
**Level 1 and Level 2 Test data needs of
regional NWP and NWC users**
Level 1 test data for global NWP

Contribution to the discussion

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➤ Introductory remarks:

- Relation of NWC and convection-resolving (regional) NWP
- Satellite data in NWC
- Satellite data regional/global NWP

➤ Test data

- User groups
- Test data types
- Test data needs for L1 and L2

➤ Summary

NWP

Established systems

NWC/VSRF

- Regional & convection resolving NWP
- Forecasts: 6 hours to 24-72h
- Resolution: ~5-7km to ~1.5–2.5 km
- Setup: ~3-6 hourly analysis updates
- Availability: 4-8 forecasts/day at $\geq t_0 + 1-3h$

- Forecasts & warnings for 6-12h
- NWC focus: up to ~6h
- Input:
 - **Observations (conv./satellite) analysed & extrapolated**
 - NWP: last available run

Evolution

- Focus on **convection resolving NWP**
- Forecasts: 6 hours (to 48 h)
- Resolution: $\leq 1 - 1.5$ km
- RUC-setup: ≤ 1 hourly updates
- Availability: 24 forecasts/day at $t_0 + 30$ min.
- Use of more remote sensing data (radar/satellite/ground-based)

- Forecasts & warnings for 6-12h
- NWC focus: up to ~1-2h
- Input:
 - **Observations (conv./satellite) analysed & extrapolated**

NWP

Integrated products



Use of satellite data e.g. to:

- Complement radar data
- Analyze convective environment, e.g. stability, for timely warnings
- Fog detection, volcanic ash
- Indication of local phenomena, convergence lines, ...
- Early indicator for detection of ...

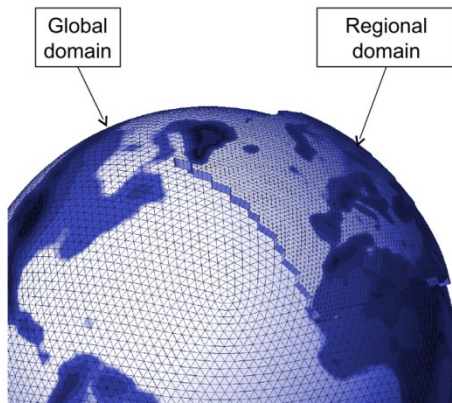
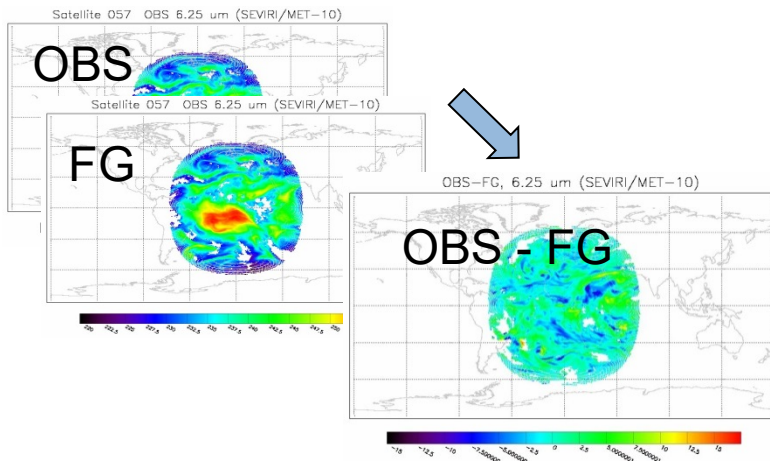
Mostly in the form of:

- Cloud, fog, volcanic ash products
- Dedicated spectral composites
- Stability indices
- CI parameter
- ...

Development areas & IRS potential:

- More accurate L2 profiles to complement RS network (in space and time)
- Convective indicators, e.g. based on PC scores
- Low level humidity, improved fog detection (e.g. use of dedicated composites)
- Wind field information, convergence lines ?
- Use of automated systems, e.g. neural networks, detection of objects

MTG - IRS in regional (convection resolving) and global NWP



Successful assimilation of MTG-IRS data

- will be key for both regional NWP **and** NWC/VSFRF applications
- provides huge potential for global NWP

NWP assimilation needs:

- Fast forward model (RTTOV)
- Stable SRF across detector array & in time
- Accurate calibration of data
- Well defined strategy for updating and communicating the PCs

Esp. high-resolution NWP requires additionally:

- very high timeliness (similar to NWC)

User groups

MTG – IRS
PC scores compressed data
(standard via EumetCAST)

MTG – IRS
Raw radiances
(via GEANT network)

- Need PC scores test data
- May need corresponding raw spectra to develop & check methods based on PCs
- Need raw spectra test data

Similar requirements for availability of test data

- PC compressed data sets
- Corresponding raw spectra

Types of use for test data

Check of format and data contents

- No high physical realism needed
- Identical (very close) to final contents and format
- Good documentation

Technical tests of data processing and methods (applications)

- Realistic underlying profiles and RT (L2: retrieval method)
- Realistic range of atmospheric situations and observing conditions
- Realistically simulated instrument & noise characteristics

Scientific investigations of data characteristics or methods and applications

- Simulated data with fully controlled and understood atmospheric conditions and instrument characteristics
- or
- Data as realistic as possible, potentially based on very high resolution NWP
- Realistic observing conditions and use of full instrument and noise characteristics

Continuous pre-launch data stream for final infrastructure and processing tests



Types of use for test data

Check of format and data contents

- No high physical realism needed
- Identical (very close) to final contents and format
- Good documentation

YES

Technical tests For data processing and methods (applications)

- Realistic underlying profiles and RT
- Realistic range of atmospheric situations and observing conditions
- Realistic simulated instrument noise characteristics

YES

Scientific investigations of data characteristics or methods and applications

- Simulated data with fully controlled and understood atmospheric conditions and instrument characteristics
- or
- Data as realistic as possible, e.g. based on very high resolution NWP
- Realistic atmospheric conditions and instrument noise

NWP: No
NWC: (Yes)

Continuous pre-launch data stream for final infrastructure and processing tests

YES



- For global and convection-resolving (regional) NWP and NWC
 - **Format:** final, at least very close
 - **Area:** (1) Dwells covering Europe (or LAC4) at nominal resolution
(2) Full disk (global NWP)
 - **Period:** TBD, at least several consecutive time slots to one day
 - **Based on:**
 - Data covering realistic range of situations, e.g. coarse NWP fields
 - Realistic IRS viewing geometry
 - Expected instrument characteristics and noise
- Documentation of input and test data production setup/assumptions
- Both full spectra and PC compressed data
- Added value: Availability of used atmospheric input profiles/fields



- Interest for development of **NWC** applications
 - Details of requirement for intended use need to be confirmed
 - Format: final, at least very close
 - Area: some dwells, LAC4/Europe (?) at nominal resolution
 - Period: TBD, at least several consecutive slots
 - Based on:
 - Realistic high-resolution NWP fields
 - Realistic IRS viewing geometry
 - Expected instrument characteristics and noise
- Documentation of input and test data production setup/assumptions
- Both full spectra and PC compressed data
- Added value: Availability of used atmospheric input profiles/fields
- Such data may help to raise user awareness



- L2 retrievals for NWC / VSRF
- **Format:** final, at least very close
- **Area:** dwells covering Europe
- **Period:** TBD, at least several consecutive time slots to one day
- **Based on:**
 - Data covering realistic range of situations, e.g. coarse NWP fields
 - Realistic IRS viewing geometry
 - Expected instrument characteristics and noise
 - Chosen retrieval setup (FCT or PWLR) not relevant for technical test
- Documentation of input and test data production setup/assumptions

- Test case data for evaluation in NWC / VSRF context
- Need for continued evaluation of L2 retrievals for selected test case scenarios
 - use of FCT or PWLR prior in OEM
 - Based on simulated or proxy data
- Suggestion for forecaster training using GRUAN simulator:
 - Use of GRUAN simulator: IRS simulations based on selected RS data
 - L2 retrievals with FCT and PWLR prior
 - Dataset with retrievals, the ‘real profile’ (radiosonde) and the respective prior used.
 - Training forecasters on what the satellite ‘sees’ and on relative contribution of data and prior to the retrieval result.

Additional test data: Pre-launch data stream for 'stress-test' of systems

- Aim:
 - full test of data reception & storage and processing systems
 - well before launch to allow possible additional system upgrades
- Users:
 - Global and convection-resolving (regional) NWP
 - NWC
- Format : Final
- Area: Operational area setup for L1 and L2
- Timing & period: real-time full data streams
 - 1) 1 yr before launch for ≥ 24 h (see also MTGUP! discussion)
 - 2) 3-6 months prior to launch for 1-2 weeks
for additional infrastructure and processing exercise (both ends!)



- Test data are mostly needed for technical testing of data processing
- Additional data needs for selected cases and specific users and setups
- Data need to
 - represent realistic range of situations and processing setup - but not the full atmospheric detail
 - be available early on
 - final format (or close to final)
- EUMETSAT plans (SWG46: mature format, simulated data, Q1/2019)
but: focus: format familiarization data / basic technical testing
pure forward simulation from model data
no instrument noise, viewing geometry
only one dwell - also global data ?
PC compressed
- Pre-launch full data stream (IRS and other instruments) needed for infrastructure and processing tests

