Plans for GEMS GRG months 18-30

Martin Schultz and the GRG team

Sub project structure

WP1: Assimilation of gas-phase chemical species in the stratosphere and troposphere
leader: H. Eskes

WP2: Implementation of global CTMs in the ECMWF system
leaders: M. Schultz, J. Flemming

WP3: Development of prototype user services
leader: A. Arola

WP4: Evaluation of reanalysis simulations
leaders: J.P. Cammas, K. Law

WP1: Assimilation of gas-phase chemical species

- Finalize the CTM-IFS coupling
- Continue collection of satellite data sets for assimilation
- First assimilation experiments (~June 2006)
- Review on inverse modelling of non-CO_2 gases + recommendations for source inversion within GEMS+
- Evaluation of assimilated fields
- Evaluation of formation and loss rates
- Inter-Comparison of CTM outputs and consistency with IFS fields
- Implement nudging capabilities
- Preparation for reanalysis (Sep 2002 – March 2005) (months 29-30)

Tropospheric satellite data for 2003

- O_3: SCIAMACHY (total column, stratospheric profile), AIRS (TBC)
- CO: MOPITT (free trop. column), SCIAMACHY (total column), AIRS (TBC)
- NO_2: SCIAMACHY (total column, tropospheric column, stratospheric profile)
- SO_2: SCIAMACHY (total column)
- HCHO: SCIAMACHY (total column)
- CH_4: SCIAMACHY (total column), AIRS (TBC)

CO observations from space

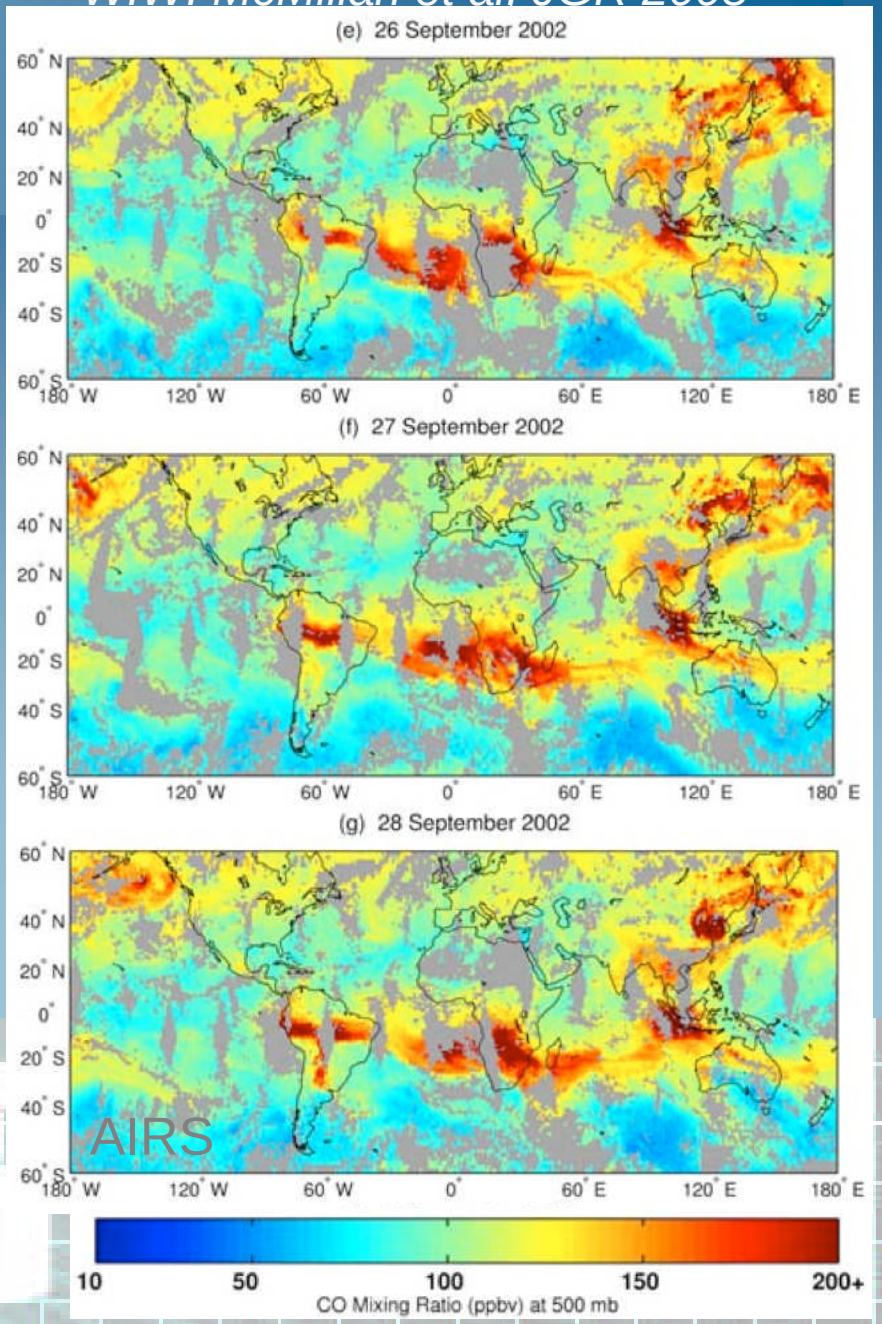
Satellite sensors:

- MOPITT
- AIRS
- IASI
- TES Aura
- SCIAMACHY
- IMG
- MIPAS
- SMR - Odin
- ACE-FTS
- MLS-Aura

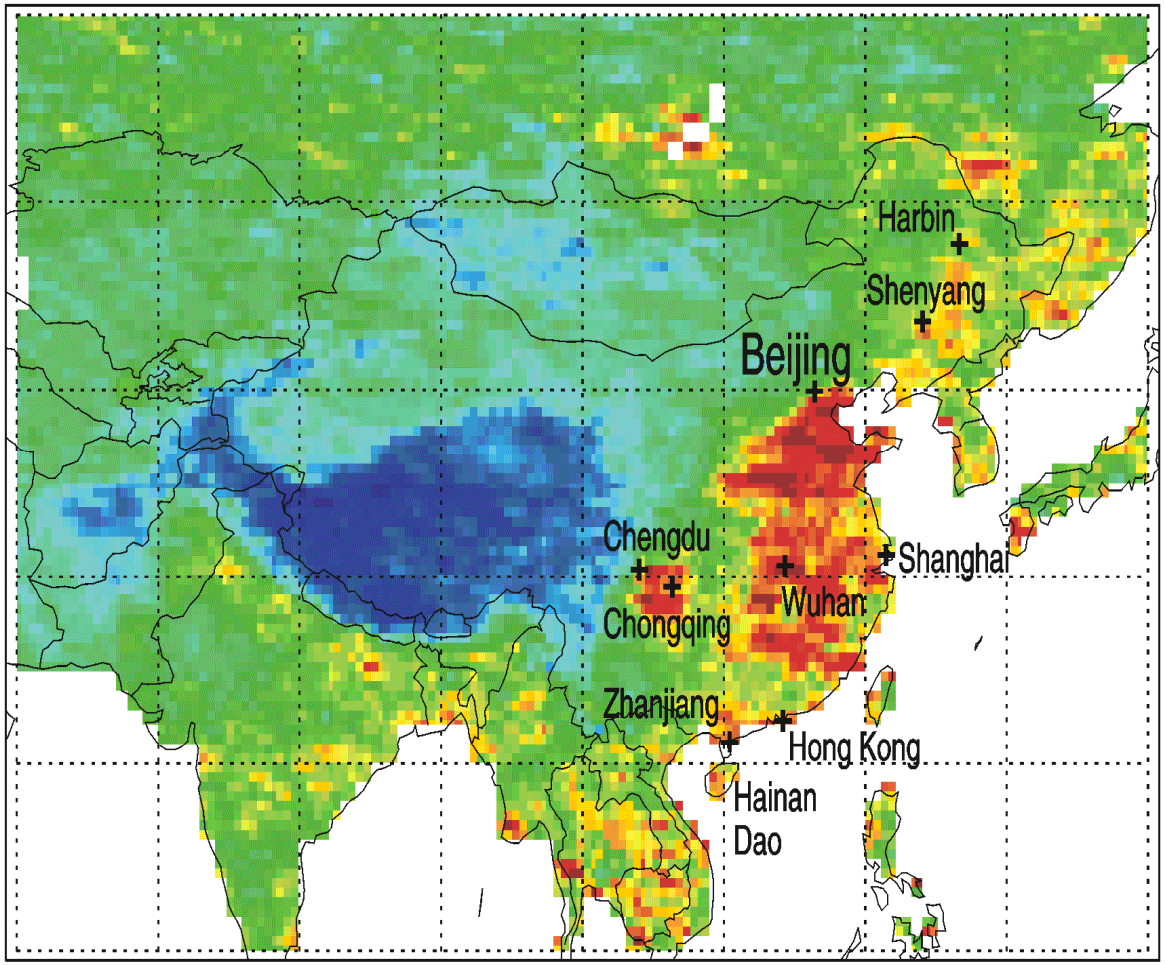
Note:

- Infrared instruments especialy sensitive to middle troposphere
- Near infrared sensitive to surface

W.W. McMillan et al. JGR 2005

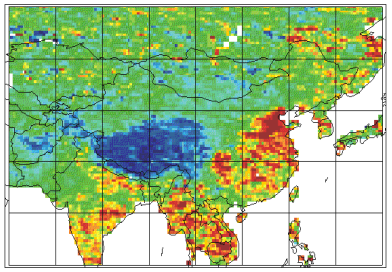


Carbon monoxide SCIAMACHY 2003

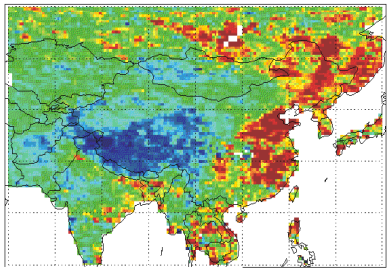


CO column [10^{18}/cm^2]

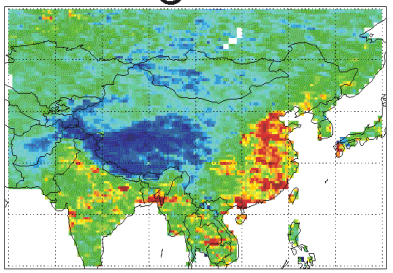
Feb - Apr

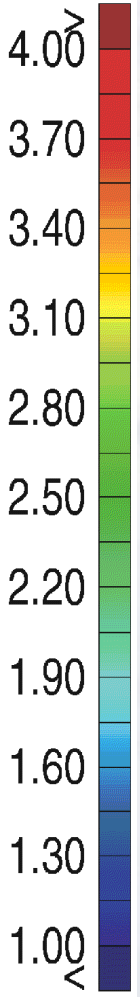


May - Jul



Aug - Oct





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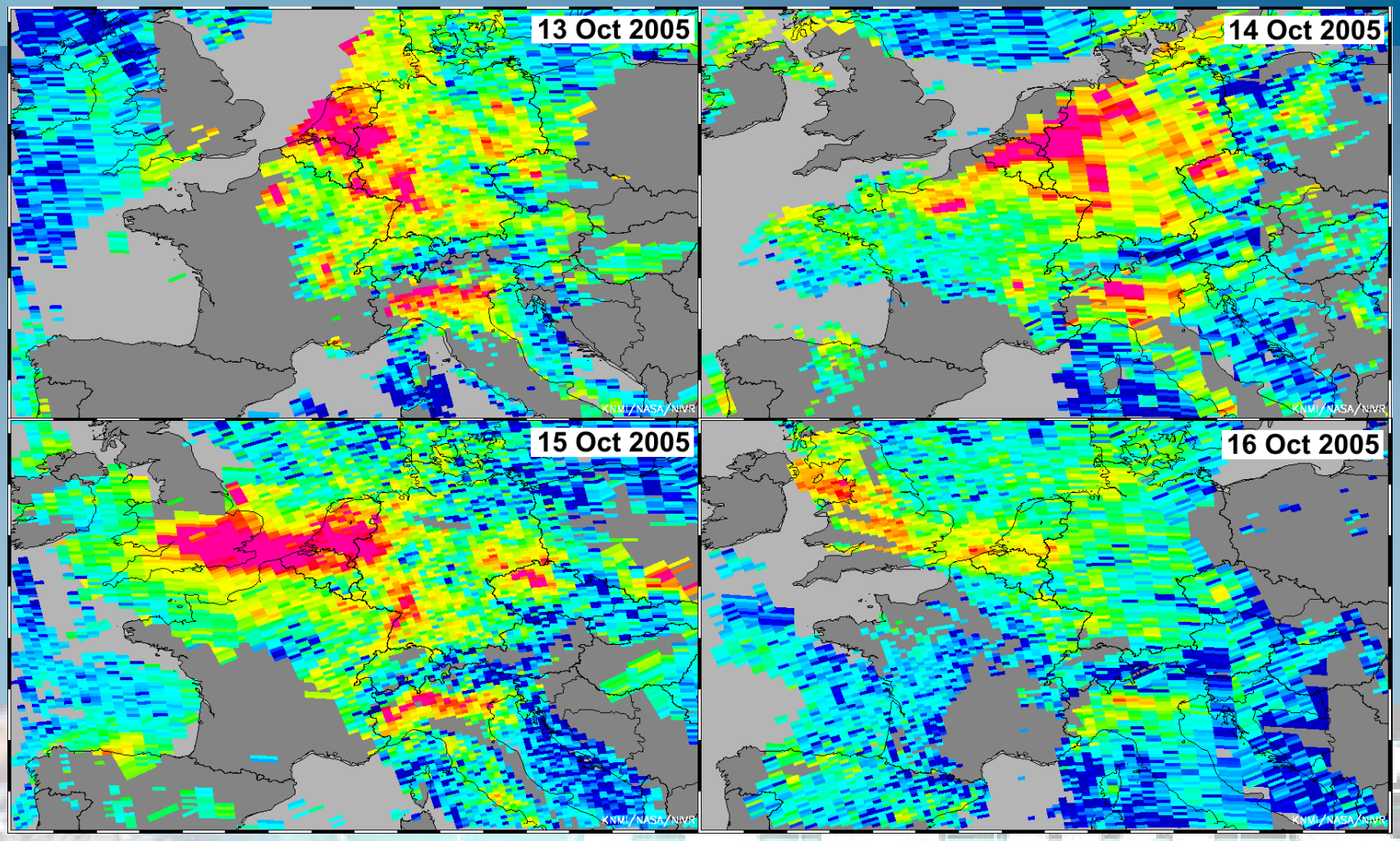
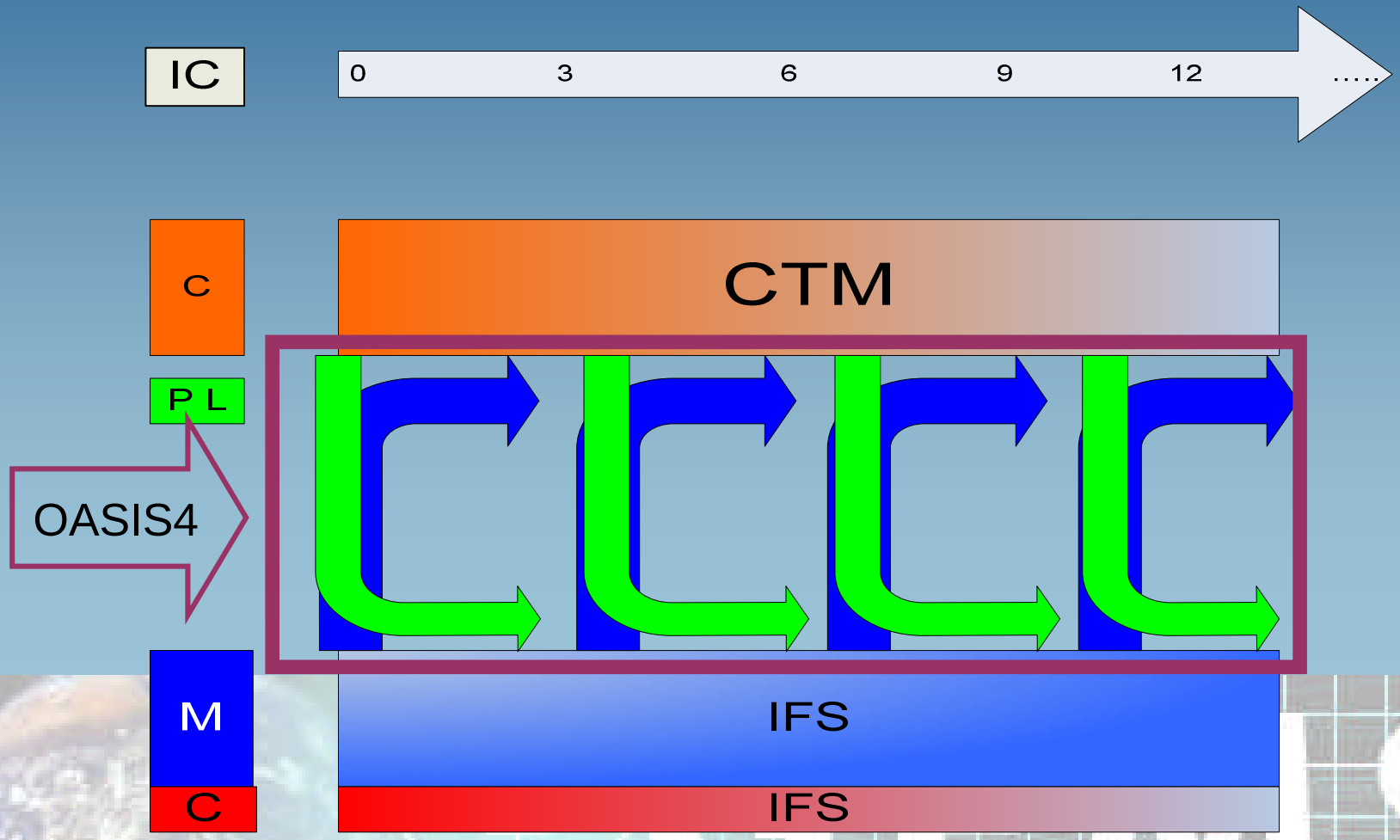
OMI near-real time NO_2, 13-16 October 2005



WP2: Implementation of global CTMs in the ECMWF system

- Run year 2003 stand-alone simulations (March 2006)
- Finish OASIS 4 interfaces including formation and loss rates (by May)
- Analysis of scientific issues related to coupling and assimilation
- Coupled forecast system ready by August
- Coupled data assimilation system ready for tests by September (including performance tests)
- Test integrity of system
- Update on emission data sets, time profiles
- Preparation of reanalysis run (November 2006 ??)
- "Real" reanalysis (August 2007)

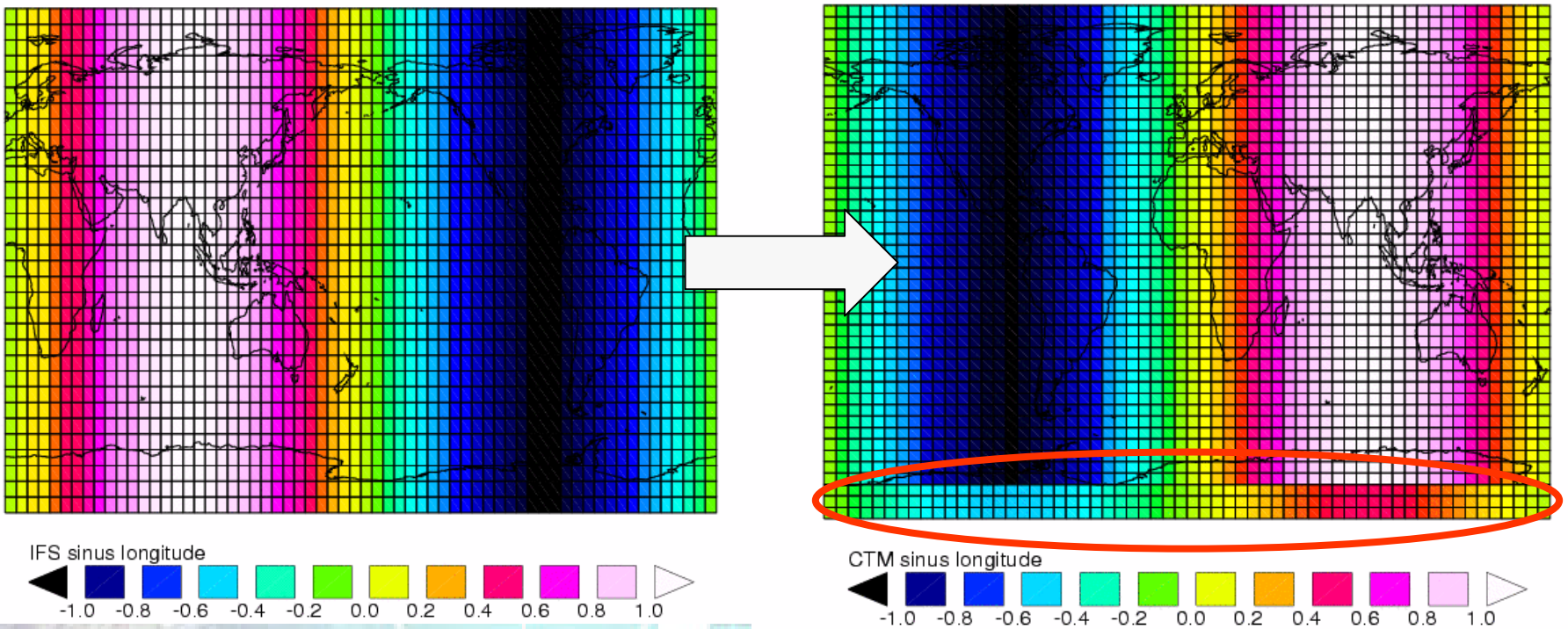
2 way - Coupling in Forecast mode



Interpolation with OASIS 4

IFS

TM5

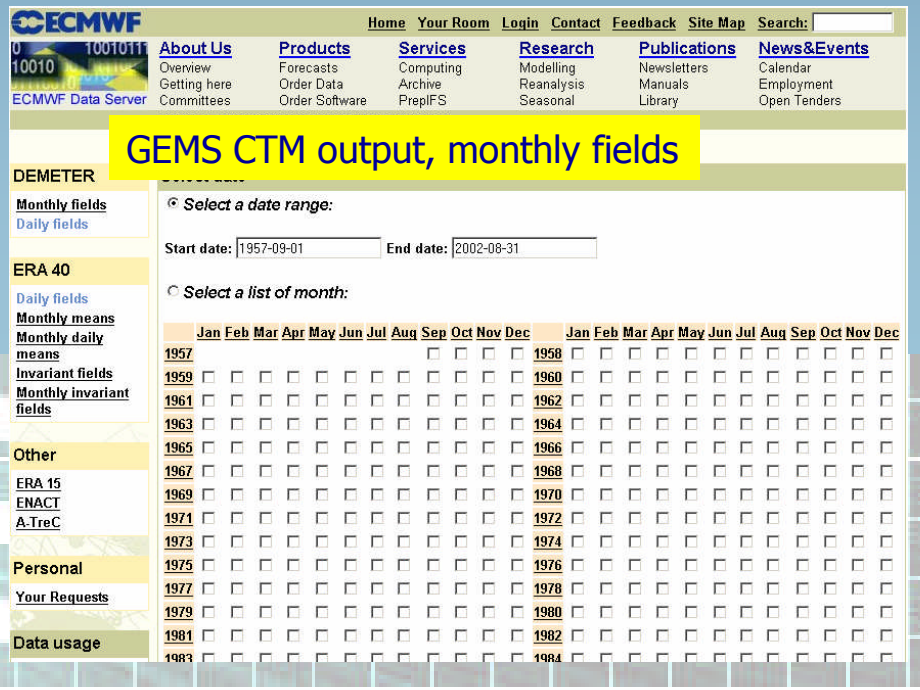


WP3: Development of prototype user services

- in the first year focus has been on UV index
- CTM output will be provided as user services
  - boundary conditions for RAQ
  - prototype web service for "outside" community
- Interaction with PROMOTE to link to user community

Web page of CTM output

- Model after ERA-40 services
- Example products:
  - concentration fields of few key compounds
  - deposition fluxes of ozone and NOx, SOx
  - time series at station locations



Boundary conditions for RAQ

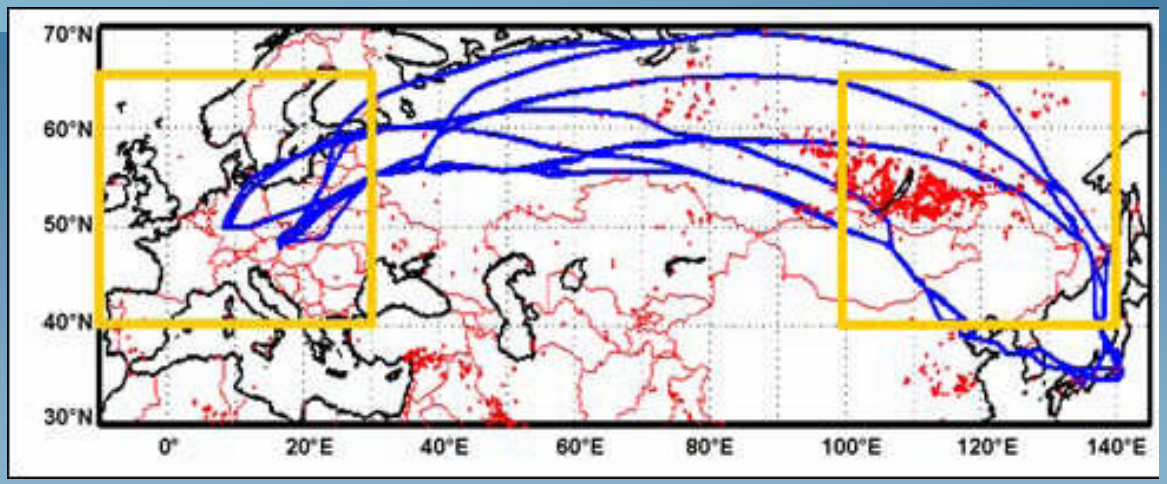
- Requested data format: GRIB
- Core species: O3, NO, NO2, PAN, HNO3, CO, C2H6, H2O2, NH3, SO2 + … (NMVOC) [total ~ 25 species]
- 3-hourly time resolution
- instantaneous values
-
- Initial storage and data transfer requirement: 840 MBytes/simulation day (T63L60) – can be reduced by cutting levels and region
- Post-processing tools needed to cut out top levels, cut out region Europe, interpolate to pressure levels, possibly reformat and rotate grids (task of PRO)

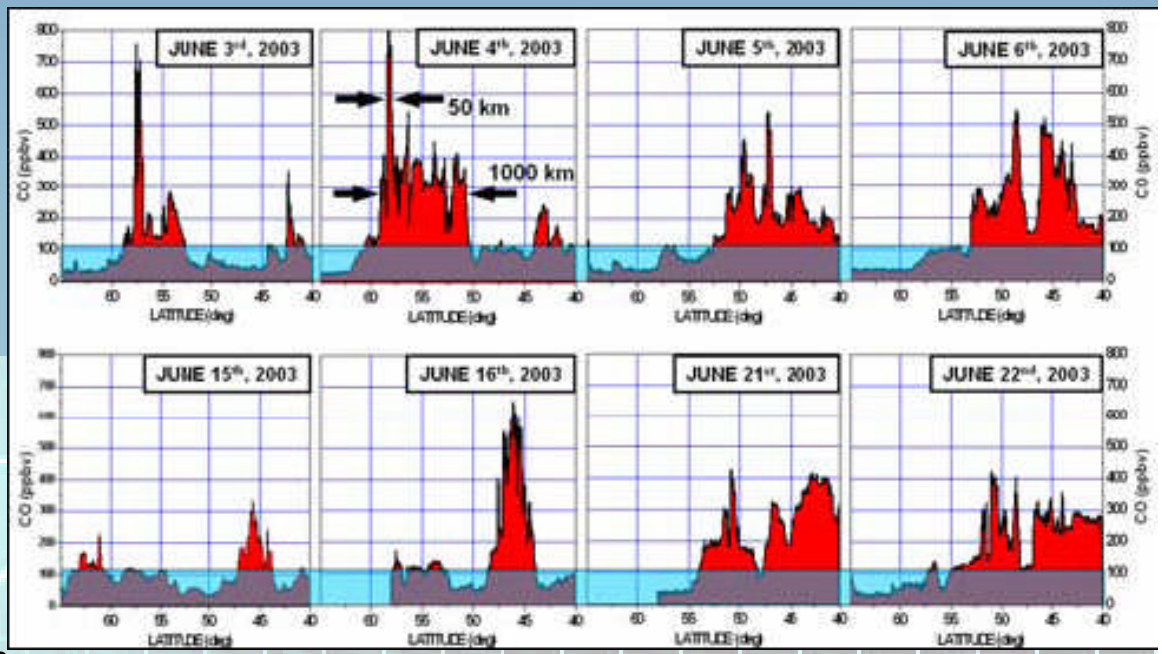
WP4: Evaluation of reanalysis simulations

- Evaluation of year-2003 based on selected episodes:
  - Siberian fires in May 2003
  - Summer heat wave July/August 2003 (incl. Portugal fires)
  - Wintersol campaign Jan/Feb 2003
  - test seasonal variation (focus on UTLS)
- Establish a common data base with evaluation data (data protocols must be respected)
- Evaluate and adapt/develop analysis routines
- Interaction with PRO_4 regarding visualisation tools and common web interface

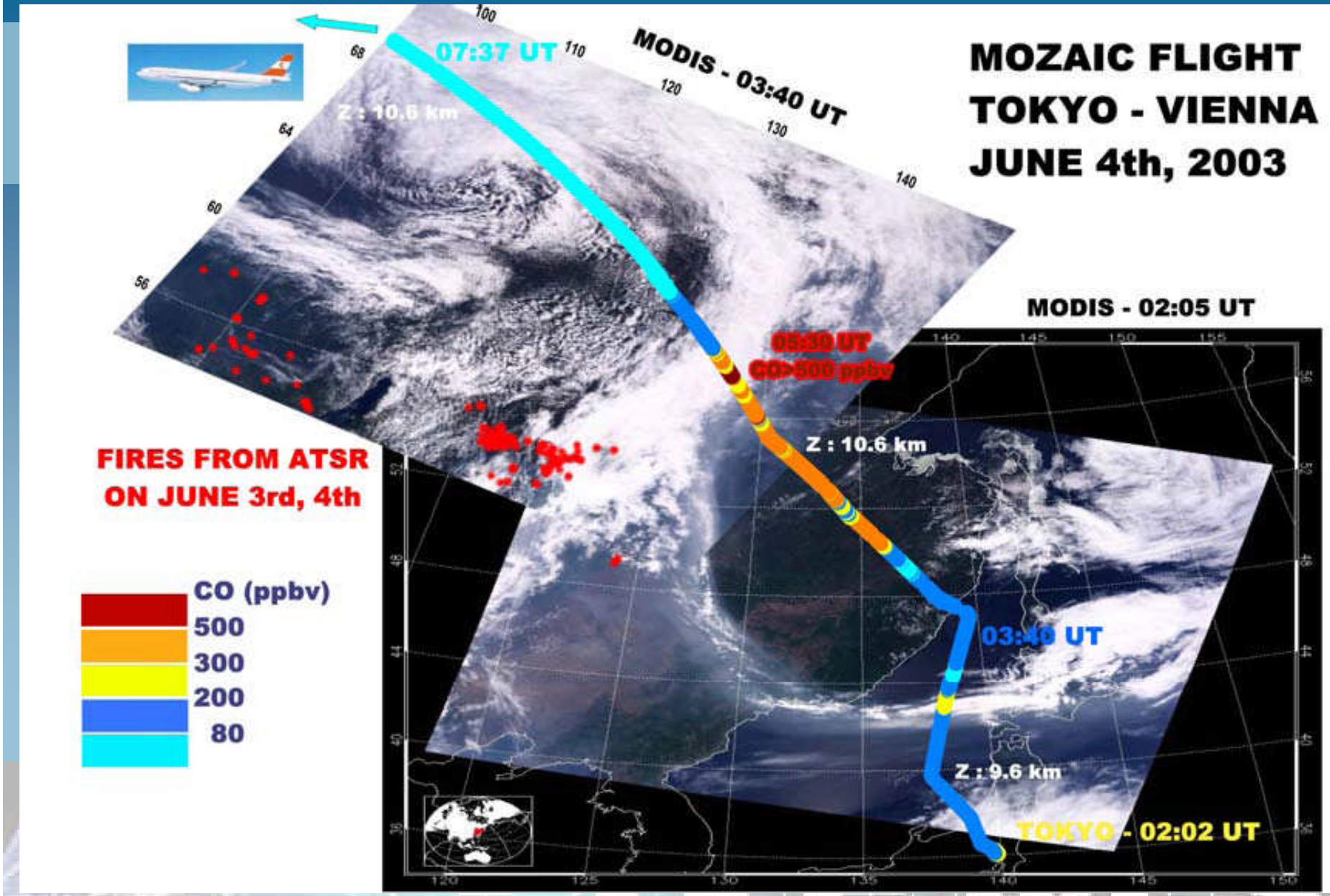
Workshop in May for technical planning of evaluation

Biomass fires over Northeastern Asia in Spring 2003: evidence of daily extreme CO concentrations in the upper troposphere with MOZAIC observations





Nédélec et al., GRL, 2005



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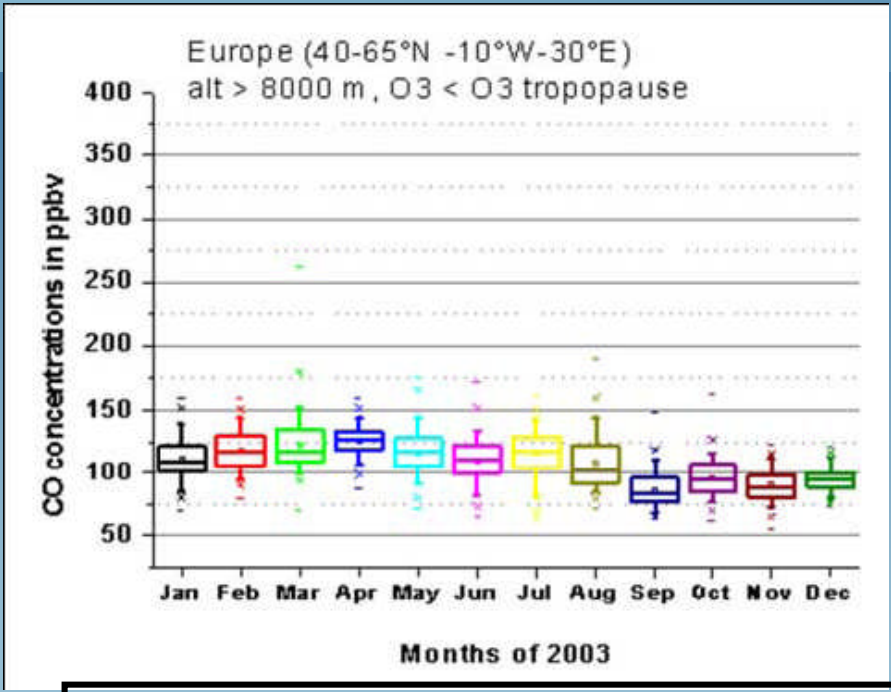

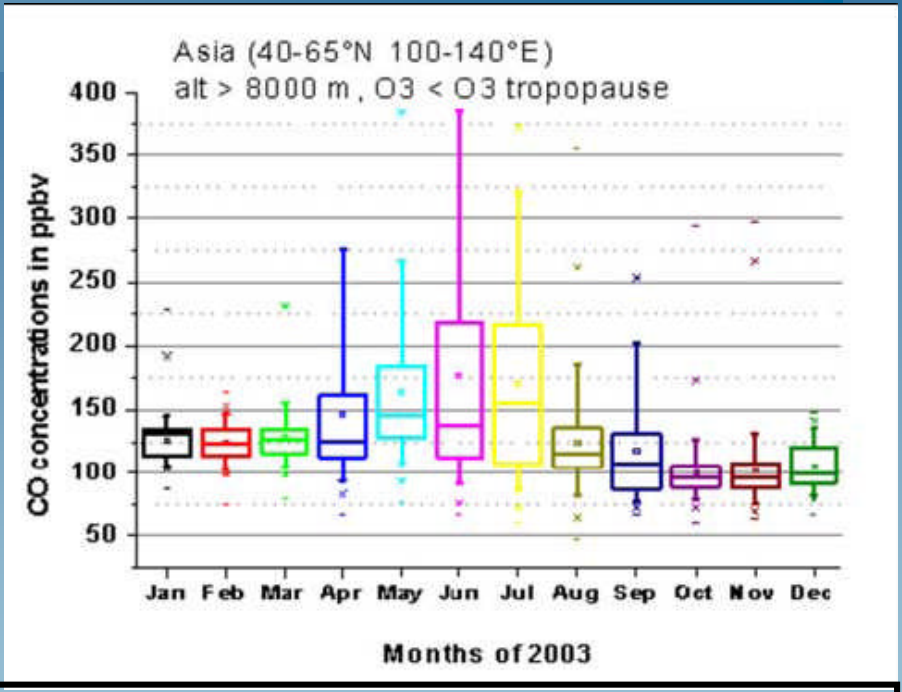

"Box charts" of the CO monthly frequency distributions for altitudes over 8000 m over Europe (left panel) and over North-East Asia (right panel) for 2003. Horizontal bars in the boxes give the median, while the boxes themselves extend from the 25% for the 75% percentiles. The small squares inside the boxes give the mean value, and the vertical bars give the 5% and 95% percentiles. Crosses give the 1% and 99% percentiles. Small dashes give the minimum and the maximum.

Nédélec et al., GRL, 2005

Milestones

Month 15 (May 2006):

- Evaluation of model P&L GRG_1 (+3)
- Nudging capability and data flows GRG_1 (+3)
- Year-2003 offline runs available GRG_2
- CTM-IFS coupling almost completed GRG_2 (+3)

Month 18 (August 2006):

- Technical eval. of assimilation system GRG_1 (+3)
- CTM offline results as prototype user service GRG_3 (+6)
- Evaluation of CTM offline simulations GRG_4 (+3)
- Test version of UV Index products GRG_3 (+3)

Milestones (2)

Month 21 (November 2006):

- Monitoring of all satellite data GRG_1 (+6)
- Critical evaluation of assimilation approach GRG_1 (+3)
- 1st reanalysis with assimilation GRG_2+PRO (+3)
- time functions for emissions GRG_2 (+6)

Month 24 (February 2007):

- Data base of observations in place GRG_4

Milestones (3)

Month 27 (May 2007):

- Improved CTM parameterisations where needed GRG_2
- Preparation of 2nd reanalysis (target period Sep 2002-Mar 2005) GRG_1,GRG_2,PRO

Month 30 (August 2007):

- 2nd reanalysis running

Meeting plans

- evaluators' meeting, 2nd half of May, Toulouse
- CTM/coupling output assessment meeting, June(?), ECMWF
- GRG team meeting, late Oct./early Nov., Jülich
- GEMS Assembly, Feb. 2007, Toulouse

- Discussions on "data set meeting", jointly with ACCENT, May, Thessaloniki
- Discussions on "tool development meeting", jointly with RAQ (AER?, GHG?), HTAP, AEROCOM, JRC (no details)

Critical issues

- functional coupled system must be ready before summer
- will chemical assimilation work in coupled set-up?
- possible runtime issues
- UTLS ozone and precursors
- coordinate with other sub projects in order to avoid duplication of work (episodes, tools, data bases)