30 YEARS 1986-2016

EUMETSAT

MTG-IRS: Update on level 1 and level 2 processing

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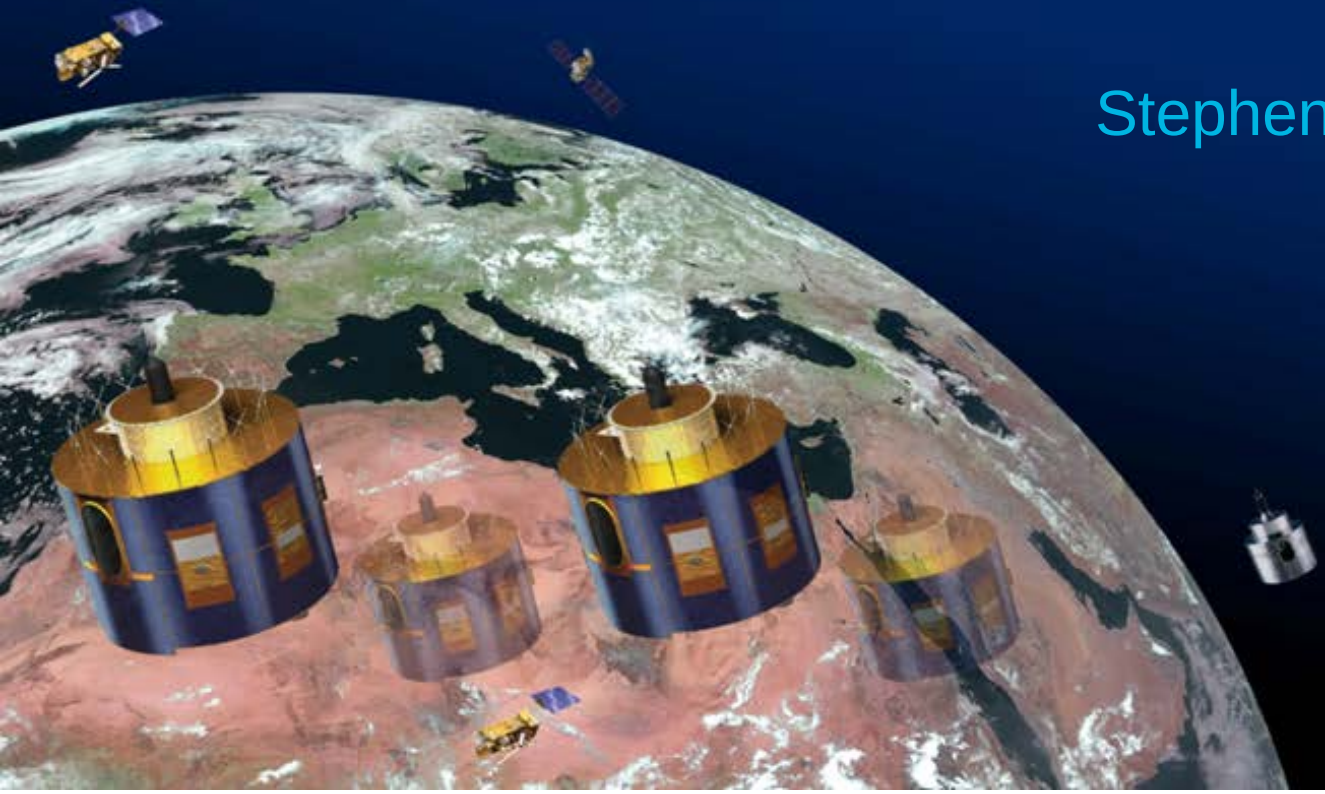


Overview

- Current status Level 1 and Level 2 Processor
- Future activities
  - Level 1
  - Level 2
  - Test data
- Concerns about Level 2 processor

Status of Level 1

- The following tools to are getting in place
  - Instrument simulator: IRASS
    - Complete but simplified instrument simulator with limited level 1 processing capabilities
  - Level 1 reference processor
    - An implementation of the detailed Level 1 processing specifications, which are prepared for the IDPF-S procurement. Objective of the L1RP is to demonstrate the physical concepts, and prepare break point data for testing operational implementation of the specifications.

Level 1 Processing Specifications

- The detailed specifications are subject to peer review.
  - Release of documents to review panels on 29/08/2016
  - dispatch of Peer Review Report on 07/10/2016

Status of Level 2

- Programmatic:
  - ATBD v3.0 is still latest (available on web)
  - Soon start to prepare for detailed processing specs
- Science:
  - The Level 2 Validation and Demonstration Processor is implementation of the ATBD v3.0
  - Running autonomous and unsupervised since June 2016 on actual observations provided by IASI and CrIS

MTG-IRS NRT Demo Project

- Products are derived globally from IASI M01, selected regions IASI M02 and CrIS
- The products are delivered to participants of the MTG-IRS NRT demo project
  - Regular product (operational forecasters):
    - DWD, FMI, DMI, AEMET, COMET, KNMI, NHMS, TSMS, SSEC
  - Specialised product for data assimilation
    - KNMI, CETEMPS, ECMWF,
    - Univ. Hawaii expressed interest to receive the data as well.

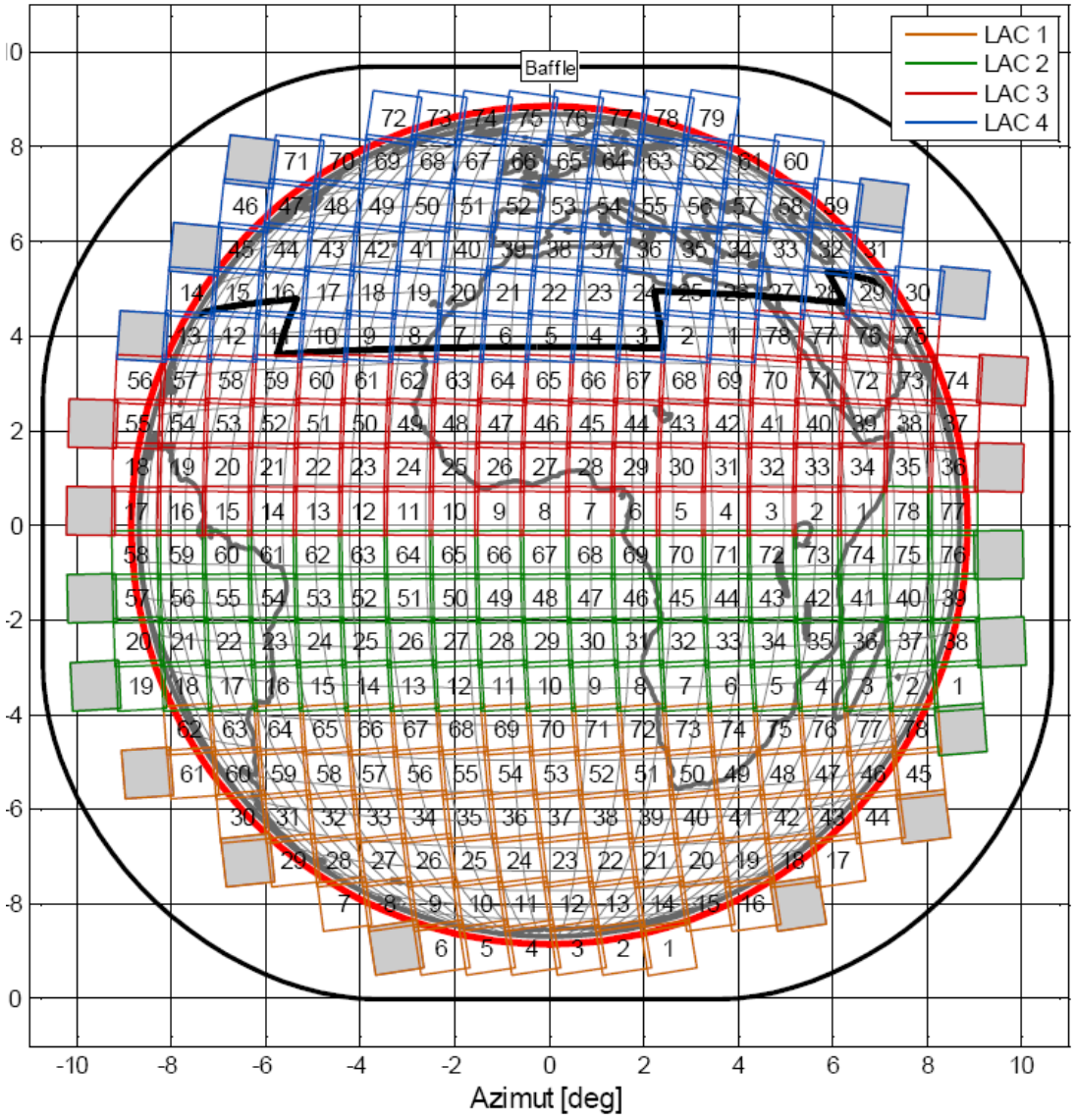
Current system (for completeness)

- Approximately 3000 channels (IASI), 800 channels (CrIS)
- SCE analysis based on IASI/CrIS measurements
- 1DVAR
  - Background: state and covariance from ensemble forecast by ECMWF
  - RTM: OSS (normal mode)
- Products for cloud free cases:
  - T(p), q(p), O3(p), Ts, emissivity
  - SPS (=T+q projected in feature space)

Level 1: Planned activities

- Consolidate the processing specs:
  - Harmonisation of response?
  - Order of calibration sequence,
  - Characterisation of the background radiation for radiometric calibration,

Illustration of Step and Stare of IRS



Planned activities: Level 2

- Investigate retrievals in feature space
  - Consider information matrix:

$$\hat{\mathbf{S}}_s = \mathbf{S}_\epsilon^{-1/2} \hat{\mathbf{K}} \mathbf{S}_a^{1/2}$$

  - Contains all information in the system. Extract the key components using SVD and use the eigenvectors to project observations and state into feature space
  - Apply the 1dvar in this space

Retrievals in feature space

- Advantages is a significant reduction of the set of linear equations to solve
- Concentrate on the key features

Development (not for operations/day1)

- Add the capabilities to perform retrievals in presence of low or high level clouds
- Include the ILS in the state vector

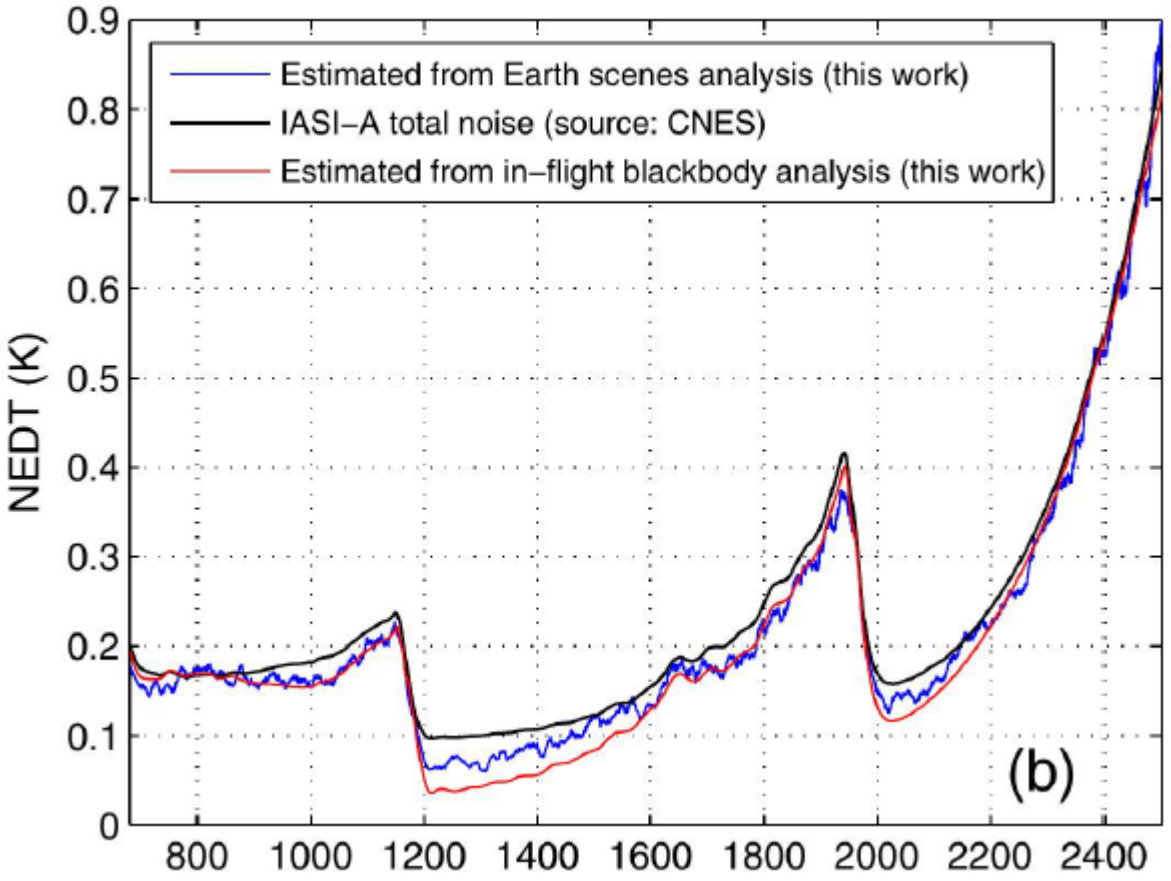
Test Data

- Plan to generate a high spatial resolution test dataset
  - high resolution NWP
  - Limited regional and temporal coverage
- Investigate to produce a “operational” stream of synthetic IRS data to support users prior to launch

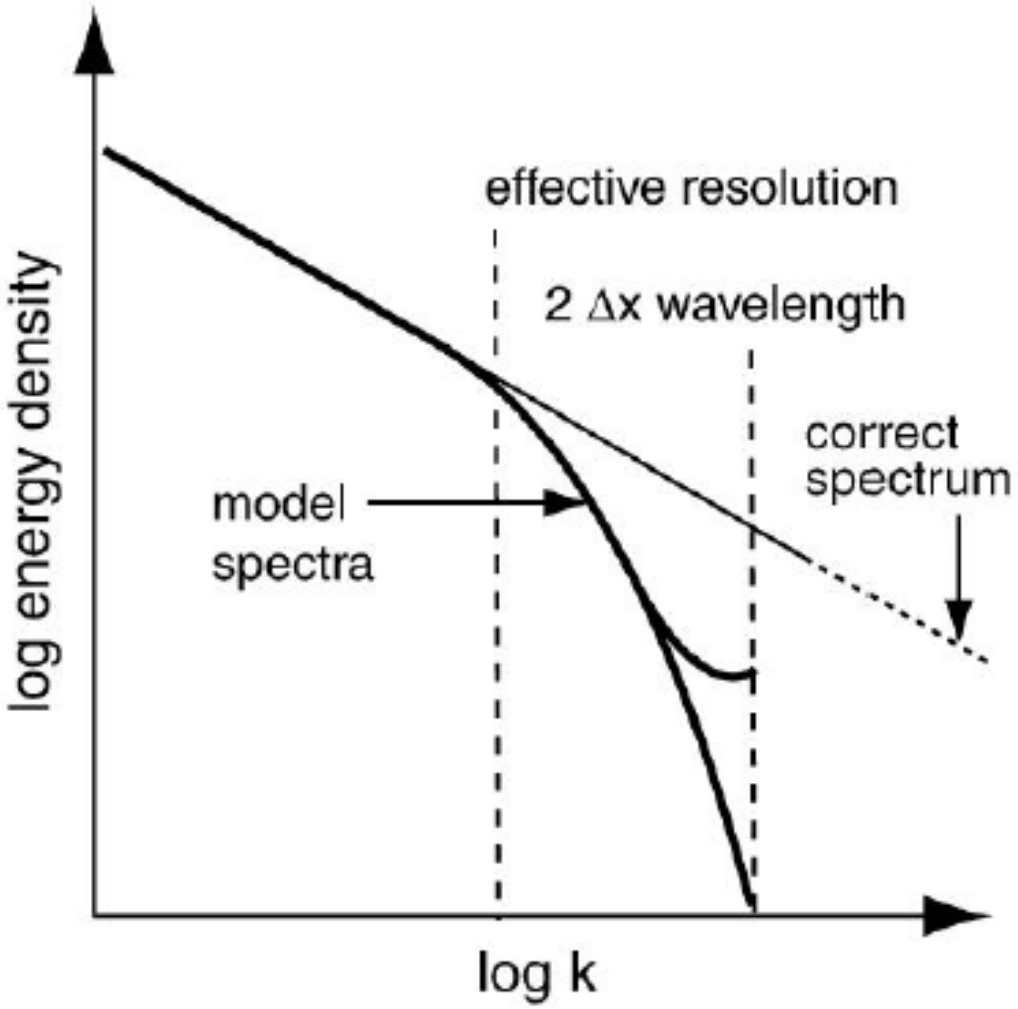
Current concerns

- Knowledge of the error covariance matrices
- method to derive observational error covariance exists
    - IASI (Serio et al 2015)
    - CrIS, pending
- Forward model errors are unknown
    - Missing a method to rigorously estimate this
- ECMWF background error covariance is likely too optimistic (representativeness error missing)

From Serio et al. 2015



From Skamarok (2004)



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