First Result on Ozone Profile Retrieval From GOME-2 and IASI

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Outline

• What do we not need
• What do we need
• Collocation GOME-2 and IASI
• NNORSY-GOME-2 ozone profile retrieval
• First results on NNORSY-GOME-2/IASI
Not Needed for NNORSY

Compared to classical retrievals schemes based on Optimal Estimation

- No a-priori profiles
- No forward model
- No spectroscopic database
- No high performance computers for real-time application
Neural network input:
- selected parts of GOME-2 spectra
- selected parts of IASI spectra
- space-time info
- observation geometry
- Temperature profiles data helps
Some Results on NNORSY-GOME-2
NNORSY-GOME-2 Profile Comparison with Ozone Sonde Station

HOHENPEISSENBERG (mid latitudes)

NNORSY sonde rel. comparison
GOME-2/IASI Collocation

- GOME-2 footprints are base grid for retrieval
- Collocation in cooperation with NWP-SAF (Nigel)
- Collocation of AVHRR with GOME-2 pixels for cloud mask

Scan characteristics

<table>
<thead>
<tr>
<th></th>
<th>pixels / scan line</th>
<th>scan time [sec]</th>
<th>time / pixel [sec]</th>
<th>forward scan viewing time [sec]</th>
</tr>
</thead>
<tbody>
<tr>
<td>IASI</td>
<td>30x4</td>
<td>8</td>
<td>0.216</td>
<td>6.48</td>
</tr>
<tr>
<td>GOME-2</td>
<td>24</td>
<td>6</td>
<td>0.1875</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Approach for GOME-2/IASI Collocation

Right hand rule for cross products

→ 3 steps for collocation

\[ \mathbf{a} \times \mathbf{b} \]
GOME-2/IASI Collocation: Step 1

Cross product $\mathbf{AP1} \times \mathbf{AB}$

Cross product $\mathbf{CP1} \times \mathbf{CD}$

$\rightarrow$ 2 resulting vectors orthogonal on pixel plain
GOME-2/IASI Collocation: Step 2

Scalar product of resulting vectors

If parallel > 0 → point is outside lines (e.g. P2)
If antiparalle < 0 → point is between lines (e.g. P1)
GOME-2/IASI Collocation: Step 3

Same procedure for vertical line pair

*P2 is outside the first line pair, further investigation is therefore not necessary*

Collocation is 5x faster than file reading (updated EUMETSAT readers)
Testorbit GOME-2/IASI Collocation
Testorbit GOME-2/IASI Collocation (magnified)

GOME-2/AVHRR collocation almost finished
First Results on Combined Retrieval

- Plots show relative errors on test data set
- No ECMWF temperatures were used here
- IASI improves retrieval mainly below ozone peak
- Probably obviates need for temperature profiles from NWP analyses
Conclusion

- NNORSY-GOME-2 ozone profile retrieval available
- New fast collocation scheme for GOME-2/IASI
- Collocation GOME-2 with AVHRR for cloud mask
- Combined one-step NNORSY-GOME-2/IASI retrieval improves ozone profile quality
- Easily adaptable for real-time application