Carbon monoxide (CO) is an important trace gas for the understanding of both air quality and atmospheric composition. It is a good tracer of pollution plumes and atmospheric dynamics. From the analysis of the IASI radiances, along with ancillary information on temperature and humidity profiles and emissivity, CO concentration products (total column and profiles) are obtained using the Fast Operational/Optimal Retrievals on Layers for IASI (FORLI) algorithm.

### FORLI CO applications at SPECA/T/ULB and LATMOS/IPSL

**Spectroscopy of the Atmosphere, Service de Chimie Quantique et de Photophysique, Université Libre de Bruxelles, Brussels, Belgium**

<table>
<thead>
<tr>
<th>Year</th>
<th>CO Total Columns Averaged on the 4 Year Period 2008-2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Daytime CO Total columns averaged on the 4 year period 2008-2011 around Paris</td>
</tr>
<tr>
<td>2009</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>MOPITT: TIR+TIR, MOPITT: TIR, IASI</td>
</tr>
<tr>
<td>2011</td>
<td></td>
</tr>
<tr>
<td>2012</td>
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</tbody>
</table>

See poster of M. Pommier for comparison of IASI and MOPITT v5 data.

#### Code implementation calendar:
- CO in 2012
- SO₂ in 2013
- O₃ in 2014
- HNO₃ in 2015

### FORLI CO results distribution

- Operational alert system for high altitude volcanic ashes
- Pre-filtering radiance (terrestrial, inhomogeneous)
- CO vertical profiles
- CO total columns
- O₃ concentrations
- CO concentration products (total column and profiles)
- MOPITT: TIR+NIR, MOPITT: TIR

FORLI CO results will be distributed in near real time by Eumetsat through the Eumetcast system.

### FORLI CO results applications in international scientific teams

#### FORLI CO in MACC-II project

**Climate - Interim Implementation** is the current pre-operational GMEs Atmosphere Service. MACC-II provides data records on atmospheric composition for recent years, data for monitoring present conditions and forecasts of the distribution of key constituents for a few days ahead.

MACC-II combines state-of-the-art atmospheric modeling with Earth observation data to provide information services covering European air quality, global atmospheric composition, climate forcing, the ozone layer, UV and solar energy, emissions and surface fluxes (http://www.gmes-atmosphere.eu).

IASI CO total columns from ULB-LATMOS are operationally assimilated in the MACC ECMWF near-real time analysis to produce chemical forecasts of CO global distributions.

#### MACC-II forecast of surface CO mixing ratio

- Hindcast experiments of tropospheric composition during the summer 2010 fires over western Russia
- More than 60 registered users exploit this dataset to further study and understand the atmospheric composition and chemistry, air quality assessment or emission source estimations.

#### Validation works and applications

- How much CO was emitted by the 2010 fires around Moscow? A. Inness et al., ACPD, 2012.
- Retrieval of MetOp/AIASI CO profiles and validation with MOZAC data.
- Validation of IASI FORLI carbon monoxide retrievals using FTIR data from NDACC.
- Assimilation of IASI satellite CO fields into a global chemistry transport model for validation against aircraft measurements.
- Satellite- and ground-based CO total column observations over 2010 Russian fires: accuracy of top-down estimates based on thermal IR satellite data.
- L.N. Yurganov et al., ACP, 2011.
- Episodes of cross-polar transport in the Arctic troposphere during July 2009 as seen from models, satellite, and aircraft observations.
- HIPOX and JackHyrax: Constraining emissions for the 2010 fires.
- M. George et al., JQSRT, 2012.
- Validation of IASI FORLI CO results distribution.
- M. Krol et al., ACPD, 2012.
- H. Sodemann et al., ACP, 2011.