

The past, present and future of the EUMETSAT HSIR L2 products

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EUMETSAT

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The EUMETSAT HSIR L2 products Presentation

IASI L2 products status & updates
From version 6...

Future evolutions
...to version 7





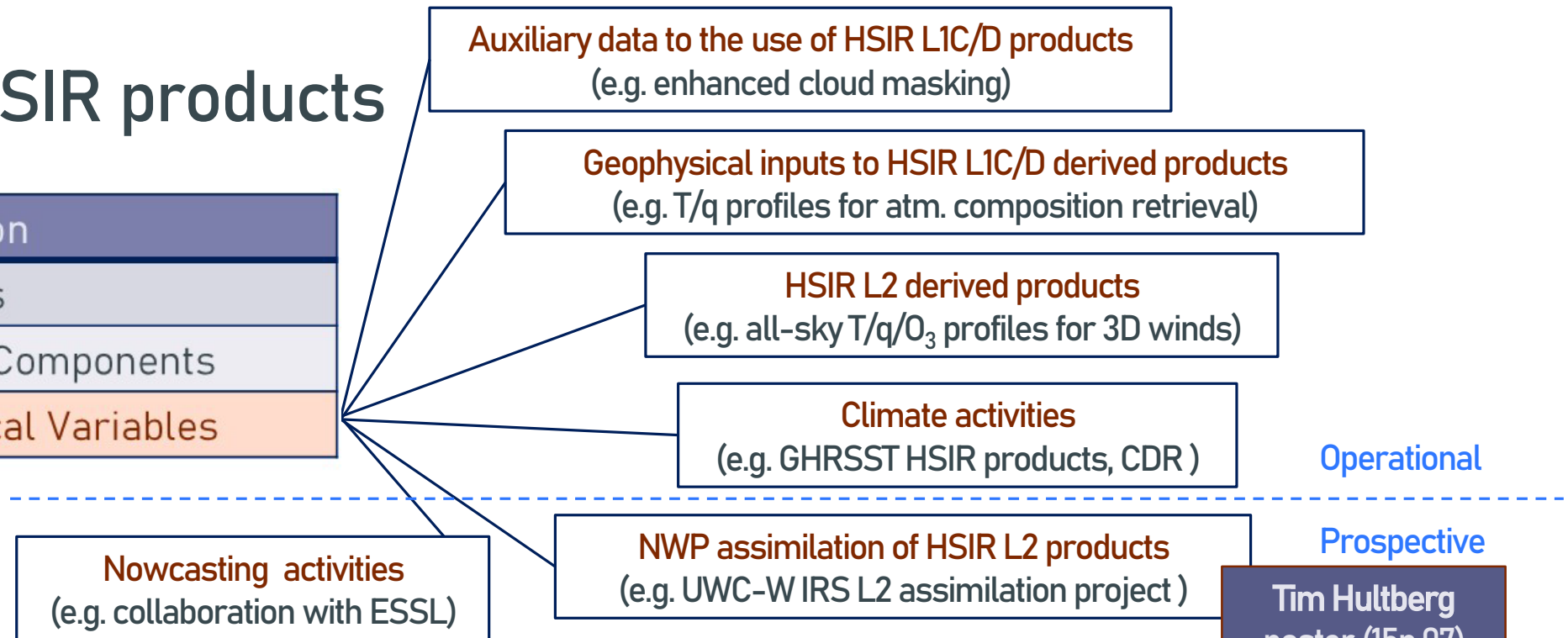
The EUMETSAT Hyperspectral Infrared L2 products



	Platform	Lifespan	Orbit	Sampling	Footprint
IASI	Metop	2007-2035	LEO	0.25 cm ⁻¹	12 km
IASI-NG	Metop-SG	2025-2046	LEO	0.125 cm ⁻¹	12 km
IRS	MTG-S	2025-2041	GEO	0.61 cm ⁻¹	4 km

EUMETSAT HSIR products

	Description
L1C	Radiances
L1D	Principal Components
L2	Geophysical Variables



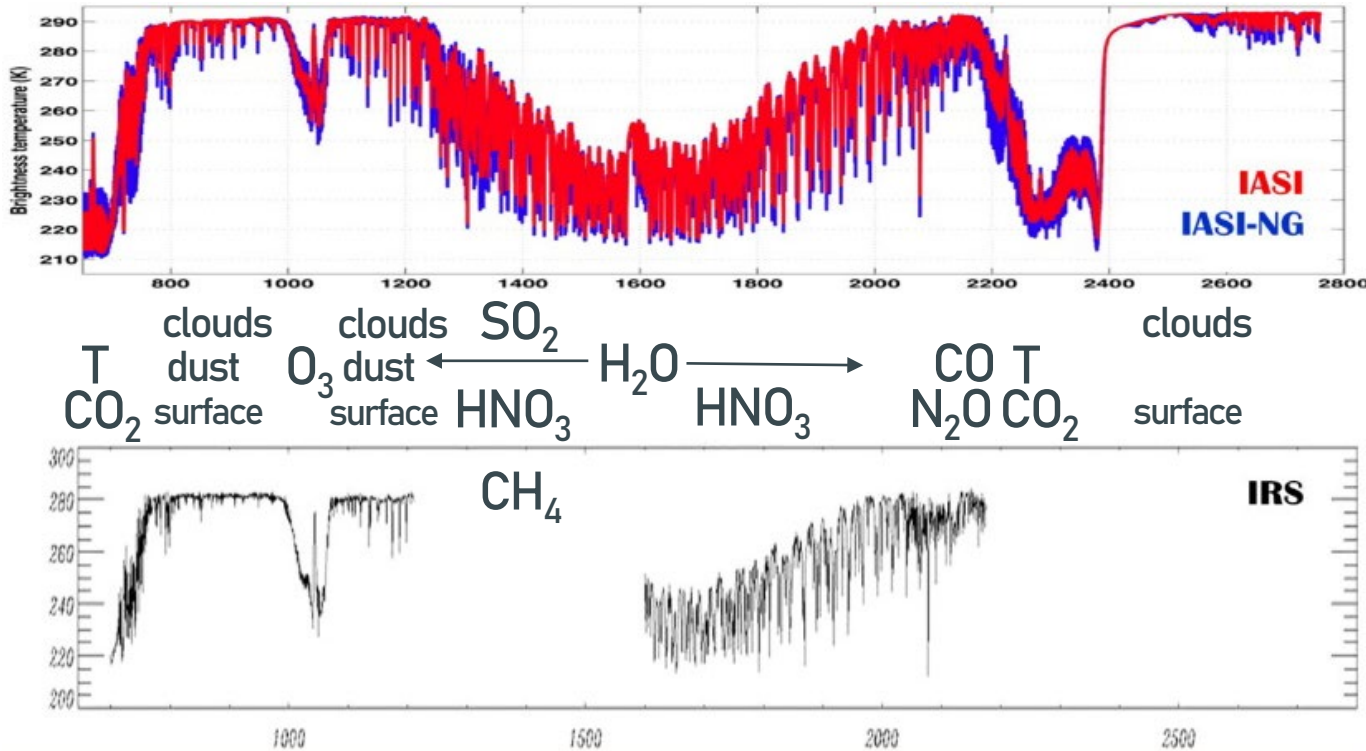
Tim Hultberg poster (15p.07)



The EUMETSAT Hyperspectral Infrared L2 products

www.eumetsat.int

EUMETSAT HSIR L2 products Operational and pre-operational



Demonstrational products: CO₂, N₂O, cloud phase

Product	Type	Algorithm
Temperature	Profile	ML + OEM
Humidity	Profile	ML + OEM
Ozone	Profile	ML + OEM
CO	Profile	OEM
HNO ₃	Profile	OEM
SO ₂	Partial col. + height	LUT
CH ₄	Total col.	ANN
Clouds	Fraction + height	OEM
Dust	Index	LUT
SST/LST	Skin T.	ML + OEM
Emissivity	PCs	ML

SAFs and partners



The EUMETSAT HSIR L2 products

Context and presentation

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IASI L2 products: the version 6 family

2014 IASI L2 v6.0

- **CO profile**: from AC SAF FORLI algorithm
- **T/q/O₃ profiles + surface SkT/ε**: All-sky retrieval using MW/IR synergy in Machine Learning algorithm (PWLR)

2016 IASI L2 v6.2

- **PWLR³**: Exploitation of horizontal correlation at EFOV level

2017 IASI L2 v6.3

- **SO₂**: content and altitude from AC SAF BRESCIA algorithm

2018 IASI L2 v6.4

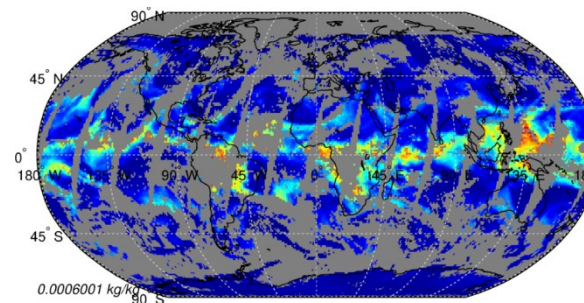
- **CO₂**: added as demonstrational product from PWLR³

2019 IASI L2 v6.5

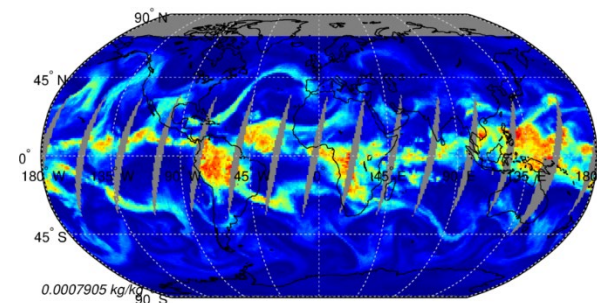
- **O₃ & HNO₃ profiles**: from AC SAF FORLI algorithm
- **CH₄**: ANN algorithm from Crevoiser et al. 2013

PWLR: Piece-Wise Linear Regression

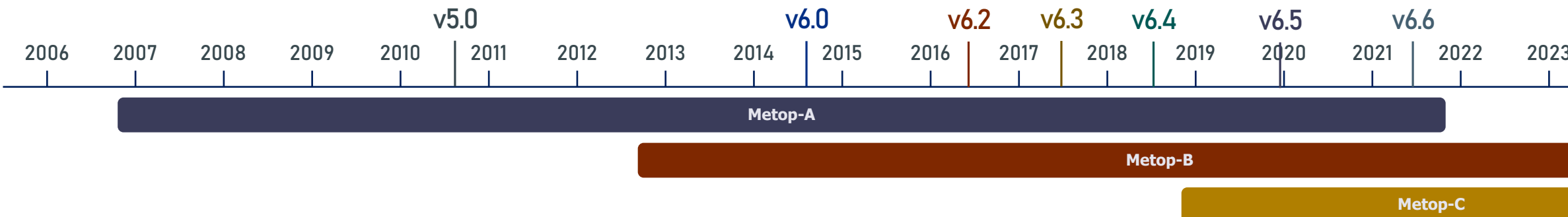
- Microwave (AMSU/MHS) and Infrared (IASI) synergy
→ All-sky retrieval (~99.5%)
- Fast Machine Learning retrieval
→ EARS IASI L2 regional processing available
- Associated error estimation + validation & monitoring
→ Informed products use



1DV clear sky



PWLR full sky





IASI L2 products: performances and quality

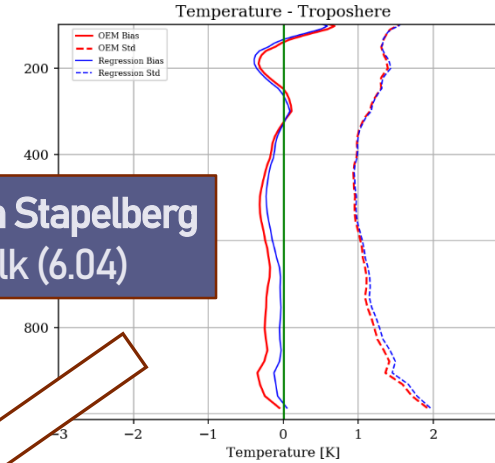
IASI L2 PWLR³ all-sky performance assessment

- Automatic scientific monitoring
 - Comparison to independent measurements (in situ, ground based, air-borne, space-borne...)

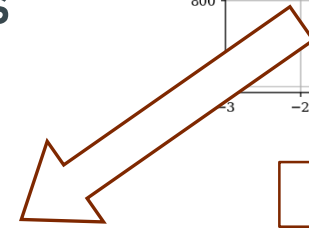
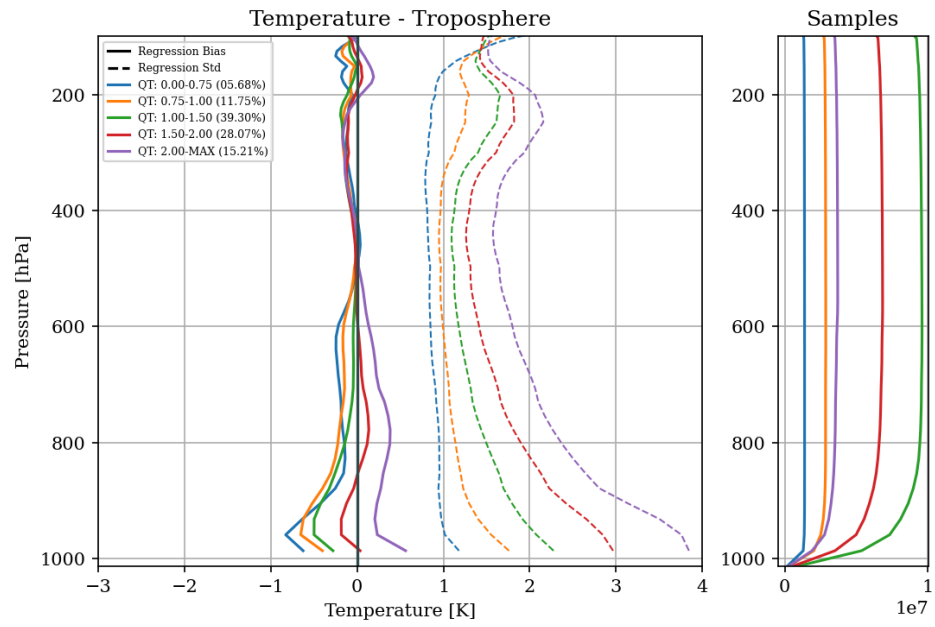
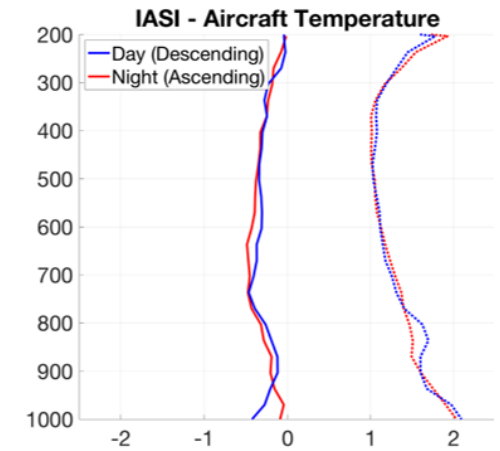
IASI L2 PWLR³ all-sky Quality Indicators (Qi)

- Scalar error estimate available for all products
- Validated against in situ measurement

PWLR³ all-sky Temperature profile performances

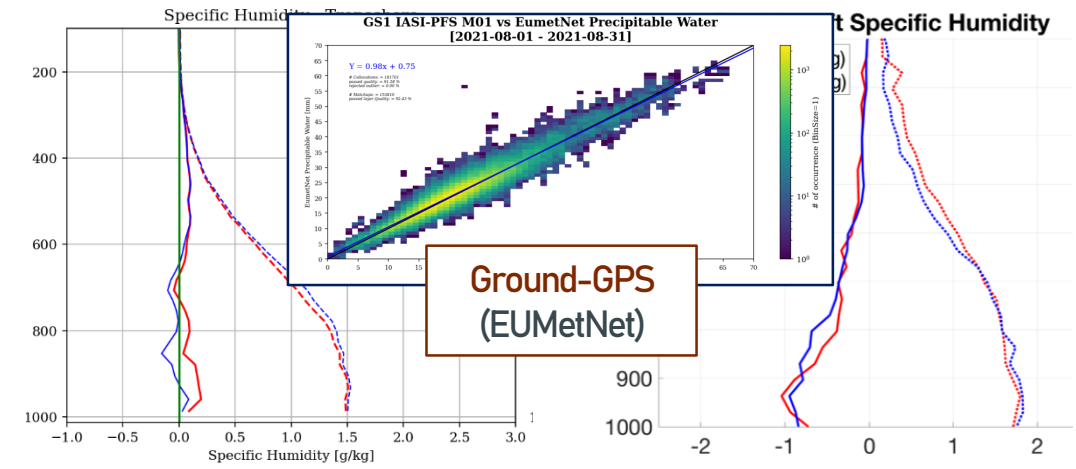


Stefan Stapelberg talk (6.04)



Sondes (IGRA)

Airplanes (AMDAR)



Ground-GPS (EUMetNet)

PWLR³ all-sky Humidity profile performances



IASI L2 products: the last updates to the version 6

Q1/2023 IASI L2 v6.7

- **CH₄**: M03 activation & retrieval update
- **PCs (L1D)**:
 - Full noise-normalisation matrix
 - New training base
 - Hybrid PCs

Tim Hultberg poster (6p.06)

Q3/2023 IASI L2 v6.8

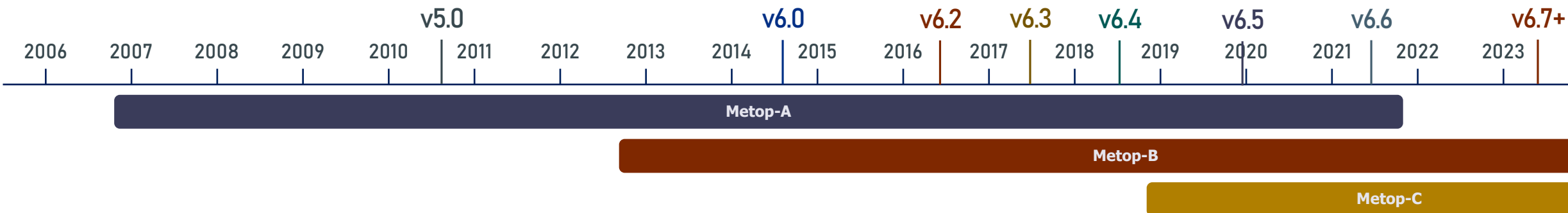
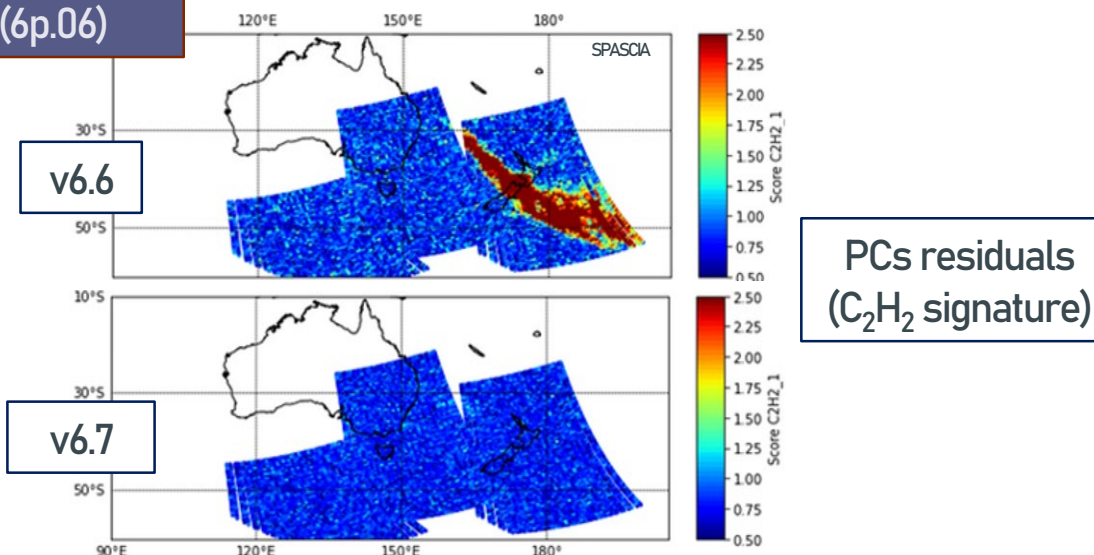
- **O₃ & HNO₃**: FORLI algorithm update

Q4/2023 IASI L2 v6.9

- **PWLR³**: Major quality update

Hybrid PCs: Addition of local PCs (granule) to the already available global PCs

- Uncommon gases or unusual amounts of common gases are retained
- Atmospheric trends are captured





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EUMETSAT IASI L2 v7

- Since 2007: new algorithms, new products, new instruments, new users, new needs...
→ Formats and products representation need to be fully re-written
- **In development**
 - All-sky T/q/O₃ pressure grid: fix levels → **sigma-levels**
 - All-sky error estimates: scalar → **full profile**
 - AC SAF processing: embedded → **independent**
 - L2 flags: obsolete → **modern**
 - Cloud products Mask & FCC/CTP → **+ TCLW/TCIW**
- **To be discussed**
 - L2 profiles PCs? Or “reconstructable” selected layers ?
 - PWLR³ with FCT as predictor (in addition to the standard FCT-free)?
 - Removal of the T/q/O₃/Ts OEM products?
 - All-sky CO₂/N₂O as average mixing ratio (instead of integrated amount)?
 - Adding some vertical information for all-sky CO₂/N₂O?
 - Add instability indices? Which ones?



Thank you!
Questions are welcome.