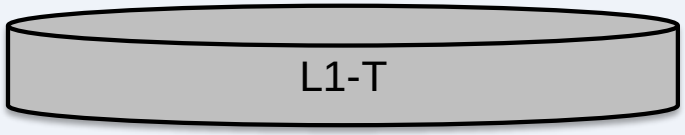
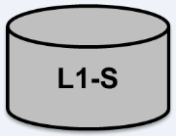
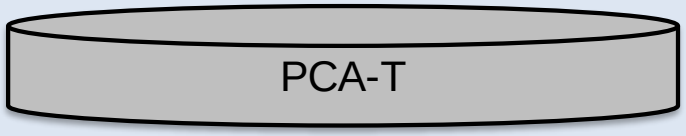
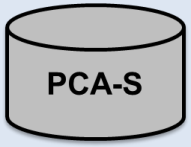
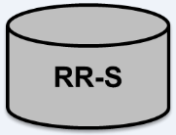
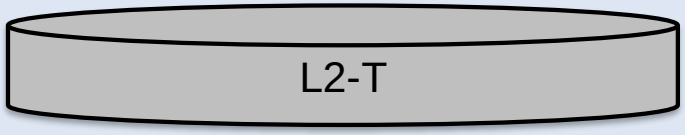
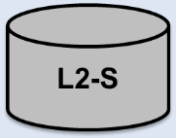
Requirements for IRS test data

For scientific and functional purposes

(M7.A8)

Christina Köpken-Watts, DWD

IRSMAG Nov 2019: from contribution by Tony McNally

	Technical data	Science data
Level-1 spectra for testing L1 processor	N/A	Single dwell of LBL spectra (0.001cm^{-1}) from high resolution (1.25Km) model fields
Level-1 radiances (super users)	 Full disk of a single repeated simulated spectra	 Single dwell of RTTOV spectra from model fields, simulating apodised IRS L1 data
PCA scores (baseline for NRT dissemination)	 Full disk of a single repeated set of simulated PCA scores	 Single dwell of PCA scores generated from L1-S
Reconstructed Radiances (baseline for many NWP / AC users)	 Full disk of a single repeated set of simulated reconstructed radiances	 Single dwell of reconstructed radiances output from IRS-PP using PCA-S as input
Level-2 retrievals (baseline for now-casting and AC)	 Full disk of a single repeated simulated retrievals	 Single dwell L2 retrievals using L1-S as input

Test data for MTG – IRS: L1 (and L2)

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

From IRSMAG May 2016: Ch. Köpken-Watts

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

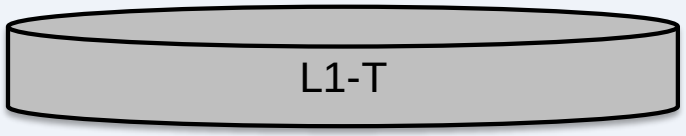
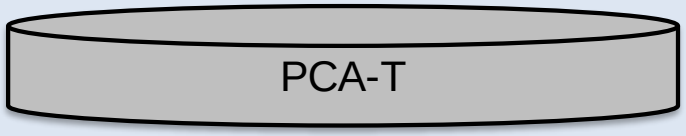
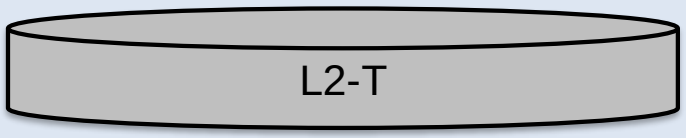
- Simulated data with fully controlled and understood atmospheric conditions and instrument characteristics

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 infrastrucutre and processing tests

(1) Technical data for functional purposes

	Technical data	Use & Requirements
Level-0 spectra for testing L1 processor	N/A	**Aims:** ➢ Format familiarization ➢ Technical preparation of systems (storage, data ingest, PC and RR pre-processing, memory, disk space, display) **User groups:** ➢ All: NWP, NWC, AC, …. **Requirements:** ➢ Final format (as close as possible), **PCA: including hybrid PCs** ➢ **Format documentation** ➢ **LAC1 - LAC4** ➢ **Realistic settings in all variables, e.g. satellite angles, QC flags in L1, PC, RR, L2**
Level-1 radiances (super users)	 Full disk of a single repeated simulated spectra	
PCA scores + used Eigenvector base (baseline for NRT dissemination)	 Full disk of a single repeated set of simulated PCA scores	
Reconstructed Radiances (baseline for many NWP / AC users)	 Full disk of a single repeated set of simulated reconstructed radiances	
Level-2 retrievals (baseline for now-casting and AC)	 Full disk of a single repeated simulated retrievals	

(2) Data for basic usage & science testing

NWP – and retrieval development:

- Preparing for assimilation of L1 (possibly also L2):
  - Area: 2-3 dwells – or European area of LAC4 ?
    Serve users of various regional models & cover various conditions
  - Testing results versus known ‚true' profile, surface and cloudiness conditions
    - Knowledge of input profiles T, q, surface (cloud), simulation setup for RT

- Setup/testing of wind derivation (external algorithms or within DA algorithms) ?
  - At least several adjacent dwells – or European area of LAC4 ?
  - Data for e.g. 3 time slices
    - Knowledge of wind field

NWC:

- Prepare for various NWC applications, mostly L2 - possibly also L1, PCs
  - NWC users in different European countries : European part of LAC4 area best

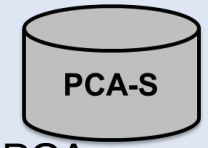
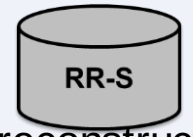
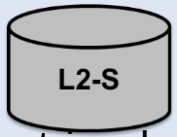
(3) Data for specific scientific investigations & preparation

Requirements:

- Likely very specifc data setup depending on user area & scientific question:
  - Some may require simulations/synthetic data at convective scale NWP ?
  - Areas ?
  - Trace gases ?
  - ….
- Probably hard to answer such needs with general purpose test data set

- Either a second stage of test data –
  Or simulations done by users themselves under fully self-controlled conditions
- Not considered here at this moment

(2) Data for basic usage & science testing

	Science data	Use & Requirements
		Aims: ➢ Testing of assimilation, retrieval, NWC applications **User groups:** ➢ All: NWP, NWC, AC, …. **Requirements:** ➢ Final format (as close as possible), PCA: including hybrid PCs ➢ Part of LAC4 ; 3 consecutive time slices ➢ Realistic settings in all variables, e.g. satellite angles, QC flag values ➢ NWP input resolution: ~5-10 km ➢ Used model profile/surface input, RTTOV simulation settings, including added instrument noise ➢ Model wind fields
Level-1 radiances (super users)	 Single dwell of RTTOV spectra from model fields, simulating apodised IRS L1 data	
PCA scores + used Eigenvector base (baseline for NRT dissemination)	 Single dwell of PCA scores generated from L1-S	
Reconstructed Radiances (baseline for many NWP / AC users)	 Single dwell of reconstructed radiances output from IRS-PP using PCA-S as input	
Level-2 retrievals (baseline for now-casting and AC)	 Single dwell L2 retrievals using L1-S as input	

Questions for discussion

Confirm (for technical/functional & scientific data)

- Areas and number of time slices needed:
  Suggestion: proceed in stages: 1 initial dwell – extend area after intial testing & user feedback
- Model input resolution, e.g. 9 km ?
- Simulation settings:
  - Apodization (agreed light apodization - or stronger apodization ?)
  - Added expected instrument noise
  - Trace gas variations (e.g. from CAMS data) necessary - resolution?
  - Surface input
  - …. ?
- L2: Retrievals with FCT or PWLR prior - or both ?
- Additional needs / aspects for AC ?