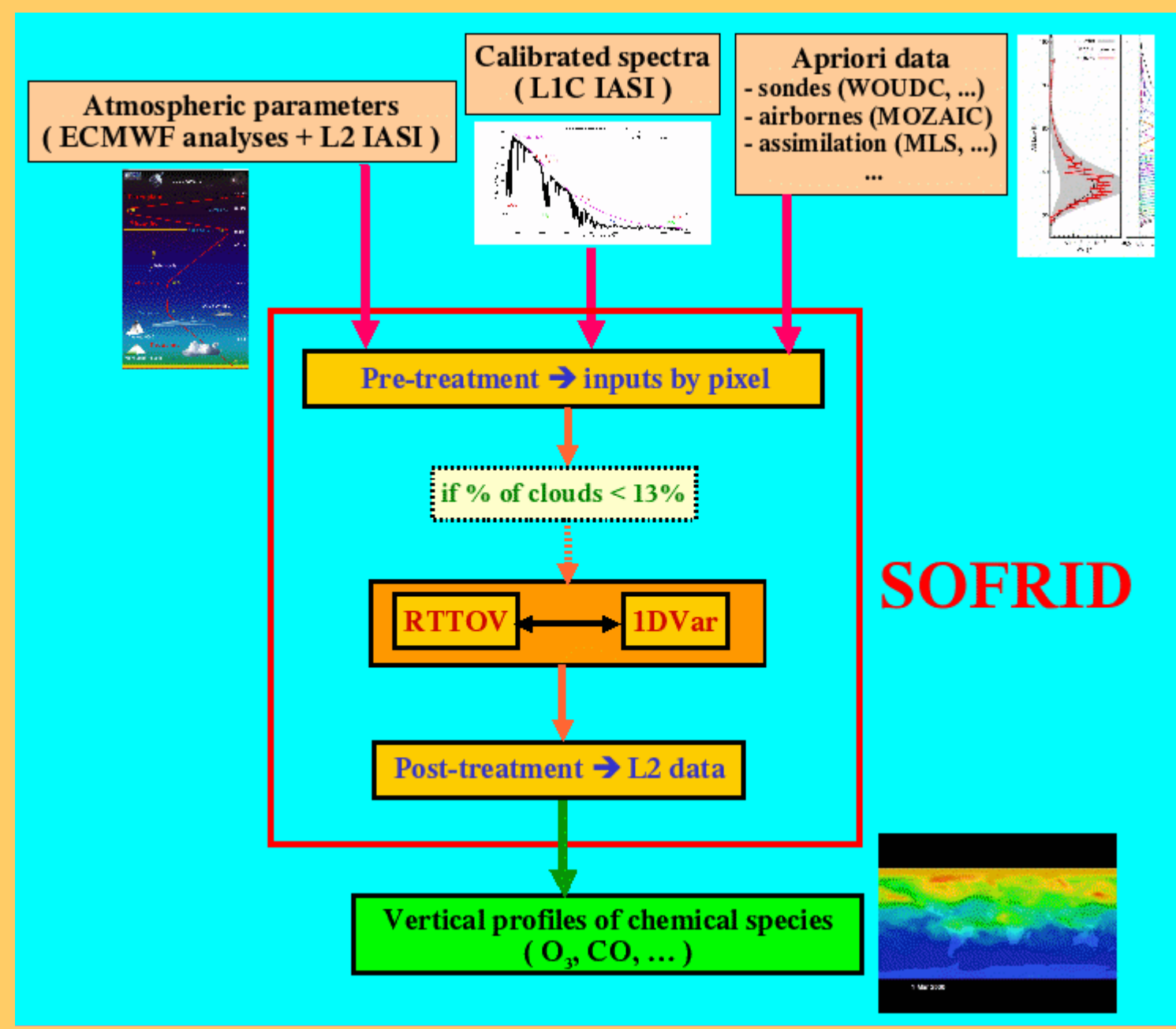


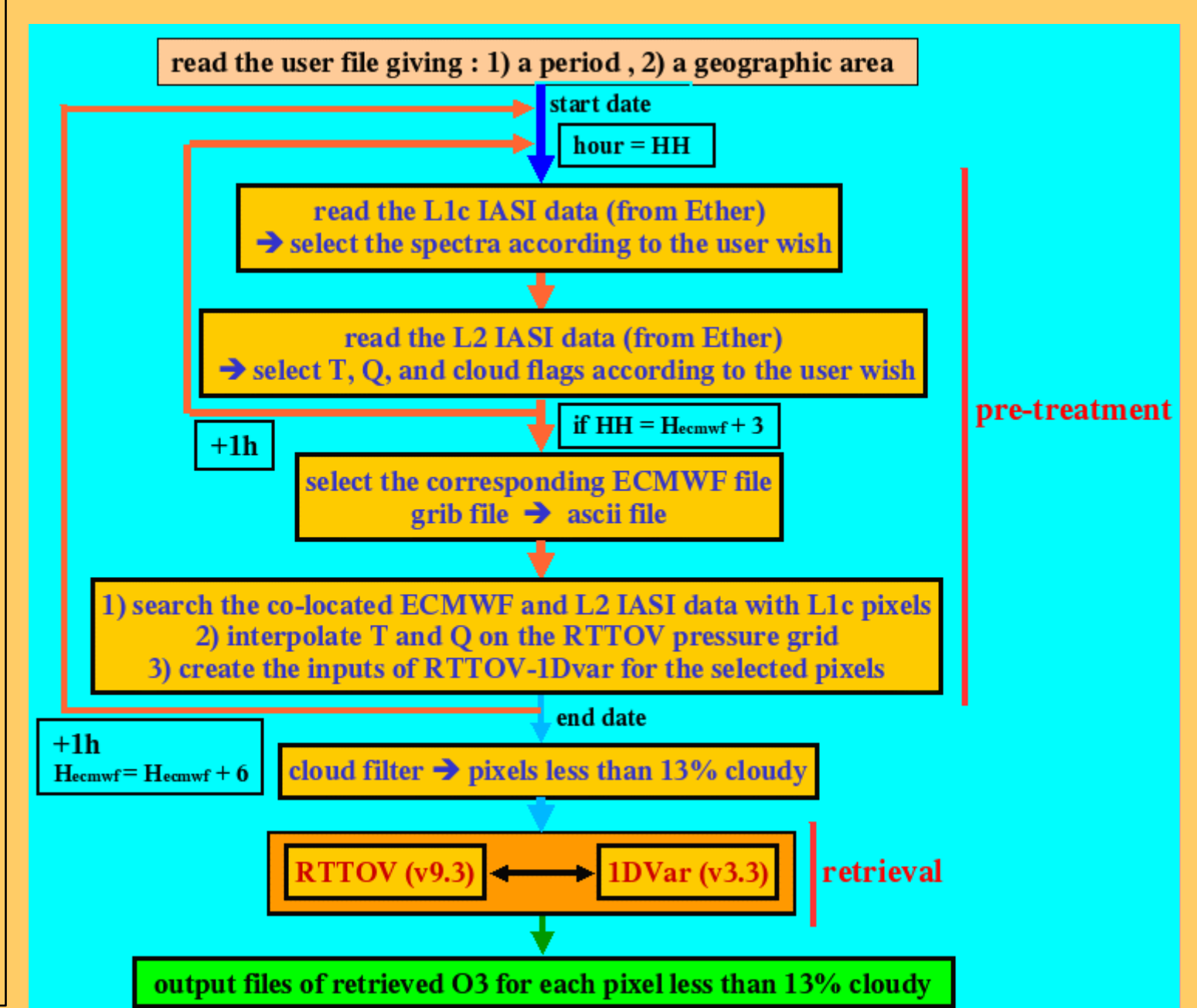
Abstract : The Infrared Atmospheric Sounding Interferometer (IASI) was launched in October 2006 onboard the first MetOp satellite. This instrument primarily dedicated to measure meteorological parameters, also enables to characterize the atmospheric content of chemical species such as ozone (O₃) and carbon monoxide (CO). At Laboratoire d'Aérodologie we developed the Software for Fast Retrievals of IASI Data (SOFRID) to retrieve O₃ and CO atmospheric contents. This software is based on the latest release of the 1D-Var module from the Met-Office (v3.3) coupled to the RTTOV (v9.3) fast radiative transfer code developed within the EUMETSAT NWP SAF. We present this software based on the following steps 1) selection of the pixels according to the user spatio-temporal wish, 2) selection of the co-located meteorological parameters from the ECMWF analyses and the IASI EUMETSAT L2 data, 3) building of an O₃ profile database and a *a priori* ensemble from WOUDC and MOZAIC data coupled with Aura/MLS assimilated fields, 4) retrieval and characterization of O₃ profiles from the selected pixels. Maps of IASI-SOFRID O₃ partial columns over Europe and Africa are presented for NH summer and winter.

Design of the IASI retrieval software developed at Toulouse

- INPUTS DATA OF SOFRID**
- **L1c IASI data**
 - Come from Ether (buffer files per day)
 - **L2 IASI data**
 - Come from Ether (2 tar files per day)
 - One tar file contain information on temperature , the other contain information on clouds
 - Vertical grid : 91 levels
 - These files contain only the odd pixels
 - **ECMWF data**
 - Grib files processed on the CEP server
 - Analyses given every 6 hours (00h,06h,12h,18h)
 - Horizontal resolution : 0.25°x0.25°
 - Vertical grid : 91 levels
 - **Apriori data**
 - Couling of WOUDC-MOZAIC data and Aura/MLS assimilated fields



- ALGORITHM OF PRE-TREATMENT**
- The user chooses
 - A period
 - A geographic area
 - Every hour we select
 - the corresponding L1c data
 - the corresponding L2 IASI data
 - Every ECMWF timestep +/- 3 hours
 - We select the ECMWF data
 - We create the inputs by interpolating the vertical profiles on the retrieval grid
 - Inputs of RTTOV-1DVar
 - Surface parameters come from ECMWF data
 - Temperature and water vapour profiles, as well as cloudy fraction, come from L2 IASI data



Retrievals : database, characterization and validation

O₃ profiles database

Objective
Database of O₃ profiles from the surface to the mesosphere to build a *a priori* data and validate IASI retrieval

Data used
 > WOUDC/SHADOZ sondes (up to 25-35 km) and MOZAIC (troposphere)
 > Aura/MLS data (UT to mesosphere) assimilated with MOZAGE-PALM

Retrieval characterization

Method : optimal estimation (1D-Var)
Spectral Window : 980-1100 cm⁻¹ with exclusions for H₂O absorptions
a priori data : WOUDC-SHADOZ-MOZAIC+MLS-Assim
Radiometric noise : 0.35 mW/(m².cm⁻¹.str)

→ ~ 2.5 independent levels of information

Validation

Tropics (MOZAIC)
Accra, Ivory Coast, 5°N, 0°E
20080711
62 pixels
DFS=2.6 (0.6/UTLS, 0.8/tropo.)

NH-Midlatitudes (WOUDC)
200806-200808
~ 50 soundings
~ IASI 600 pixels
DFS=2.3-2.9 (0.6-1.0/Tropo., 1.5-1.8/Strato.)

IASI-SOFRID O₃ data over Europe and Africa

UTLS / tropospheric O₃ over Europe

UTLS Columns

Columns (p>400 hPa)

18/07/2007 Europe

- > **UTLS :** Maxima over North-Western Europe/UK
- > **Troposphere :** Maxima over Eastern Mediterranean

Tropospheric and UTLS information uncorrelated

IASI O₃ over Africa

- > **Strato. :** North-South gradient well reproduced
- > **UTLS :** Maxima south of 20°S / north of 30°N → lower tropopause / Jets
- > **UTLS/Tropo. :** high O₃ columns over Tropical Atlantic → Biomass Burning/LiNOx + export

- > High O₃ in Strato./Tropo. and low O₃ in UTLS columns over North-Atlantic, South Med., Red sea... → Desert dust ?
- > Few pixels/ low tropo. O₃ over deserts... → Surface emissivity ?

Strato. (< 100 hPa)

Tropo. (> 150 hPa)

UTLS (100-250 hPa)

Lower Tropo. (< 450 hPa)

14-16/07/2008 Afrique

Conclusions

- SOFRID : Software for a Fast Retrieval of Iasi Data**
- RTTOV/1D-Var retrieval module adaptation to O₃ retrievals
 - coupling between ECMWF analyses and IASI L1C data
 - cloud filter based on flags from IASI L2 data
 - a priori ensemble based on WOUDC-MOZAIC and Aura/MLS assimilated fields

Results

- O₃ profiles with 2 to 3 independent elements of information (DFS)
- good sensitivity in the troposphere and stratosphere → correlation coefficients of ~ 0.8 with sonde data
- main features of tropo., UTLS and strato. O₃ captured over Europe and Africa
- problem with mineral dust and emissivity over and around deserts

Perspectives

- > Implementation of the RTTOV emissivity module
- > Use the RTTOV aerosol module to take mineral dust into account
- > Retrievals of CO
- > Formating of L2 products