Progress Report on GEMS GRG

Guy Brasseur and Martin Schultz

Sub project structure

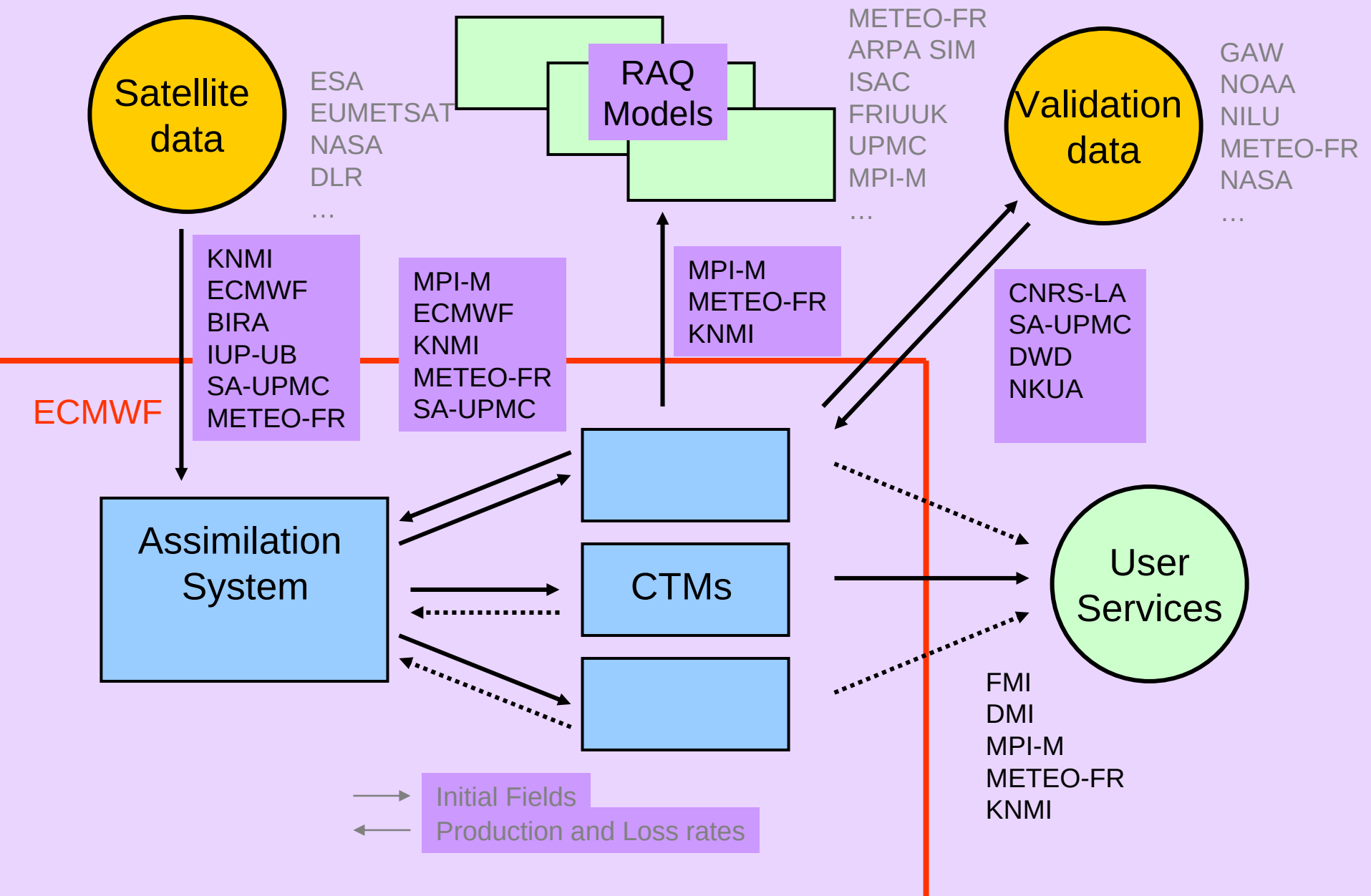
WP1: Assimilation of gas-phase chemical species in the stratosphere and troposphere
leader: H. Eskes

WP2: Implementation of global CTMs in the ECMWF system
leaders: G. Brasseur, M. Schultz

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

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

Data Flow and Responsibilities in GEMS GRG



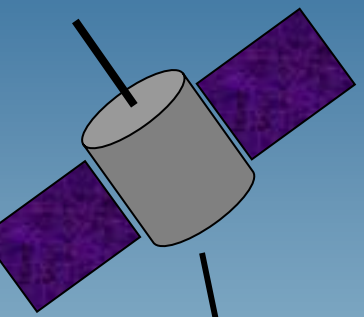
WP1: Assimilation

- IFS model has been extended to accommodate GRG tracers
- Definition of chemical production and loss rates to be transferred from CTMs to IFS
- Introduction of P&L to IFS pending successful testing of OASIS 4 interfaces
- Sciamachy data sets for ozone and NO2 provided by KNMI, awaiting reformatting and assimilation tests

WP2: CTM Implementation

- 3 CTMs installed at ECMWF computer system
- Parallelisation/Performance issues addressed
- Workshop on CTM-IFS coupling strategy (Oct. 2005)
- Discussions on exchange of chemical production and loss rates
- Implementation of OASIS 4 and toy model development
- Preparation for year-2003 forward simulations (including “ERA-2003” (PRO) and emission data sets)
- Work on CTM-IFS interfaces started (reading of met. fields and assimilated chemical fields, output of P&L)

Chemical data assimilation strategy



trace gas column densities

IFS

advected conc. fields as initial condition, met. fields

1-hourly (?)

chemical terms (P, L, E, D) and conc. fields for next forecast

CTM

CTM equation

Mass budget for each species

Number of species $i = 1 \ldots 100$

$$\frac{\partial c_i}{\partial t} + \mathbf{V}_h . \nabla_h c_i + \frac{\partial}{\partial z} w_c c_i - \frac{\partial}{\partial z} K_Z \frac{\partial c_i}{\partial z} = E + R - D$$

$E_i \neq f(c_i)$ ... Emission

$R_i = f(c_i, c_j, c_k, c_{m,} \ldots)$ ... Chemical conversion

$D_i = l_{Dep} c_i$ ... Deposition

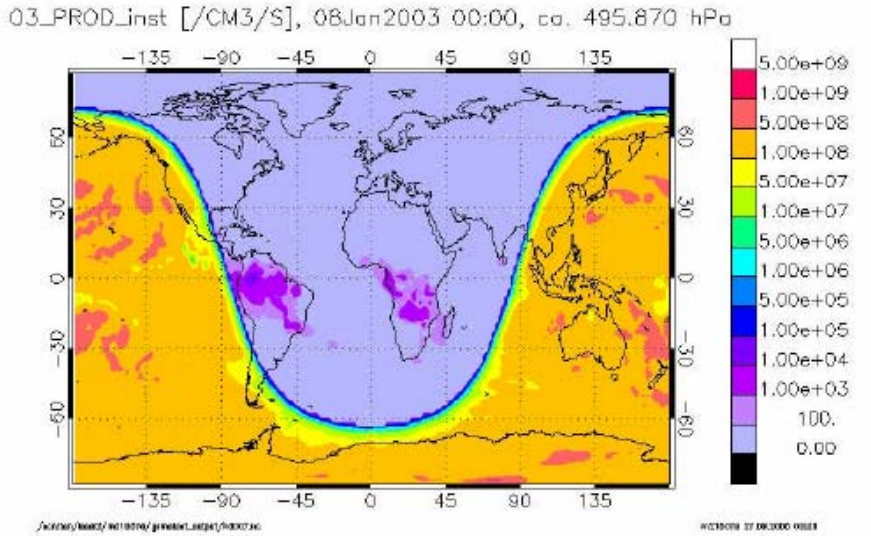
500 hPa MOZART

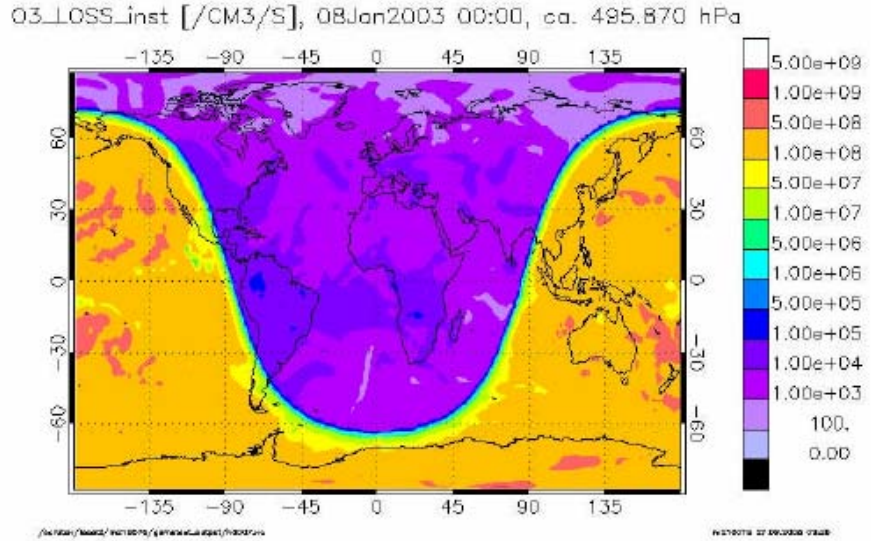
$P(O_3)$
MOZART

Watch the gradients!

$L(O_3)$
MOZART

1.12.2005





O. Stein (MPI-M)

WP3: Prototype user services

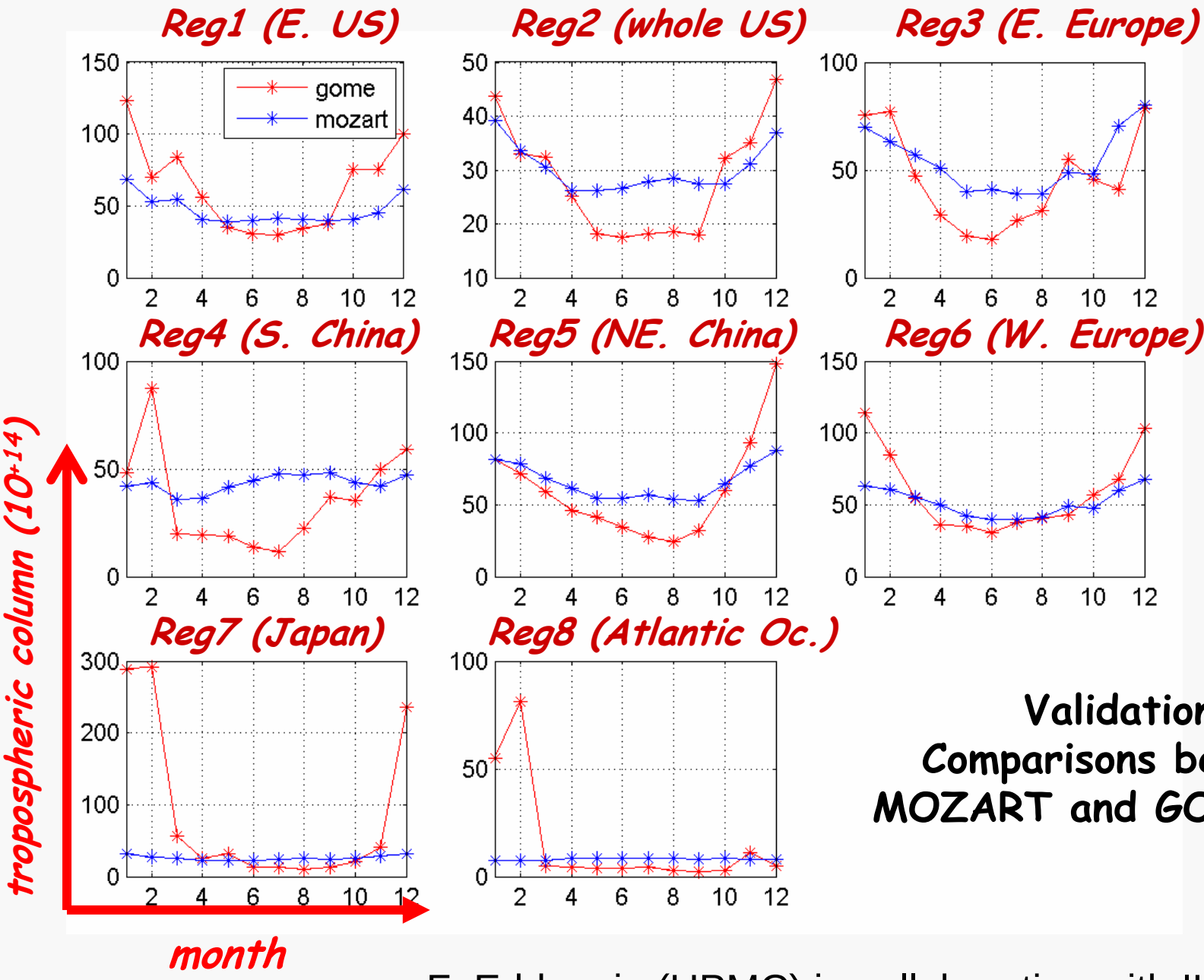
- Strategy for calculation of UV exposure developed (focus on clouds and surface albedo)
- Discussions on storage of CTM output (to be continued today and tomorrow)
- Questionnaire to RAQ

WP4: Evaluation

- Survey of available data sets (ongoing)
- Discussions with data providers – both for reanalysis purpose and near-realtime transfer
- Data transfer and (some) analysis tools installed and tested
- Definition of CTM output formats and fields
- Two workshops on evaluation January 2006

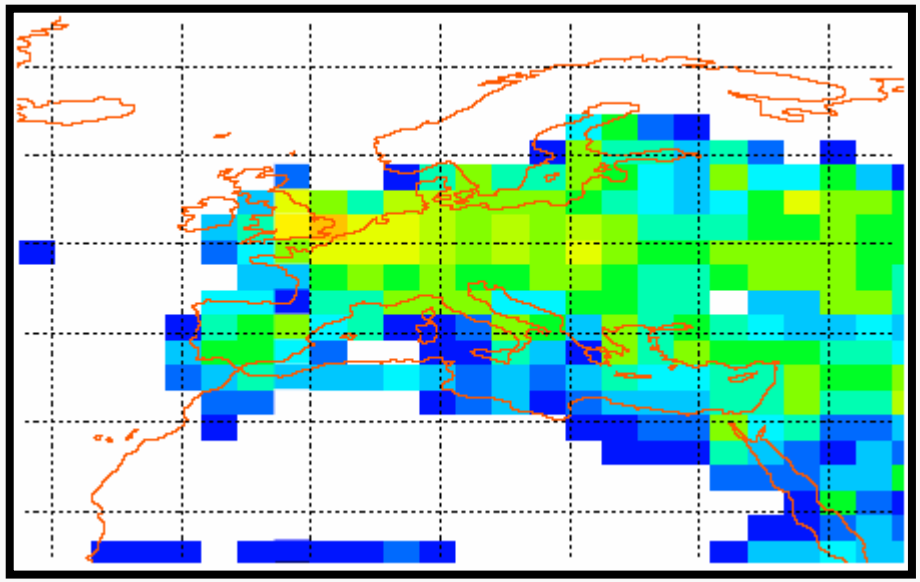
Data set survey

	A	B	C	D	E	F
1						
2	**Available data sets GRG**					
3						
4	**Source**	**Parameters**	**Contact for data base**	**Email of data base contact**	**Web site**	**Availibility**
5	Ground based (station) data					
6						
7	WMO/GAW global stations	CO, NOx, VOC, SO2, Precip. Chemistry				
8	WMO/GAW World Data Centre for Greenhouse Gases (WDCGG)	O3 (ground), CO, NOx, VOC,...	Japan Meteorological Agency, 1-3-4, Otemachi, Chiyoda-ku, Tokyo 100-8122, Japan, Tel: +81-3-3287-3439, Fax: +81-3-3211-4640	wdcgg@hq.kishou.go.jp	http://gaw.kishou.go.jp/wdcgg.html	Made availale to GEMS by the Global Atmospheric Watch (GAW) network
9	WMO/GAW regional stations	CO, CH4, aerosol chemistry, , BC, meteorolog. Parameters, O3 column and surface, solar radiation (visible and UV)				
10	WMO/GAW World Ozone and Ultraviolet Radiation Data Centre (WOUDC)	lists are availabe for GEMS contact, discussion needed. , O3 column and profile, UV solar radiation	Meteorological Service of Canada, 4905 Dufferin Street, Toronto, Ontario, CANADA ,M3H 5T4, Phone: +1-416-739-4635 Fax: +1-416-739-4281	woudc@ec.gc.ca	http://www.woudc.org/index_e.html	Made availale to GEMS by the Global Atmospheric Watch (GAW) network
11	CMDL	O3, CO, NOx, etc			http://www.cmdl.noaa.gov	
12	selected supersites (e.g. Hohenpeissenberg)	O3, NOx, PAN, CO, VOC, peroxides, OH, etc	Harald Berresheim	Harald.Berresheim@dwd.de	http://www.dwd.de/de/FundE/Observator/MOHP	Hohenpeissenberg data available



Validation:
Comparisons between MOZART and GOME NO2

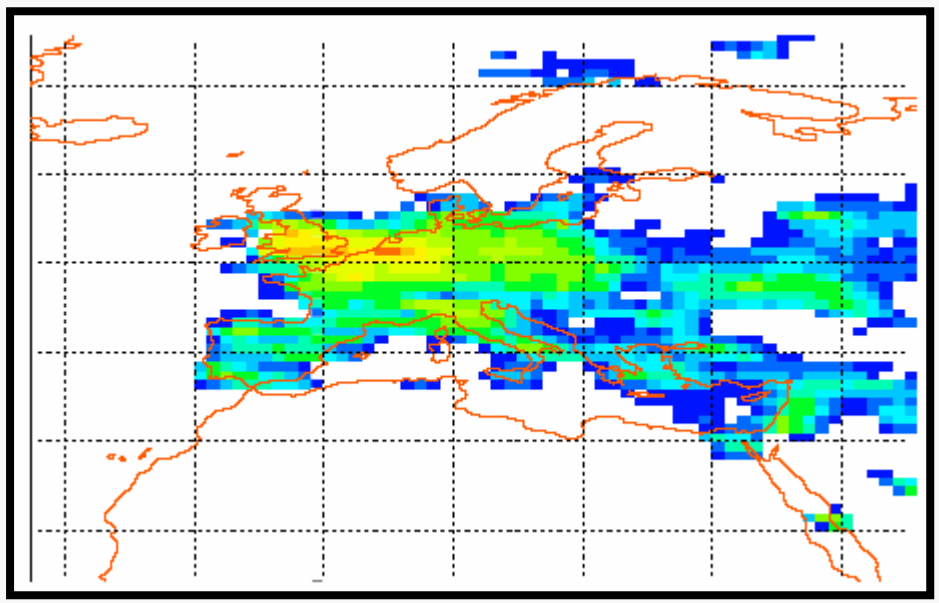
F. Eddounia (UPMC) in collaboration with IUP Bremen



MOZART

July

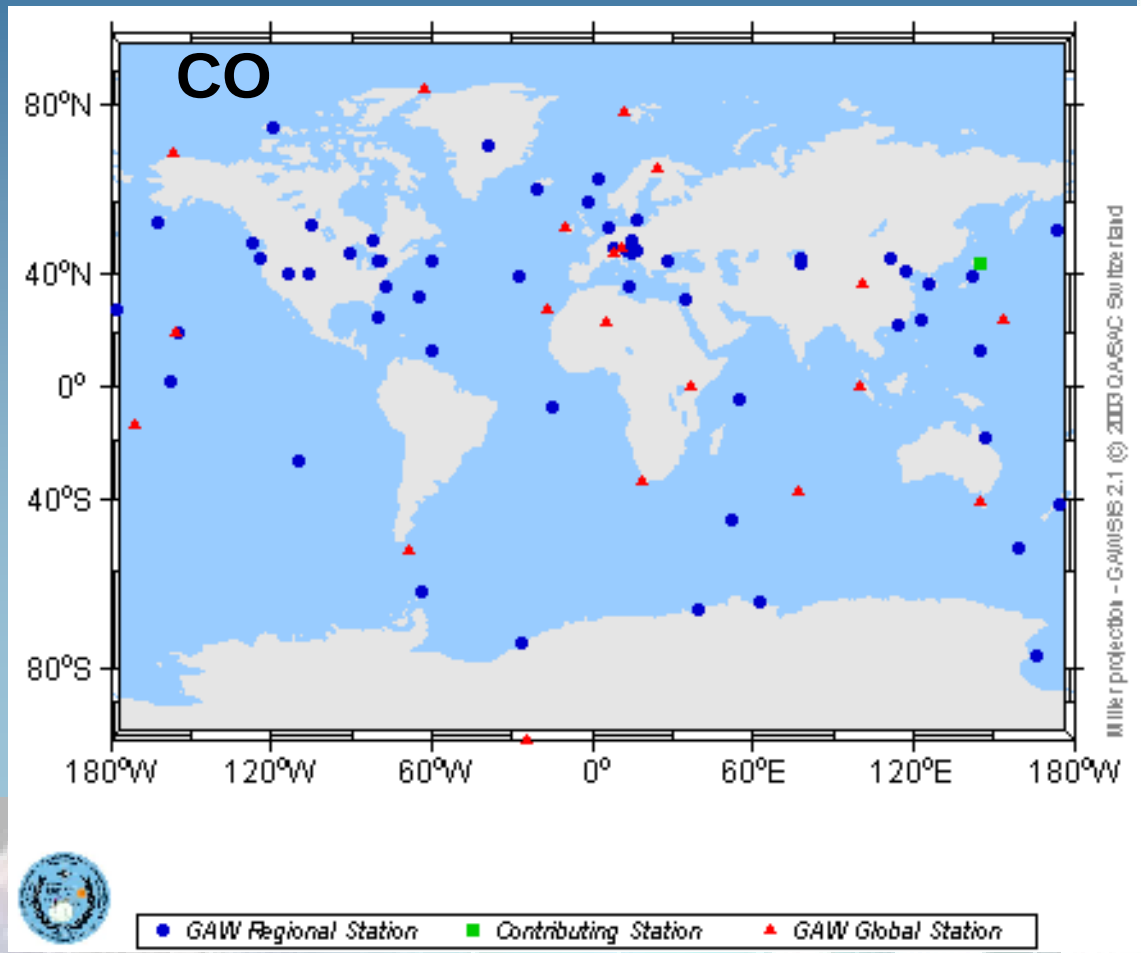
(10^{+14} molec/cm^2)

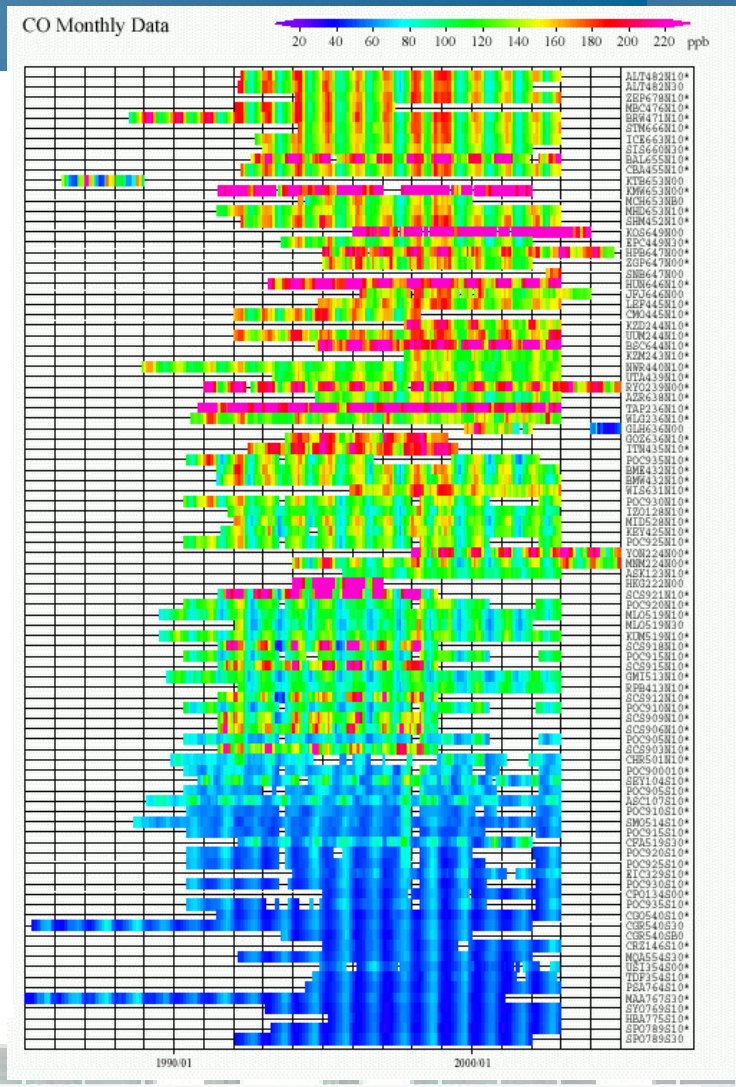


GOME

F. Eddounia (UPMC) in collaboration with IUP Bremen

CO surface data





H. Flentje and H. Berresheim (DWD)

GEMS presentations
(to be completed)

- NDSC ozone working group meeting, HP, Sep. 2005
- GAW/ACCENT workshop on CO, Dübendorf, Oct. 2005
- HTAP meeting, Washington, Jan. 2006

+ communications with data providers...

upcoming:

- EGS, Vienna, Apr. 2006
- WMO/ACCENT expert workshop, Geneva, Apr. 2006

GRG breakout sessions

Tuesday afternoon:

- Review of activities
- CTM coupling / available data sets for evaluation

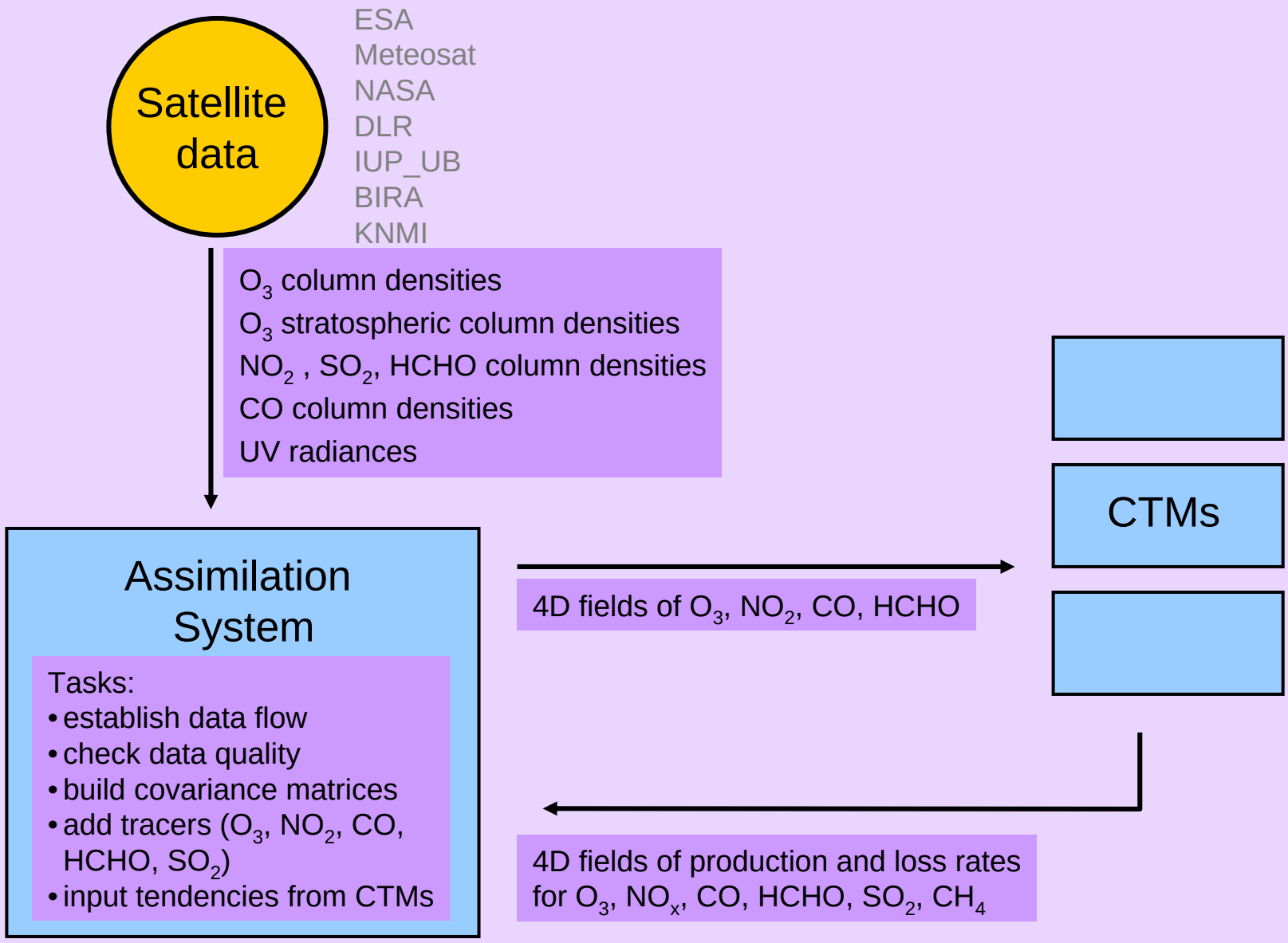
Wednesday morning:

- Use of observational data
- Data transfer/formatting issues

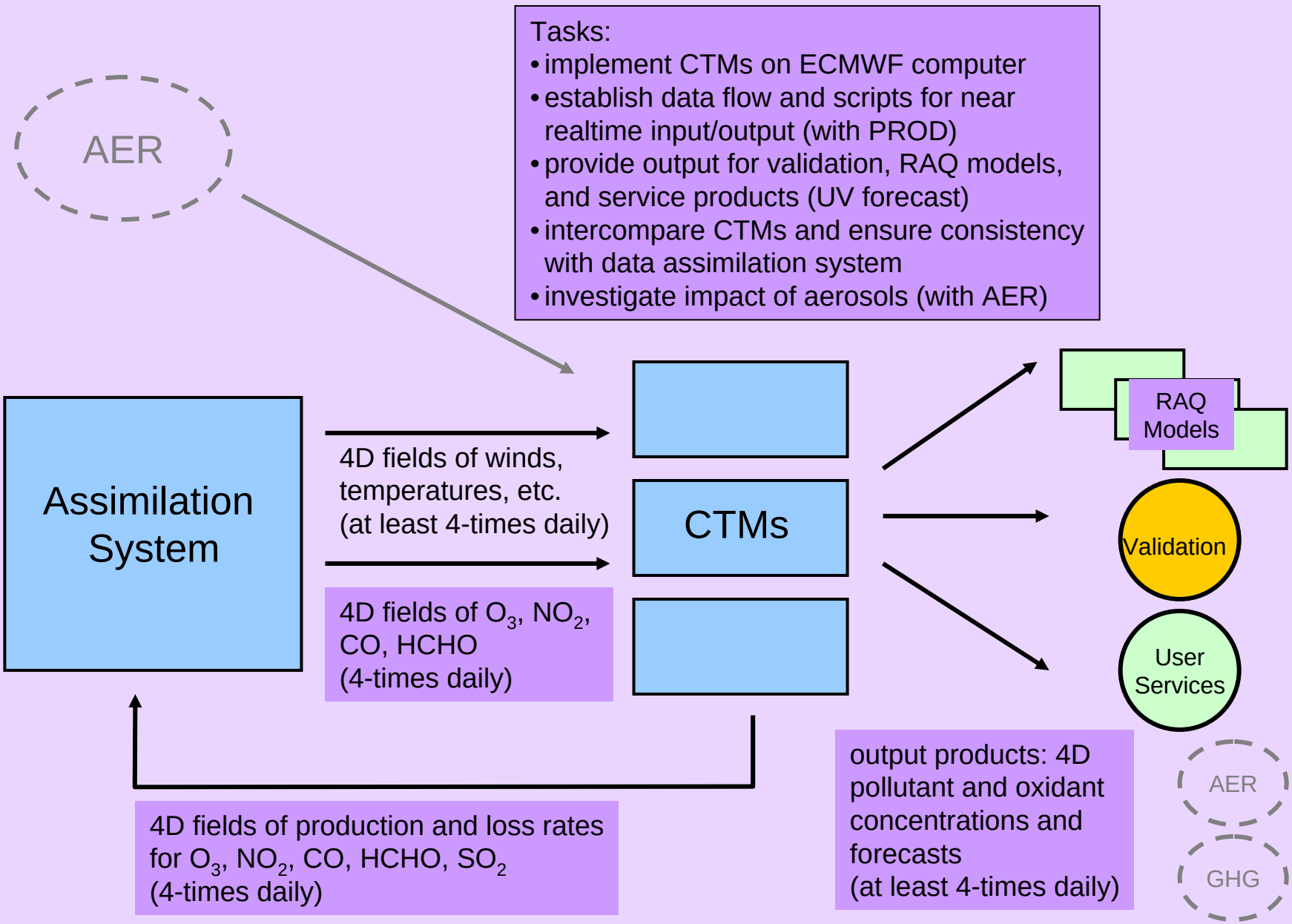
Wednesday afternoon:

- Work plan months 13-30

Data Flow and Tasks in GEMS_GRG_1

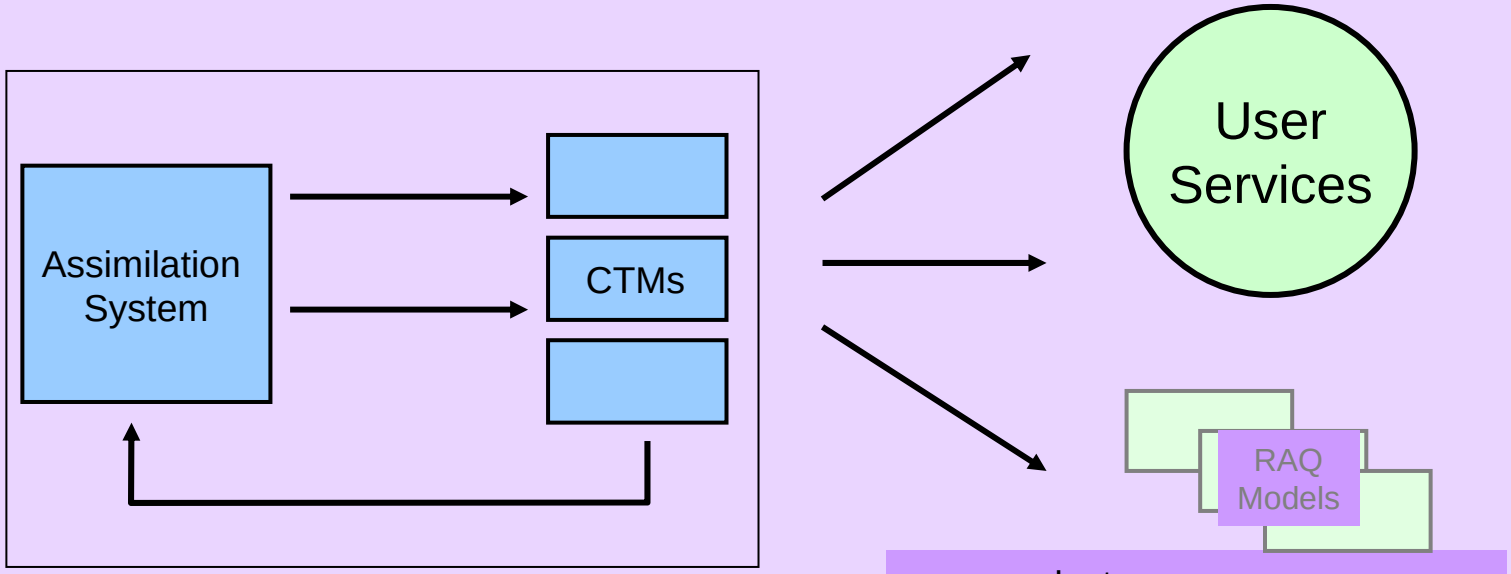


Data Flow and Tasks in GEMS_GRG_2



Data Flow and Tasks in GEMS_GRG_3

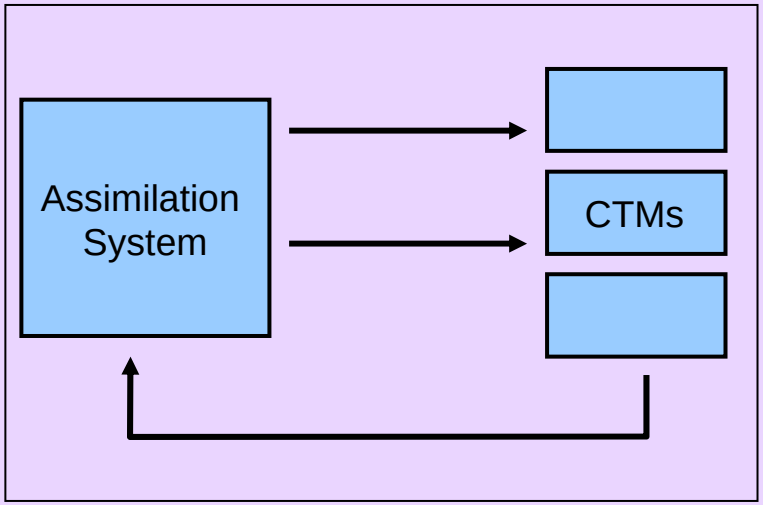
Tasks:
- consult with users to define products and product specifications
- develop realtime UV forecast product
- implement suitable diagnostics and data streams for background pollutant concentrations and doses, and deposition and emission fluxes
- make products available on the web



user products:
UV index, 4D pollutant and oxidant forecasts, deposition and emission fluxes (at least 4-times daily)

Data Flow and Tasks in GEMS_GRG_4

Tasks:
- define data formats and data exchange protocols for validation data and model output
- compile available data sets
- develop validation procedures (daily/monthly, case studies) and define parameters
- evaluation of reanalysis run
- define future validation procedure for post-GEMS system



model output

Validation data

Validation data:
-ground based station data
-ozone sondes
-DOAS and lidar obs.
-aircraft profiles and flight tracks
-research satellite products

Work plan months 13-30

- consolidation of the GEMS system
- finish implementation of OASIS 4 interfaces
- perform and evaluate first 2003 reanalysis runs
- link CTMs to data assimiliation
- assess scientific issues related to IFS-CTM coupling (“dislocation problem”)
- sensitivity studies (daily cycle of emissions etc.)
- develop evaluation tools
- finalize interfaces with RAQ, develop interfaces with AER and GHG
- develop first prototype user services
- prepare longer reanalysis simulations (2000-2006)