Long-term analysis of methane as retrieved from SCIAMACHY

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Outline

- Brief recap of latest retrieval improvements
  more in Frankenberg et al, ACP (2008) and GRL (2008)

- Latest source inversion estimates on the basis of SCIAMACHY
  more in Bergamaschi et al, JGR, in press

- The 2007/2008 methane anomaly and challenges for the
detection by SCIAMACHY: degrading detector pixels

- First tentative (promising) long term time-series
Motivation slide, methane on the rise ...
The nagging problem

Frankenberg et al., JGR 2005

ESA Atmospheric Sciences Conference, Barcelona
Multi-spectra fit, results for the Q-Branch
Analysis of 4 methane spectra with $N_2$ pressure from 125-900hPa, 0.011cm$^{-1}$

Frankenberg et al, ACP, 2008
Atmospheric water vapor
Implication on SCIA CH$_4$ retrievals

Optimised treatment of water absorptions

Frankenberg et al, GRL 2008
ESA Atmospheric Sciences Conference, Barcelona
TM5 inversion results

Bergamaschi et al, JGR, in press
Inversion over Asia, TM5 nested zoom (1x1)

Bergamaschi et al, JGR, in press
Long term analysis, why interesting?

Rigby, M., et al. (2008), Renewed growth of atmospheric methane, GRL. (using AGAGE, not NOAA!)

Dlugokencky et al. (2009), Observational constraints on recent increases in the atmospheric CH4 burden, GRL, in press:
1) Artic T is high
2) Tropical precip is high
23Tg emission anomaly in 2007!!
Most sensitive region, the Q-branch of the $2\nu_3$ band

Frankenberg et al, ACP, 2008
Degrading detector pixels, Random Telegraph Noise

Histogram of pixel nr 99, channel 6+, state ID 46, orbit 30886.
But luckily one important pixel still works ...
Time-series over the Sahara

Monthly mean over the Sahara

CH₄ VMR (ppb)

Jan04  Jan05  Jan06  Jan07

TM model
SCIA median
SCIA mean
Conclusions and Outlook

- SCIAMACHY offers a completely new view on the global methane distribution
- High tropical methane emissions are confirmed with the new retrieval but are reduced to about 200Tg/yr
- Inversions of new retrieval versions is very consistent with ground-based measurements
- Channel 6+ is degrading, clear jump in quality after 2005
- Retrievals after 2005 still feasible even though more noisy
- Increase in 2007 can be observed, analysis ongoing (too early to jump to conclusions)
Dynamic Processes Governing Lower-Tropospheric HDO/H₂O Ratios as Observed from Space and Ground

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low relative HDO content

SRON

high relative HDO content