EUMETSAT Aerosol Missions and Products: focus on 3MI, the Multi-View Polarimeter Flying on Metop-SGA

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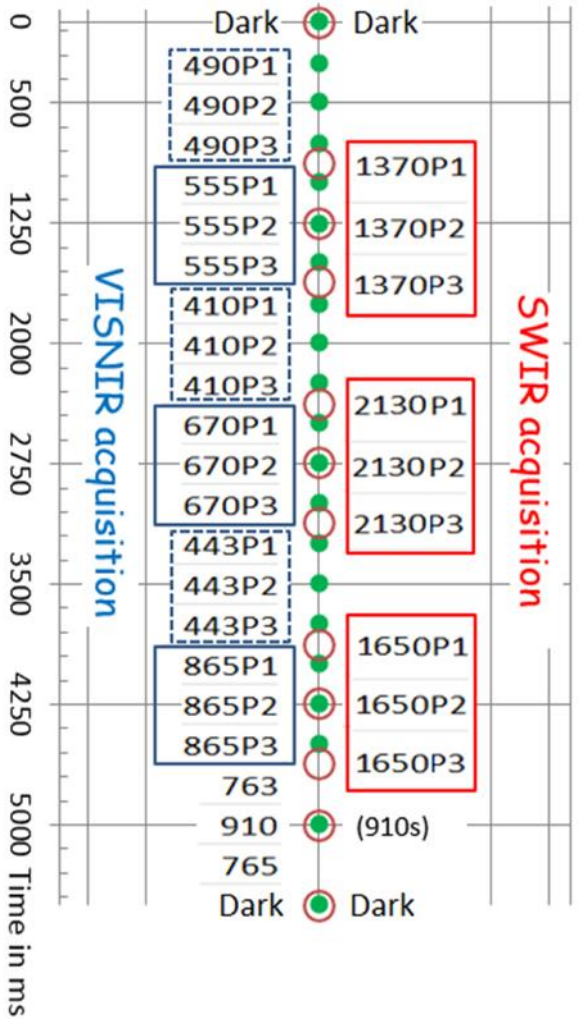
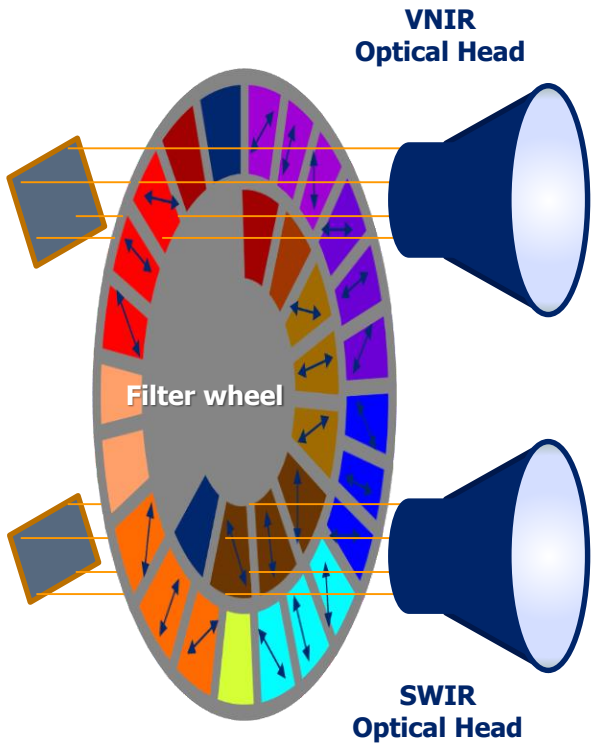
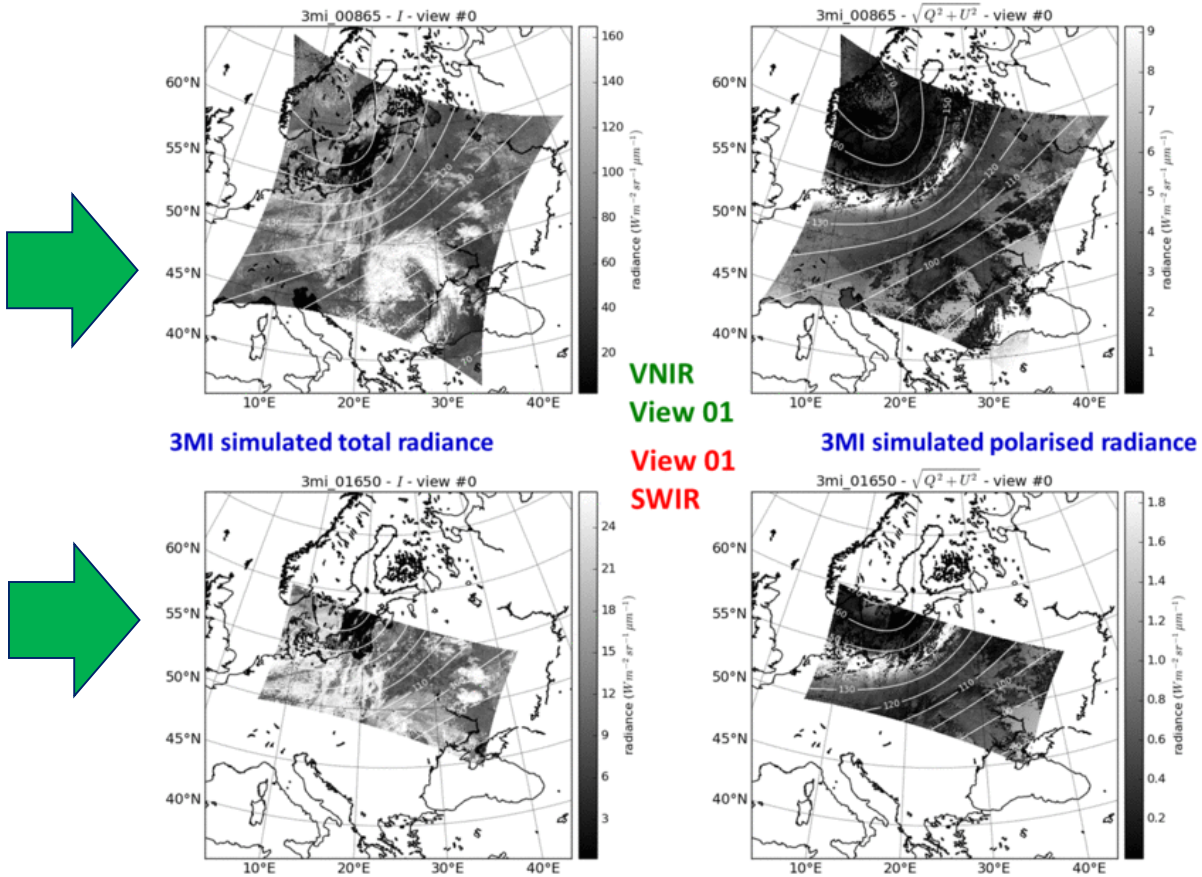
3MI Design

2D Push-broom radiometer (2200 km swath, 4 km pixel at nadir) with:

- Multi-view: 1 ground target is seen 14 times
  - VISNIR : 1 view every 22s, ~9° between 2 successive views
  - SWIR : 1 view every 11s, ~4.5° between 2 successive views
- Multi-channel (12 channels from 410 to 2130 nm)
- Multi-polarisation (9 channels with -60°, 0°, +60° polarisers)



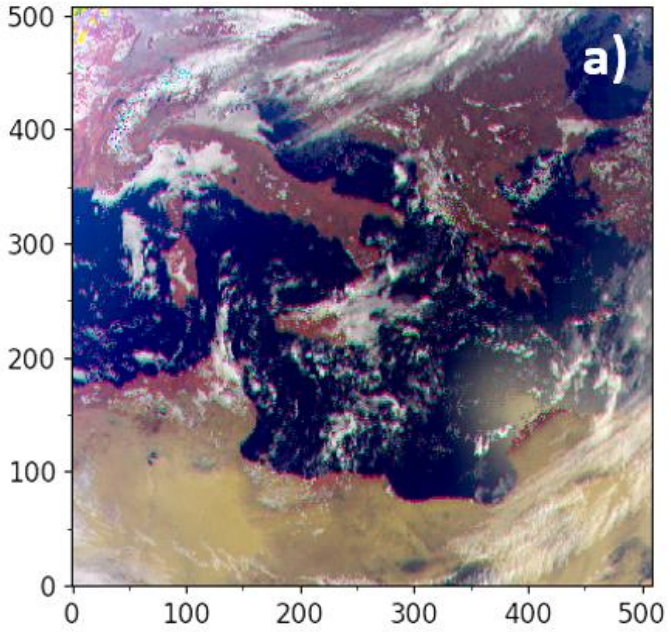




3MI Level-1 products

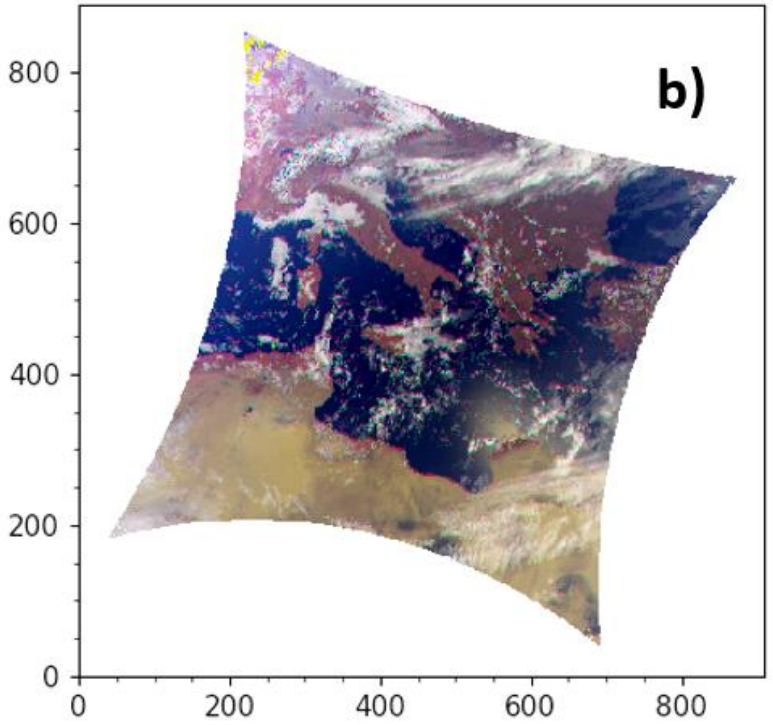
2 level-1 products will be generated in NetCDF format:

Level 1B

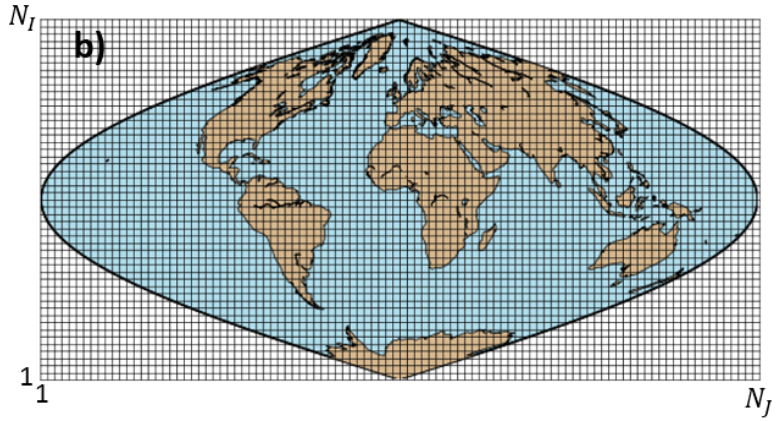


Geo-located Stokes Vector (I,Q,U)
in their acquisition geometry

Level 1C

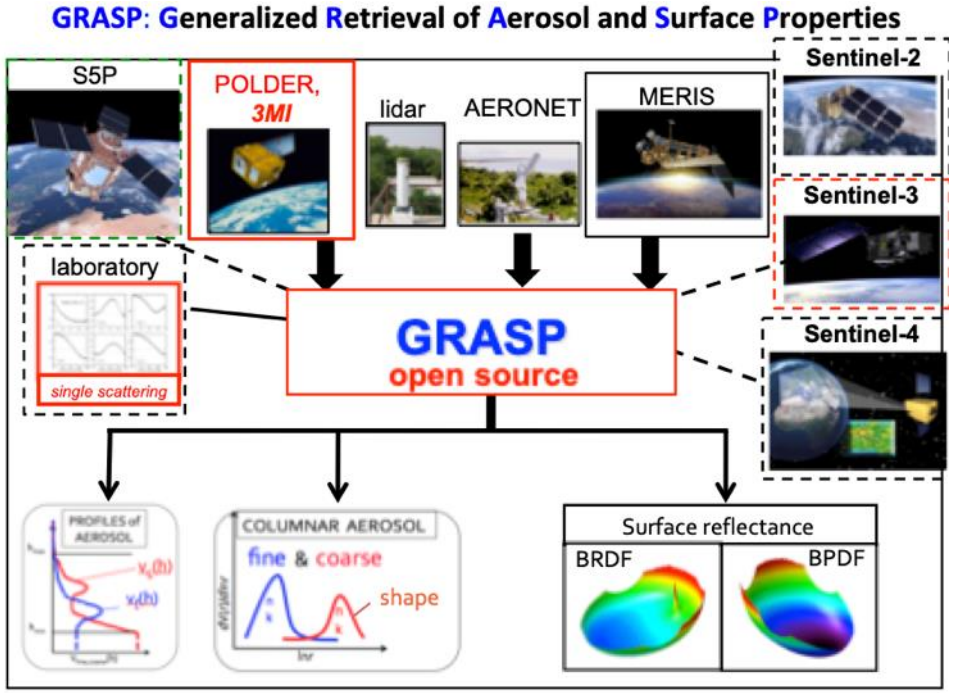


Geo-projected Stokes Vector (I,Q,U)
Including sub-pixel information from METimage



3MI Aerosol Retrieval

- The 3MI Day 2 NRT aerosol retrieval will be based on Simultaneous Surface Aerosol Retrieval (SSAR) approach
- Based on POLDER/PARASOL experience, GRASP is well adapted to aerosol retrieval from multi - angle – polarimetric observations



- **Main task** is to **adapt** and **optimized GRASP** to 3MI NRT aerosol retrieval needs.
- Many aspects of GRASP applications can be analyzed and tuned:
  - **RT calculation accuracy**: precision vs performance
  - **Aerosol model**: detailed vs optimized
  - **A priori on surface**: no vs a priori vs fixed;
  - Only multi-spatial pixel retrieval

3MI Aerosol Retrieval: GRASP NRT Tests

A series of tests from different GRASP configurations were performed: to verify speed and accuracy

- All NTR retrieval approaches have provided comparable images of surface reflectance and main aerosol parameters

Table summarising the settings proposed for the 3MI-GRASP

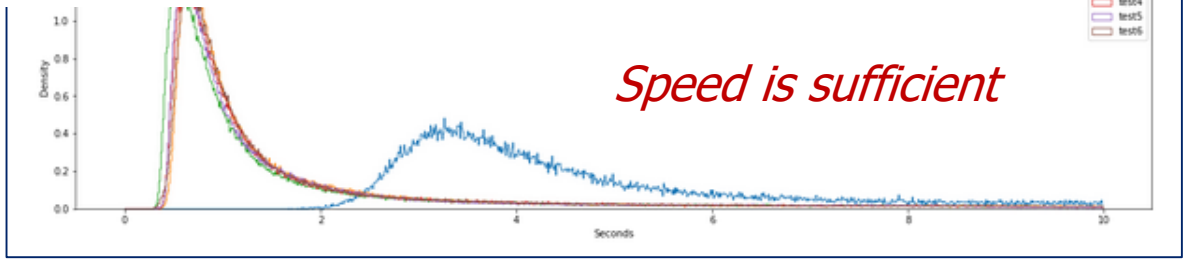
	Reference	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
Aerosol	Retrieved Detailed model	Retrieved Detailed model	Retrieved Detailed model	Retrieved Optimized model	Retrieved Optimized model	Retrieved Optimized model	Retrieved Detailed model
Surface	Retrieved	Retrieved	Retrieved	Fixed a priori	Retrieved a priori constraint	Retrieved	Retrieved a priori constraint

- **More details on GRASP optimization possibilities:**

Oleg Dubovik:
Assessment of multi-angular polarimetry potential

- **Bertrand Fougnie:**
How consider the geometry of acquisition on the aerosol retrieval performance

- Further tests will be implemented (surface a priori, aerosol models etc) to optimize the retrieval.



Conclusions - Outlook

- EUMETSAT 3MI Mission will provide a unique long-term of operational time series for atmosphere characterization (aerosol and clouds)
- Spectral extension to SWIR, 2200x2200 km² ALT/ACT field-of-view, and a nadir spatial resolution of 4km, are the main improvements wrt POLDER/PARASOL heritage
- Based on POLDER/PARASOL experience, and studies GRASP algorithm is planned to be used for 3MI/NRT aerosol retrieval.
- Adaptation of **GRASP** to 3MI NRT needs:
  - **The speed is sufficient**
  - **Several efficient GRASP NRT configuration were designed and tested;**
  - **The efforts on finalizing 3MI/NRT are in progress**
- Latest GRASP v1.0.0 version has been installed at EUMETSAT and is currently under validation
- The v1.0.0 version implements consolidations that also support the retrieval for OLCI
- This will allow to test GRASP with real data and Near Real Time retrieval constrain