROADCAST (Direct Readout)

Kongsberg Spacetec AS - Background

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- Direct Broadcast Receiving Stations Worldwide
- DNMI (met.no) Receiving Station
- Contractor/Operator for Svalbard Station
- EPS (METOP) Reference User Station (RUS), Product Generating Facilities (PGF) and Front End Processors (FEP) Contractor
- NASA Ground System Interface processing Facility (GSIF) contractors for Svalbard and GSFC
- Owned by Kongsberg Defence and AeroSpace
- 25 years

Colocated with the Tromsø Station (KSAT)

Direct Reception Challenges

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- Mission specific systems and operational concept for each mission - cost issues
- Proprietary algorithms - inconsistent calibration
- Proprietary hardware and software - hard to modify and maintain
- Proprietary data formats -interoperability issues
- Manual operation - this is some places expensive
- Auxiliary data management - time and cost issues
- Short term and long term archiving - usability issues - cost
- Access to data (catalogue and distribution) - usability
- Maintenance and sustained support - cost issues

- Limited budgets

What is MEOS POLAR?

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- **A multi-mission and user configurable** system for acquisition, archiving, processing, analysis and distribution of direct broadcast satellite data from polar orbiters.
  - NOAA
  - METOP
  - TERRA
  - AQUA
  - SeaWiFS
  - FY-1
- **Fully automatic** (all tasks) - the operator makes the rules and the system performs according to the rules as long as the operator has defined
- **Built to meet the challenges**

Satellites, sensors and transmissions supported by MEOS POLAR

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Polar Orbiting Satellites	NOAA	METOP	SeaStar	FY-1	TERRA and AQUA
Transmissions	**HRPT**	**HRPT**	**HRPT**	**CHRPT**	Direct Broadcast
Sensors					
AVHRR	+	+			
AVHRR/3	+	+			
SeaWiFS			+		
TOVS	+				
ATOVS	+	+			
MVISR				+	
MODIS					+
AIRS					+
AMSU-A					+
HSB					+

MEOS POLAR - Design

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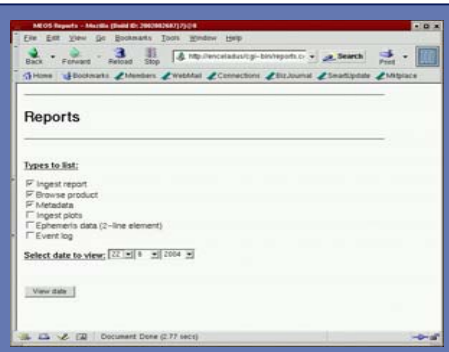

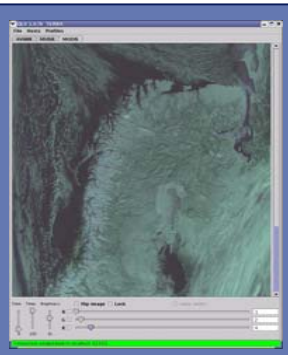

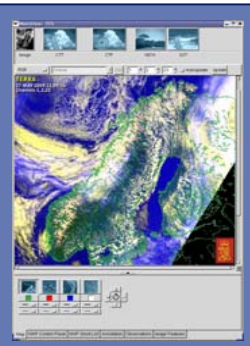

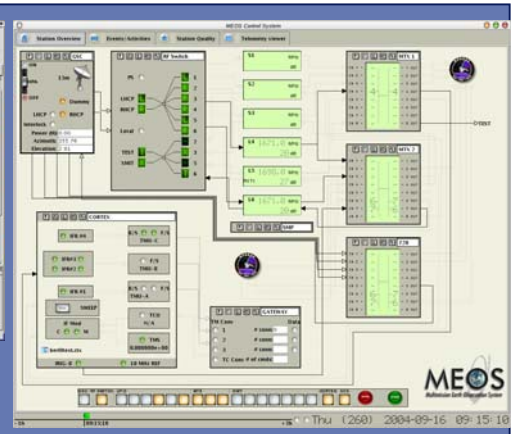

Linux based

L1
Image Geocoding
(PROJ.4)

L0

L1
IMAPP, AAPP, GSFC
SeaDAS, ANA, Custom

L2
IMAPP, GSFC,
Custom

WEB
Catalogue

Archiving
Short Term - Long Term

Format Convert
Distribution
HDF5,EOS-HDF, HDF, ...

MEOS POLAR - Station Control System GUI

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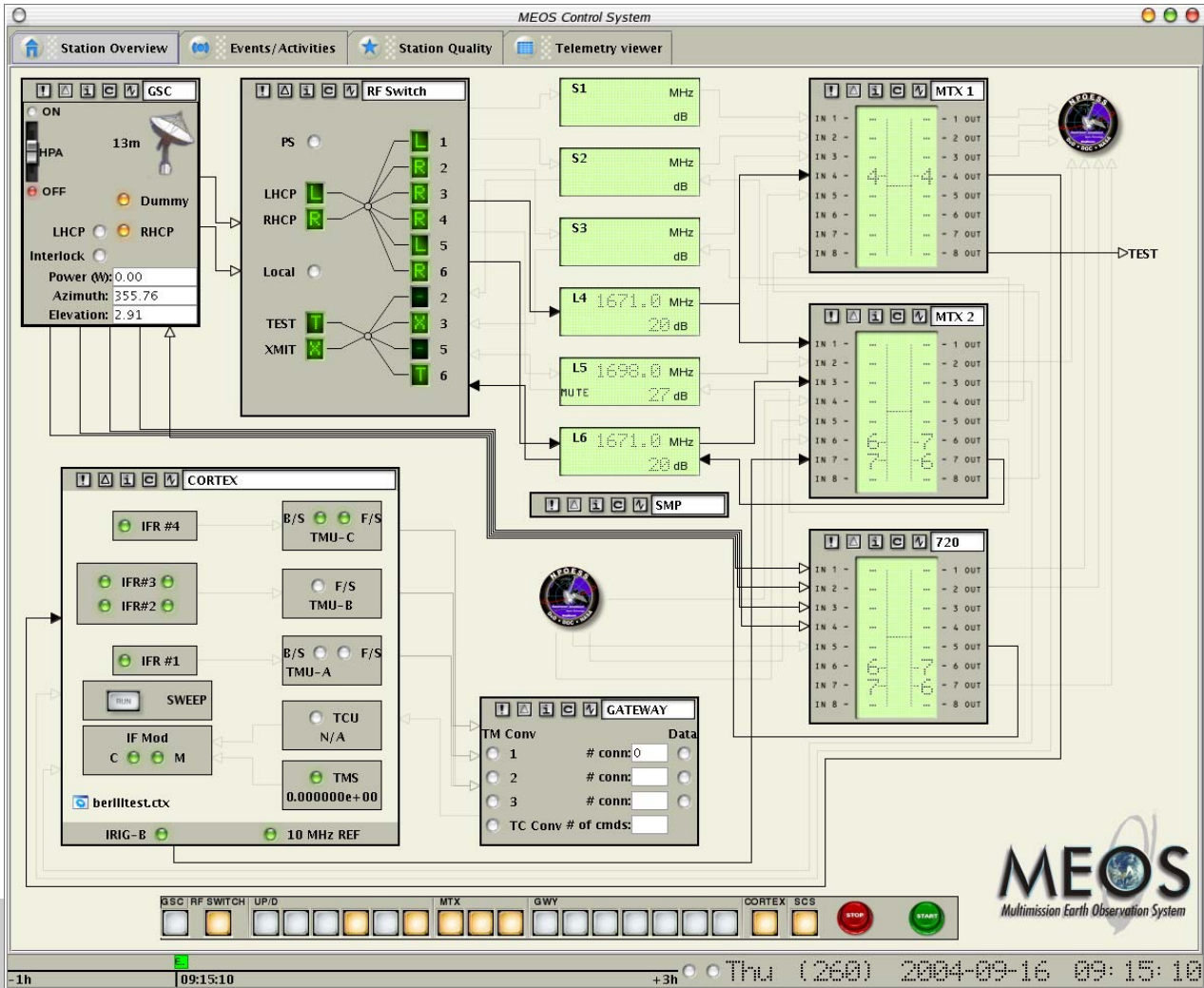
The GUI visualizes the status of the automatic operation. Some of the key components include:

Schedule Display
Activity Display
Event Log
Station Overview
Telemetry Viewer

It is a Java program



MEOS POLAR - Future

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- Standardization of level 1 processing packages
  - one and only one per instrument
  - sustained interface specifications
  - International collaboration
- Improved automation - more ”invisible” to data users
- Improved designs - less cost
- Networked Operations vs Direct Broadcast - low cost stations will support Direct Broadcast
- Support Future satellites (NPP, NPOESS, FY-3)

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Poster B49

MEOS POLAR - MEOS View

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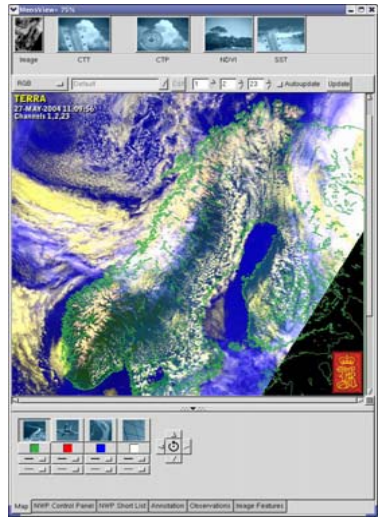
MEOS View visualisation tool

- Is a standard feature in the Basic Package.
- Designed for use within operational environment where speed is essential. Efficiency and simplicity are key features of the intuitive Graphical User Interface (GUI).
- Can produce and playback animations, print, overlay geographical, meteorological, oil spill, ship and wind information and. Images can be annotated with text and meteorological symbols.



MEOS POLAR - Level 1 processing

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- AAPP up to level 1b (AVHRR)
- AAPP (ATOVS)
- IMAPP (MODIS, AIRS, AMSU, HSB)
- OGP and SeaDAS (SeaWIFS)
- Integrated for operation in automatic production chain

MEOS POLAR - Geocoding

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- Multi sensor
- Multi projection from publicly available Proj4
- MODIS bowtie correction based on specific MODIS geometry
- Input and output data are managed by the MEOS Rolling archive

- Format: HDF5

MEOS POLAR for METOP

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- The METOP satellite launches in April 2006
- KSPT's METOP system is based on our

  MEOS and RUS- Reference User Station, developed for EUMETSAT's Polar System (EPS) Core Ground Segment

The METOP processing system will consist of 4 main elements:

- Front End System
- Basic Package
- Advanced Package
- Host Computer

MEOS POLAR for METOP - Dissemination

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Front End Equipment

- L/X-band tracking antenna with
  - feed/downconverter
  - Digital receiver/bitsynchroniser
  - Satelitte Tracking controller
  - Systems cables

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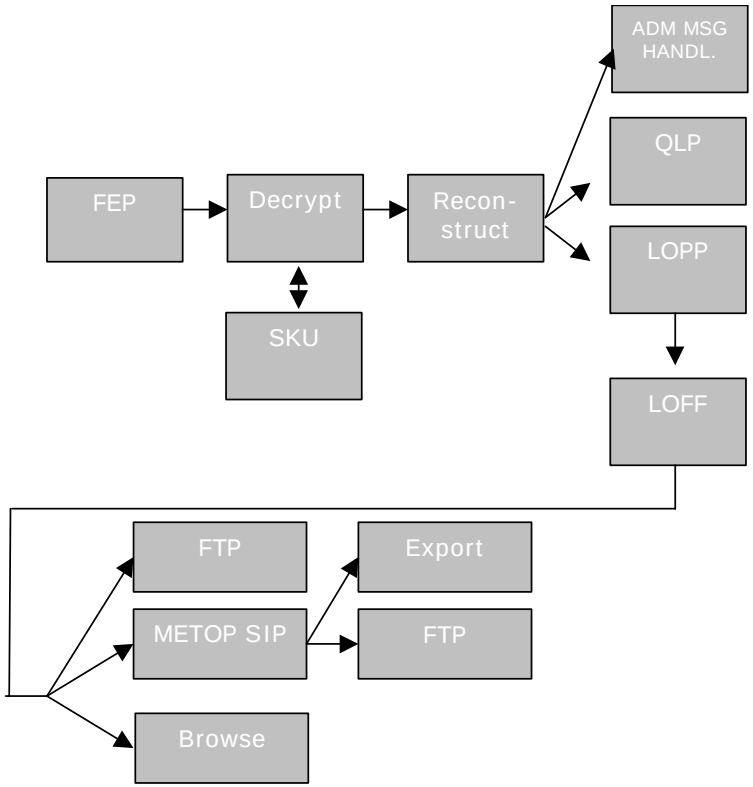
- MEOS POLAR for METOP - Basic Package



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Subsystems

- FEP

  Controls Frame synchroniser board

- Decrypt

  decrypt METOP HRPT/LRPT VCDUs. The SKU must be physically connected to the host computer through a RS422 connection.The key files are in XML format Decrypt

- Recontruct

  Reads VCDUs and contructs Instrument Source Package, and also perform packet error control on the ISP

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Subsystems

- ADM message handler

  Handles METOP Adm. Messages, writing OSV to disk and extracts METOP event messages

- QLP

  Subsamples and reformats all received data and distribute the result on a network connection.The distributed data can be displayed in real time by a stand alone Java Quick Look Viewer (QLV)

- L0PP

  The METOP level 0 Pre-processor subsystem. Already reads ad selects the OBT/UTC auxdata file

- L0FF

  Level 0 product File Formater subsystem reads and selects the OSV audata file from ADM Messages from the downlink datastream

METOP

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Subsystems

- METOP SIP

  Same functionality for generating HDF-5 products as for the NOAA SIP, but taking METOP AVHRR L0 products as input. No level 1b files generation.

- FTP

  capable of transferring files between any two hosts in the network. Normally it is set up to transfer data to specified hosts after subsystems storing data in a format of general interest. The user may select whether it shall be included in the processing chain or not.

- Browse

  Generates browse products (jpeg) and meta data (ASCII) from level 0 data (NOAA and METOP).

Subsystems

- Export

  Export HDF5 products to JPEG, PPM and PNG with user specified channel combinations, colour tables, overlays and legends.

MEOS POLAR - Advanced Package

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Value added products for NOAA / METOP

- Sea Surface Temperature
- Cloud Top Temperature
- Cloud Top Height
- Cloud Top Pressure
- Cloud Amount
- Cloud Mask
- Cloud Image
- Cloud Type
- Hot Spot Detection
- Precipitation Index
- Normalised Difference Vegetation Index
- Cloud Classification

Value Added Products for MODIS

- Cloud Mask Product
- Aerosol Product
- Precipitable Water
- Product Cloud Product
- Atmospheric Profile
- Product Surface
- Reflectance Product
- Snow Cover Product
- Thermal Anomalies Product

The end

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