GEMS progress & planning at ECMWF

A.Hollingsworth

Scope of Presentation

- Schedule of GEMS project
- Current Status
- Near-term Plans
- Longer term plans
- Issues for the transition to operations of GEOLAND, MERSEA, GEMS

GEMS Schedule

- The start-up
  - Formal start date 1 March 2005
  - Contract signature 13 May 2005
  - Kick-off 4-5 July 2005
- For most partners, the effective start was delayed by several months from the formal start
- Overall schedule at ECMWF
  - Year 1 Build 3 Assimilation systems GHG, GRG, AER
  - Year 2 Run 3 Separate re-analyses
  - Year 2-2.5 System upgrade
  - Year 2.5-3.5 Run unified reanalysis. Build pre-operational system
  - Year 3.5-4.0 Transition to operations – mid-2009

ECMWF Progress: Operations and Support

- New web collaboration tools have been created to facilitate reporting, document exchange & discussion across the GEMS project
- The PRISM GUI for process control will soon encompass IFS-OASIS4_CTM coupling
- Data Formatting and Acquisition
  - Revisions have been prepared to the Canadian BUFR proposal for composition variables, and submitted to WMO WG for approval
  - A suite has been developed for automated acquisition of archive data from Space Agencies
  - Several years of SCIAMACHY data and MODIS data have been acquired from ESA & NASA and reformatted in BUFR

Main areas


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APT Demo
Welcome to the collaboration tools of the GEMS project.
Here you will find applications for reporting, document exchange and discussions. Hopefully they will help in the exchange of ideas and opinions within the GEMS community.
You can find help about how to use the tools, input data, attach files and more in the tutorial pages.
Reporting
This area provides you with a framework for writing reports to the EU or Managment board. Visit the main page of Reporting area or choose your group:
[GHG] [GRG] [AER] [RAQ] [PRO] [MAN]
Discussions
This area enables you to discuss and plan your work, share ideas, comment on problems. It is divided into General discussions and discussions for each sub-project group:
[GENERAL] [GHG] [GRG] [AER] [RAQ] [PRO] [MAN]
Recent discussions
Welcome to the General discussions | General Discussions | 2005-11-02 11:03 | Miha Razinger
Welcome to the MAN discussions | MAN Discussions | 2005-11-02 10:59 | Miha Razinger
Welcome to the RAQ discussions | RAQ Discussions | 2005-11-02 10:58 | Miha Razinger
Documents
Recently uploaded documents
PRO Documents | 2005-11-30 14:38 | Miha Razinger
GRG Documents | 2005-11-17 11:22 | Miha Razinger
General Documents | 2005-11-02 11:19 | Miha Razinger
GHG Documents | 2005-11-02 11:19 | Miha Razinger

GEMS/PRISM GUI development for data assimilation process control

- New release of prepIFS with OASIS4 configuration ready.
- Testing in December, introduced in January
- Jan- Jun
  - Create run environment for coupled experiments
  - Create run configurations for coupled models
  - Feature enhancement to oasis4 configuration
  - User feedback from job submissions, bug fixes
  - PRISM steering board meeting in January

Interactions with WMO on BUFR Parameters for GEMS

WORLD METEOROLOGICAL ORGANIZATION
COMMISSION FOR BASIC SYSTEMS
MEETING OF EXPERT TEAM ON DATA REPRESENTATION AND CODES
MUSCAT, OMAN, 5 - 8 DECEMBER 2005

ET DR&C/Doc. 3.9(1)
ITEM: 3.9
(15.XI.2005)
ENGLISH ONLY

BUFR parameters for GEMS

Submitted by Martin Suttie (ECMWF)

Summary and Purpose of Document
This document propoes a few new table B entries to represent aerosols and chemical species

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ACTION PROPOSED
The ET DR&C meeting is kindly asked to consider the proposed requirements.

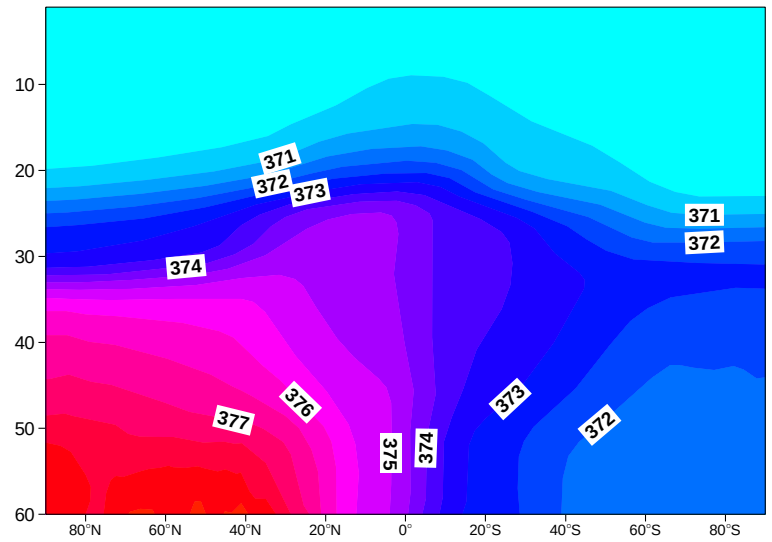
Progress on Greenhouse Gas Modelling

- **ECMWF & GEMS numerics and physics teams made big developments, so trace constituents are transported by dynamics, boundary layer turbulence & moist convection.**
  - CO2 is a model variable, advected by the dynamics, and transported by the boundary layer and converctive vertical fluxes
    - Specified climatological surface fluxes.
  - 14 month run with actual meteorology & free-running CO2.
    - Validation against Fluxnet data and aircraft data is encouraging.
  - Extensive testing of conservation properties is underway
    - currently there is ~10% / per annum non-conservation
  - Suggestions from the model results of missing land boreal sequestration sink & missing tropical biomass-burning source

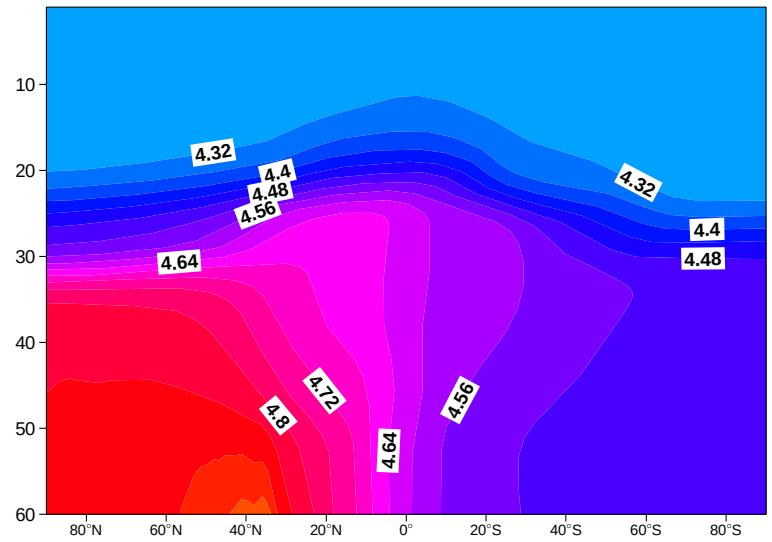
Greenhouse Gas Animation

Annual means of simulated tracers concentrations

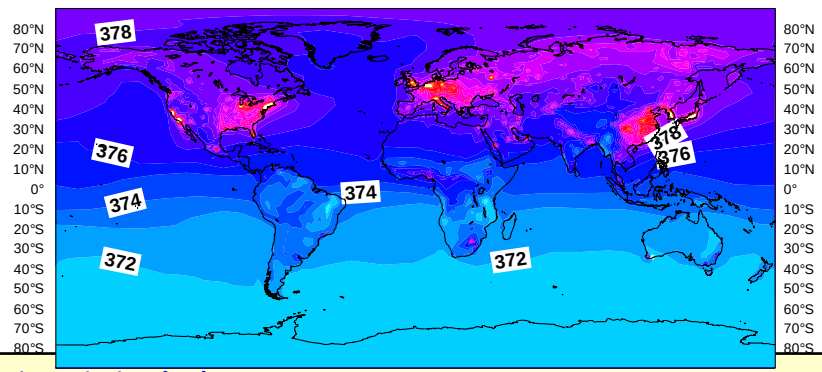
Latitudinal Gradient of CO2 concentration - 2001



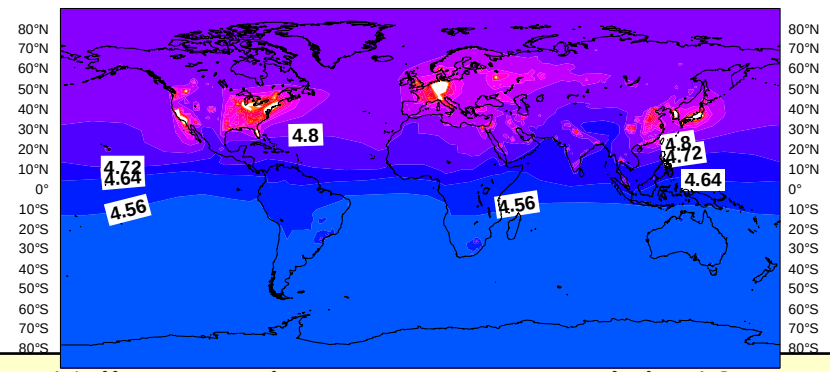
Latitudinal Gradient of SF6 concentration - 2001



CO2 concentration at the surface - 2001

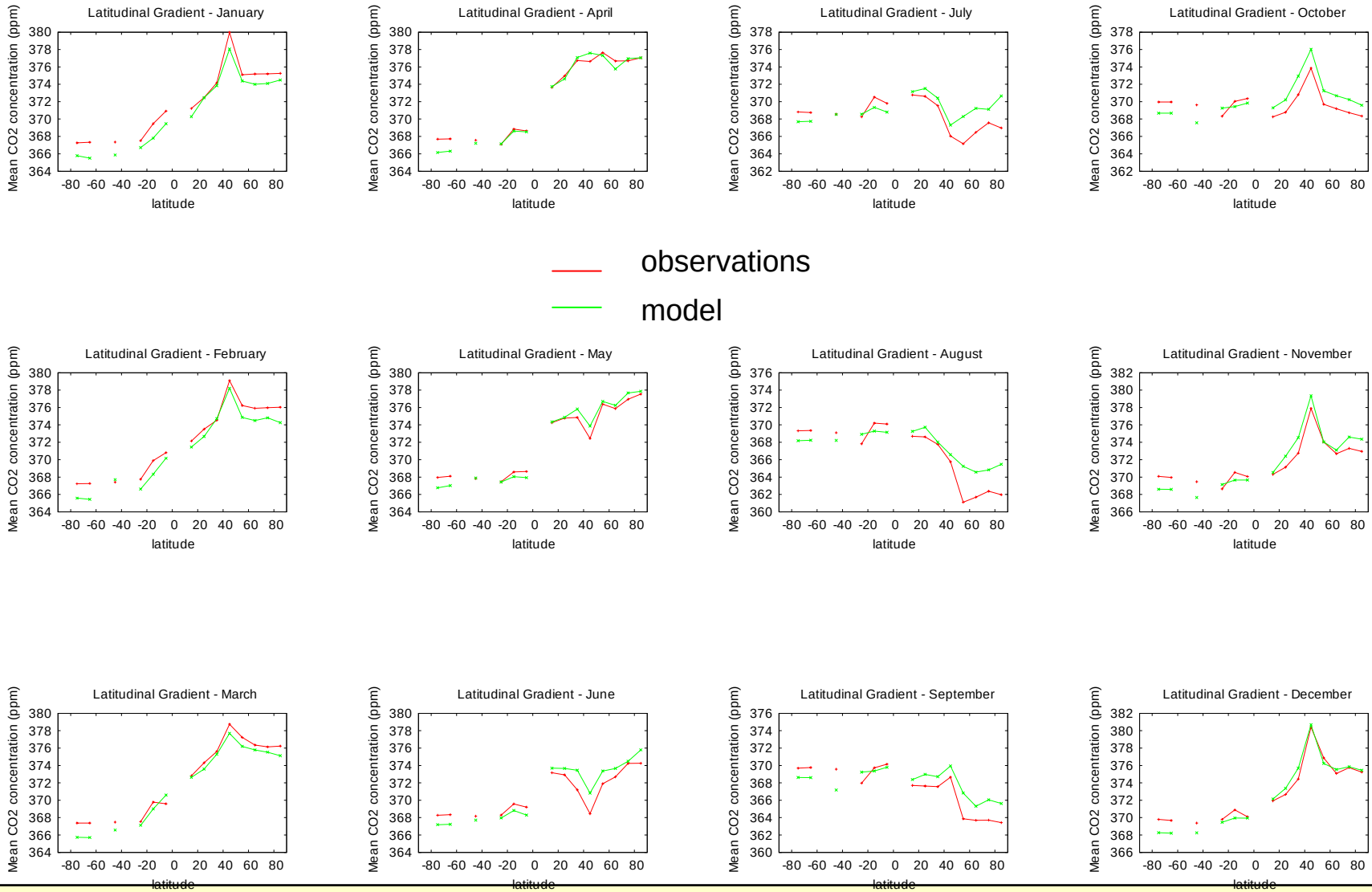


SF6 concentration at the surface - 2001



Forward modelling verification

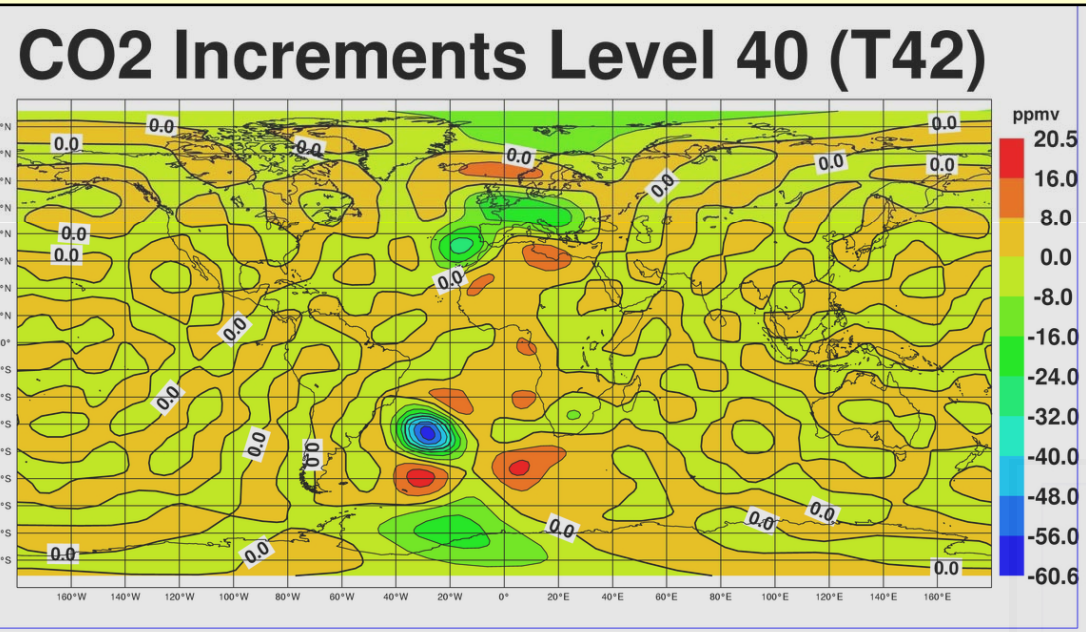
Comparisons to in situ measurements at the surface

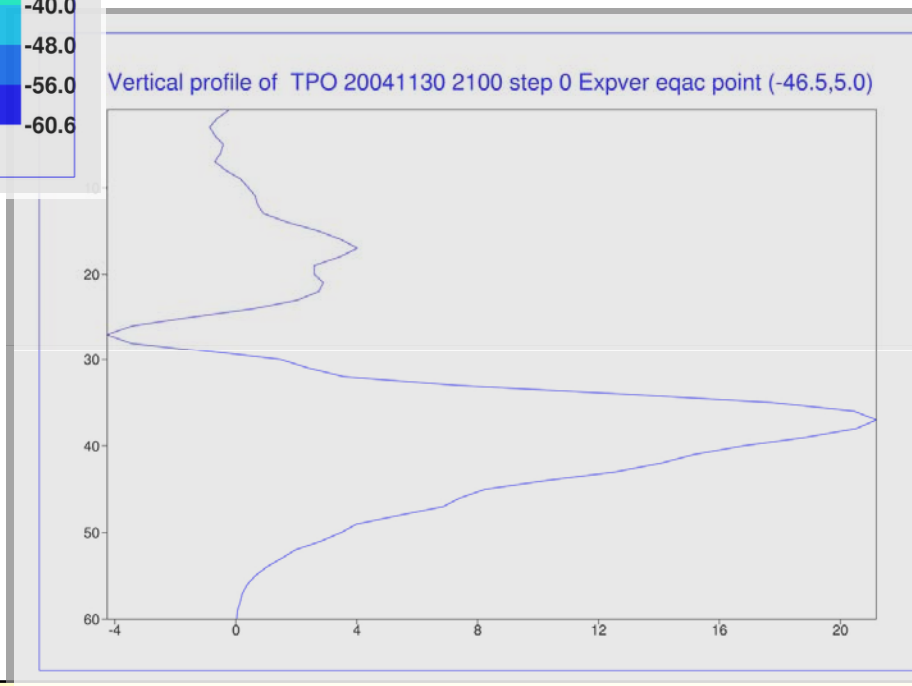


Progress on Greenhouse Gas Assimilation

- **ECMWF & GEMS data assimilation teams made big developments in IFS (Cycle 30r1) for GEMS, which benefit the Greenhouse Gas, Reactive Gas & Aerosol projects**
  - 320 AIRS channels received operationally, including ~60 channels for CO2
  - First 4D-Var assimilations of a few orbits of CO2 data from AIRS are being assessed
  - Data assimilation tools for data display & data quality monitoring in preparation

We've got an assimilation system!!!



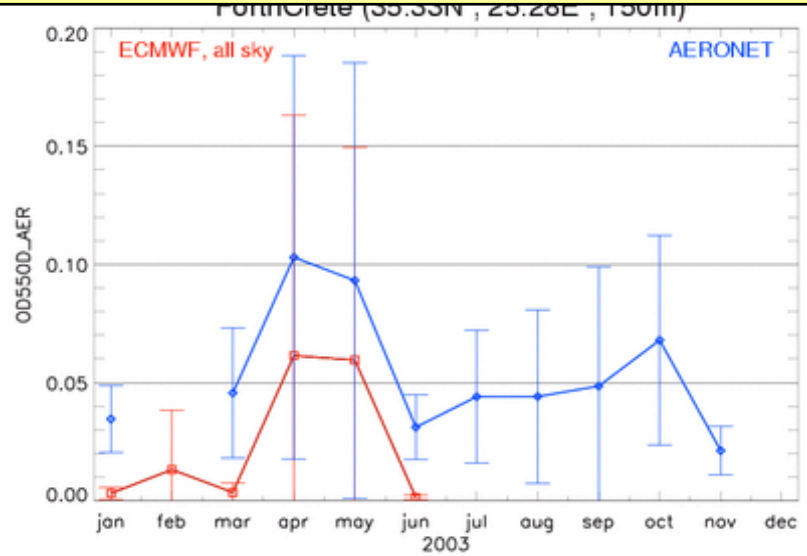


Progress on Aerosol Modelling

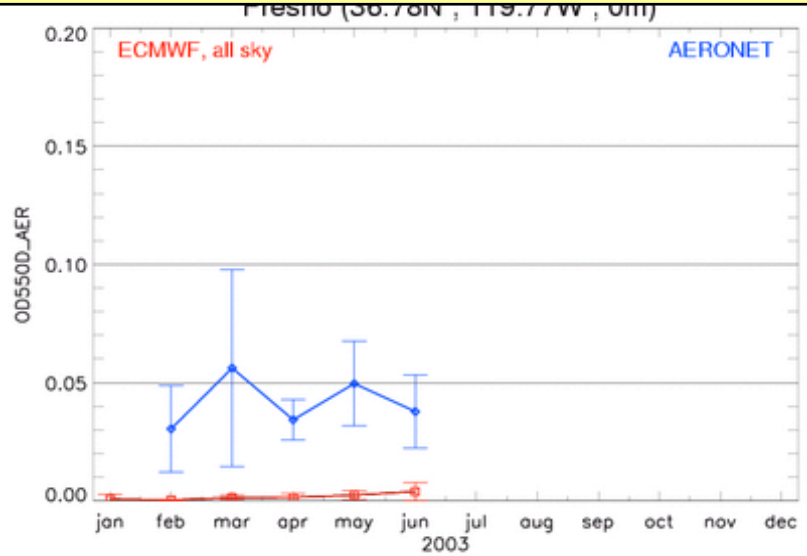
- **ECMWF & GEMS numerics and physics teams made big developments so trace constituents transported by dynamics, boundary layer turbulence & moist convection.**
  - Sea-salt and Desert dust are model variables, with 3 size bins, transported by dynamics, boundary layer turbulence & moist convection. Dynamically-specified surface fluxes.
  - 12 month run with actual meteorology & free-running Aerosol. Validation against Aeronet data is encouraging.
  - Consistent model underestimation of aerosol optical thickness is under investigation
  - Code was developed with FMI for consistent UVB post-processing

Aerosol Animation

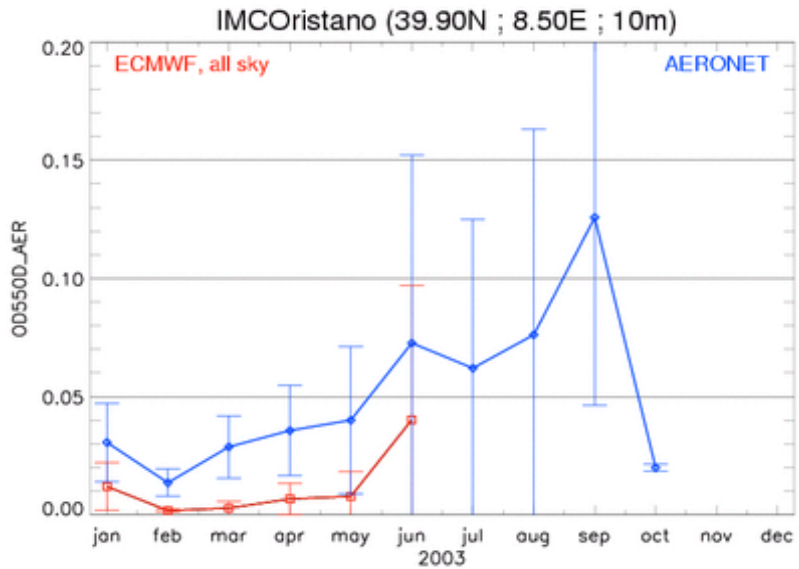
Example of comparison with AERONET stations

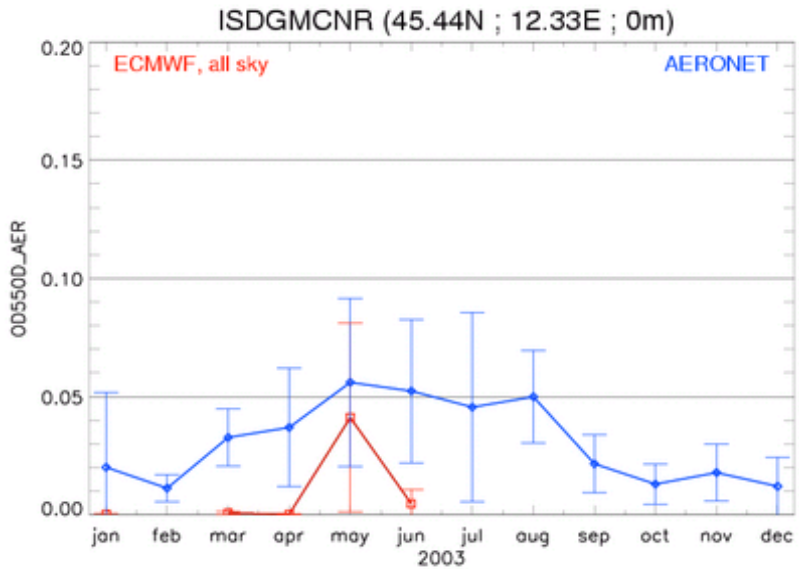


Graph	Data source	Species	Parameter
SERIES	ECMWF	AER	OD550D
IMCOristano	an2003	mALLYEAR	



Graph	Data source	Species	Parameter
SERIES	ECMWF	AER	OD550D
ISDGMCNR	an2003	mALLYEAR	





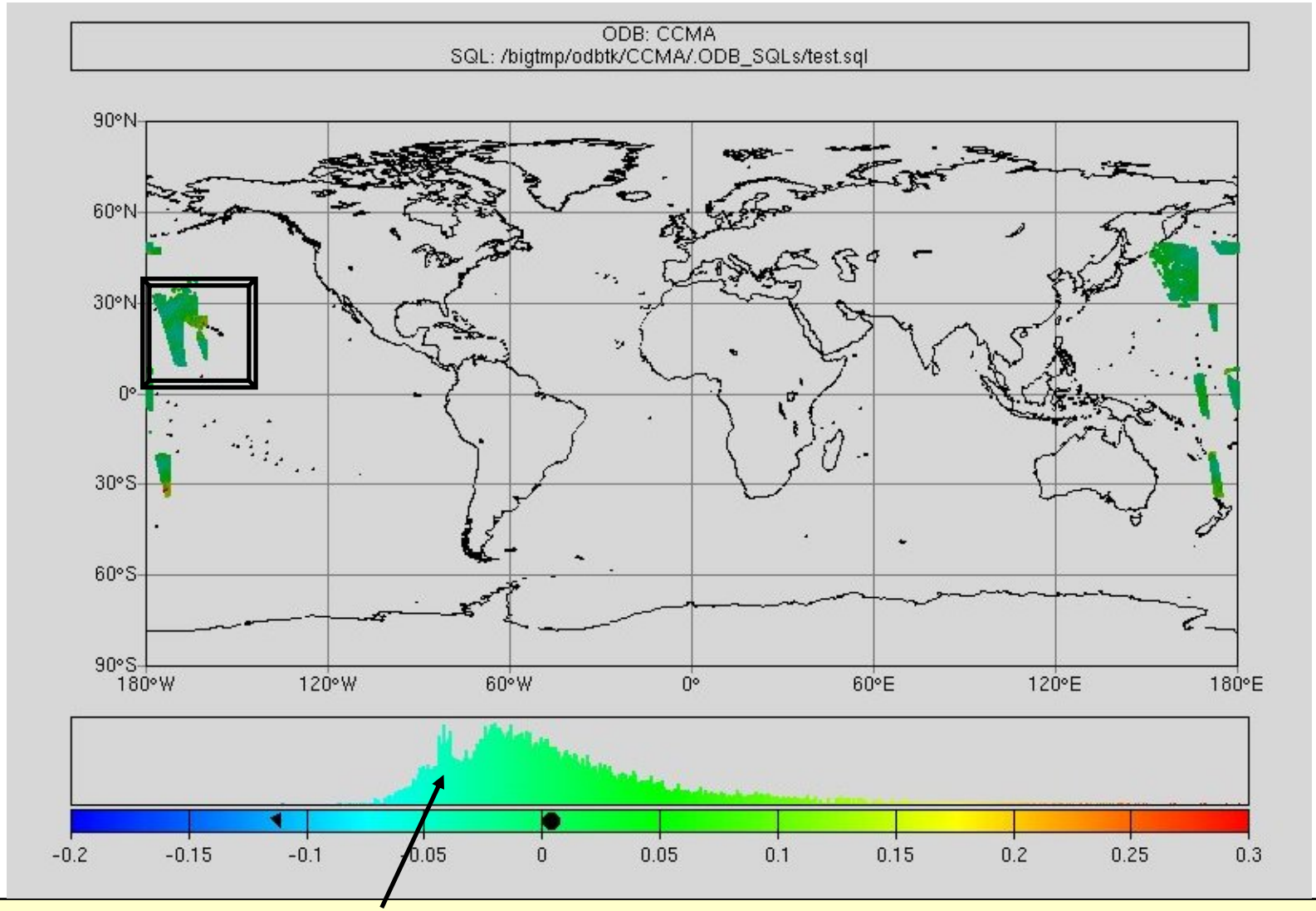
Progress on Aerosol Assimilation

ECMWF & GEMS data assimilation teams made big developments in IFS (Cycle 30r1) which benefit GHG, AER, GRG

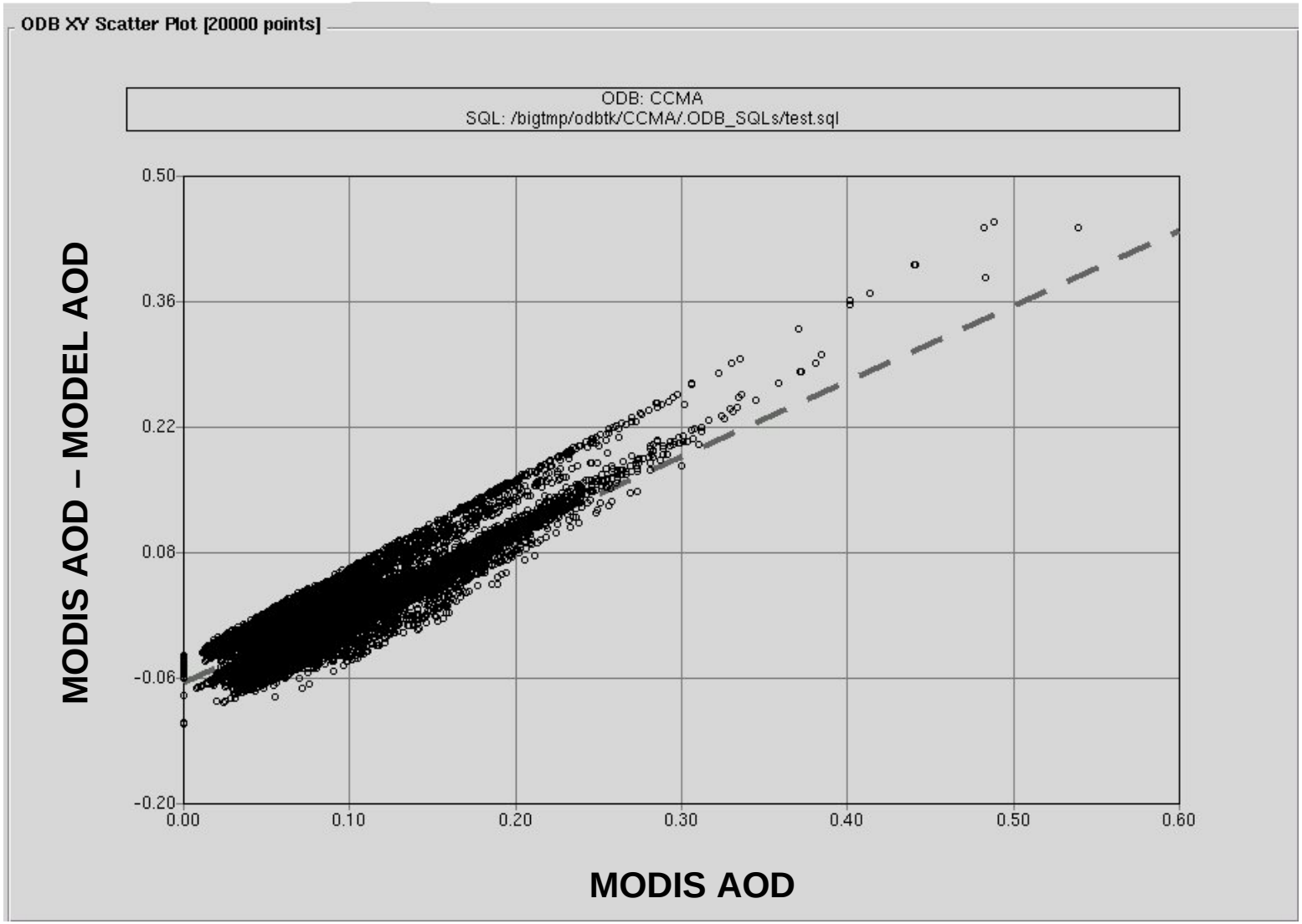
- Extensive experimentation to determine statistics of short-range forecast errors, from divergence of short-range forecasts
- First 4D-Var assimilations of partial orbits of MODIS data are being assessed
- Data assimilation tools for display, data monitoring are in preparation

Preliminary ODB plots (2004120100 – one cycle)

First guess departures



Preliminary ODB plots (2004120100 – one cycle)



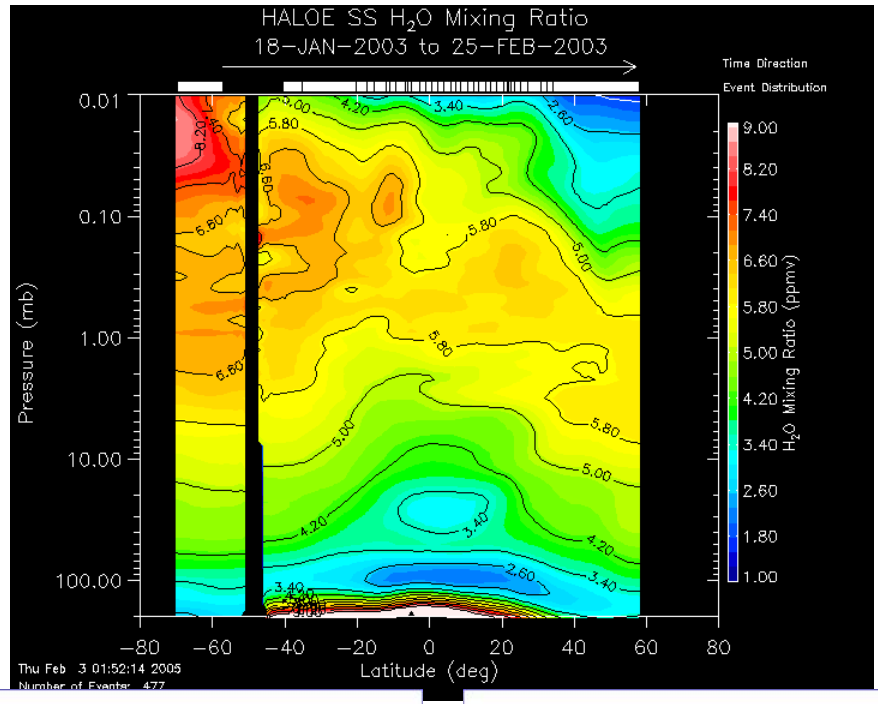
Progress on Reactive Gas Modelling

- **ECMWF & GEMS numerics and physics teams made big developments so trace constituents transported by dynamics, boundary layer turbulence & moist convection.**
  - OASIS4 adopted as IFS-CTM coupler
  - Much technical work in progress on coupling, with the help of CERFACS & PRISM partners
  - Definition of P&L terms to be transferred from CTM to IFS has been agreed
  - Options for data to be transferred from IFS to CTM being assessed

Progress on Reactive Gas Assimilation

- **ECMWF & GEMS data assimilation teams made big developments in IFS (Cycle 30r1) which benefit GHG, AER, GRG**
  - Reanalysis of July 2002 – Dec 2003, for CTMs to check stratospheric Brewer-Dobson circulation, will be ready by end Dec 2005
  - First assimilations of single ozone observations are being assessed / debugged
  - Data assimilation tools for display, data monitoring in preparation

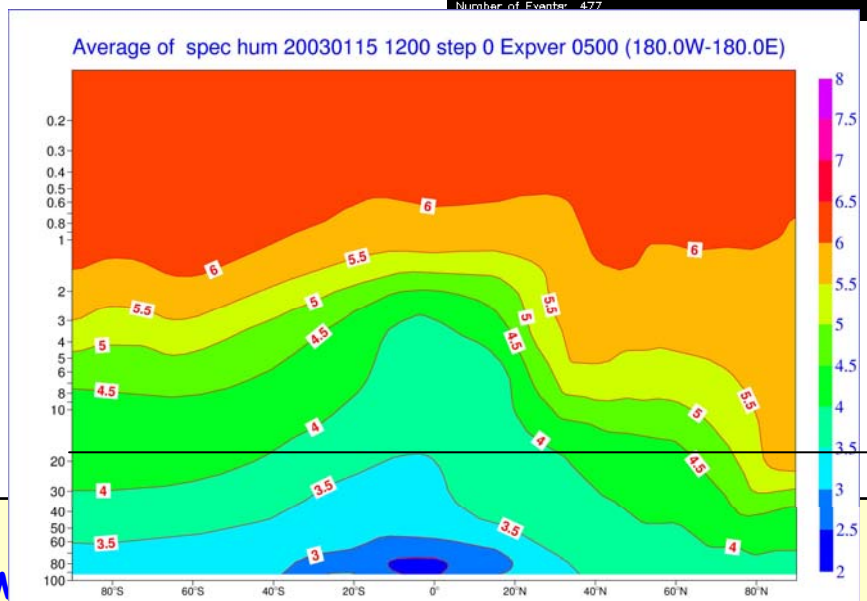
2003 reanalysis for CTM partners – spec. humidity [ppmv]

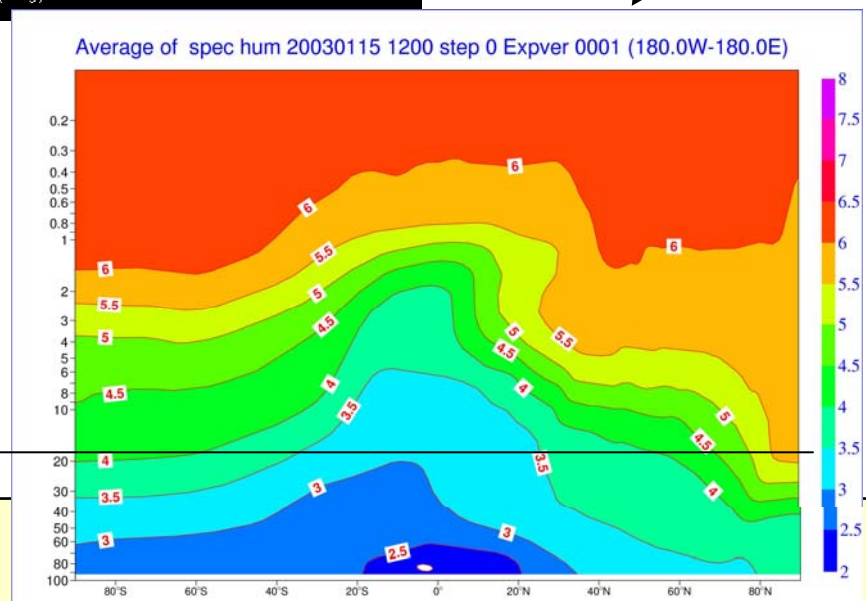


HALOE

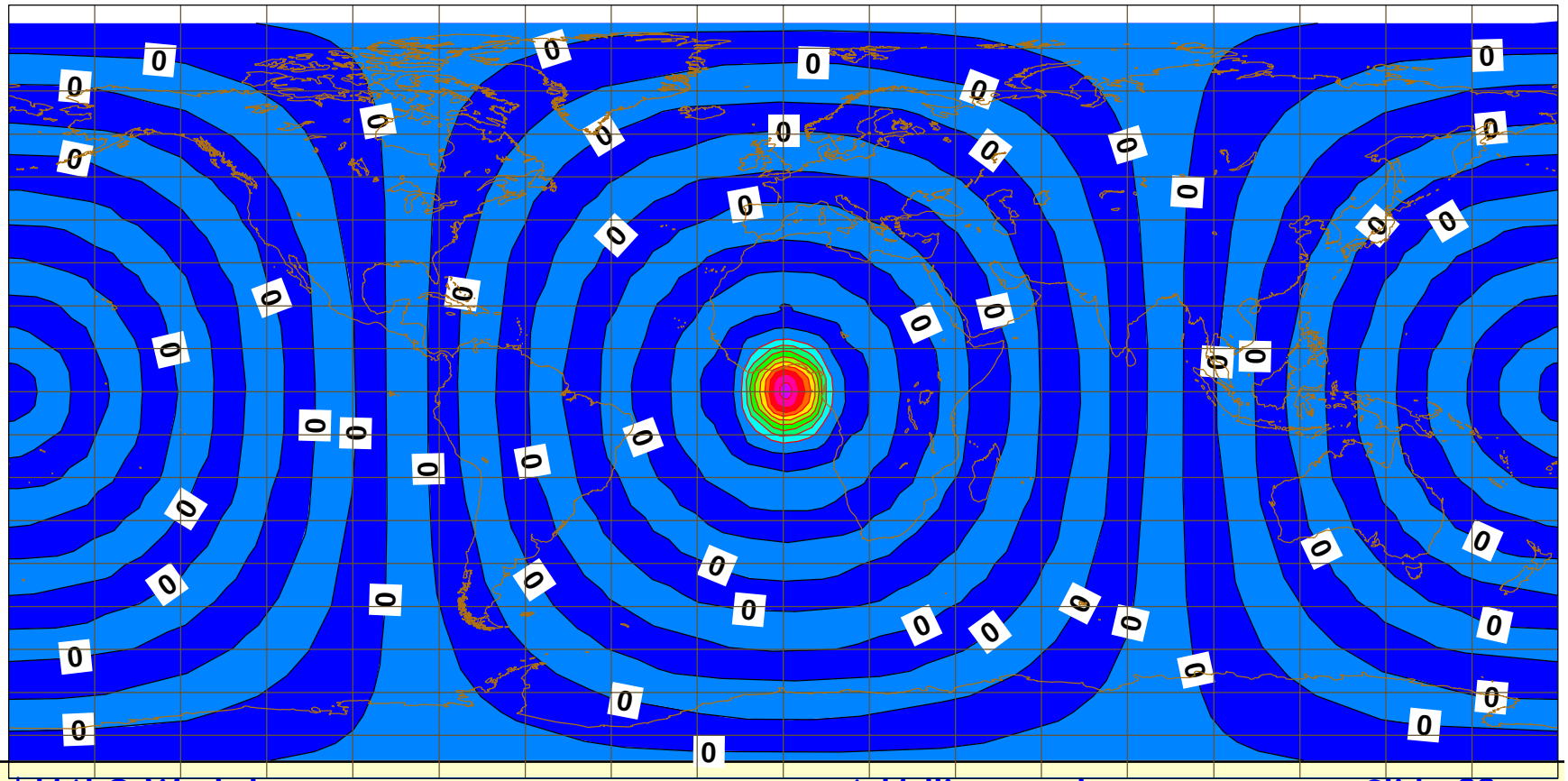
EXP 0500

Operations





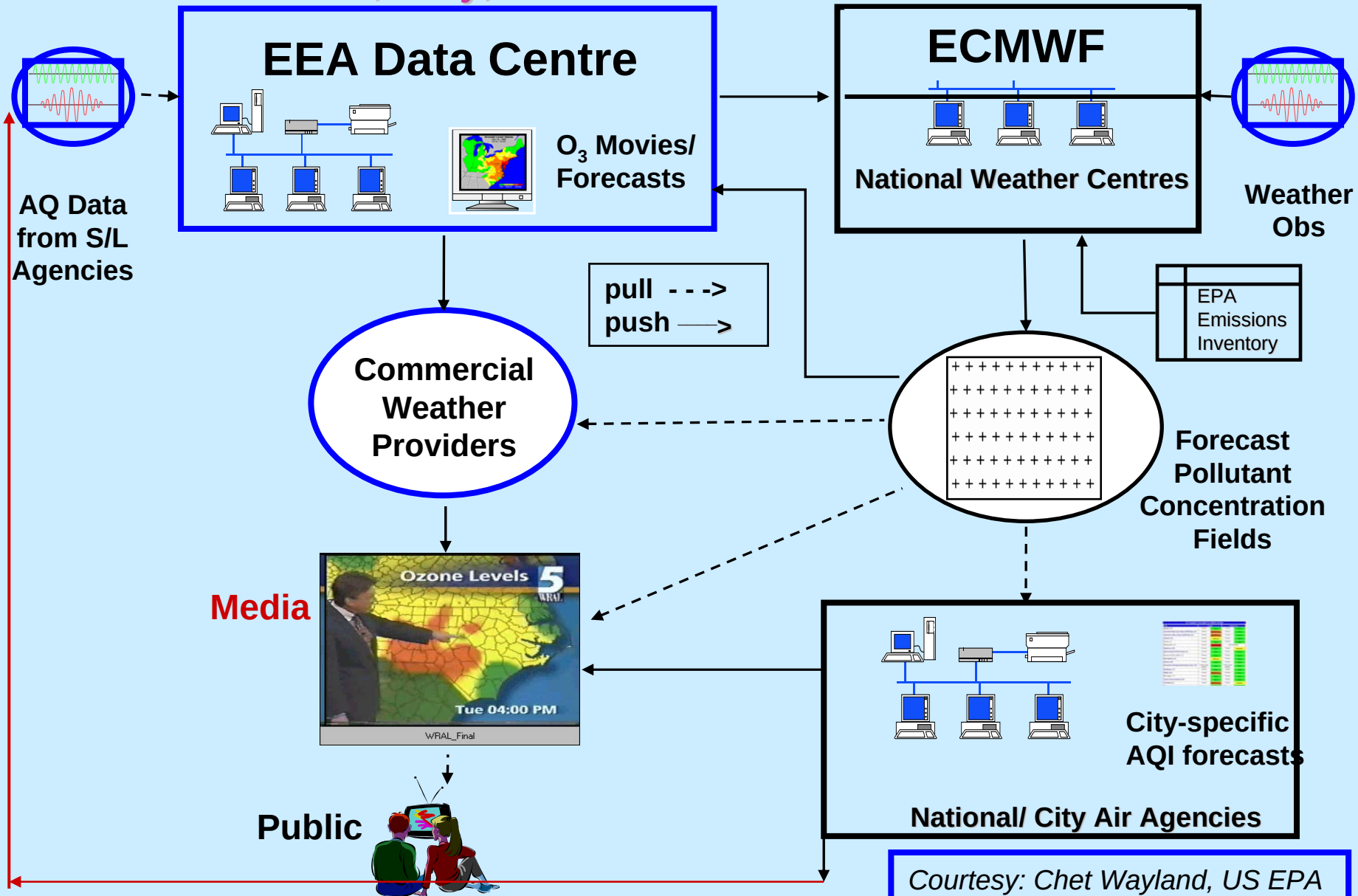
Increment from single ozone observation



Project	MAM 2006	JJA 2006	SON 2006	DJF 2006/7	MAM 2007	JJA 2007
GHG_ Modelling at ECMWF	Continue validation of model transport, surface fluxes	Continue validation of model transport, surface fluxes	Assessment of GHG model performance in Data Assimilation	Assessment of GHG model performance in Data Assimilation	Assessment of GHG model performance in Data Assimilation	Prepare upgrades of GHG model
AER Modelling at ECMWF	Continue Validation of Aerosol Model	Continue Validation of Aerosol Model	Assessment of AER model performance in Data Assimilation	Assessment of AER model performance in Data Assimilation	Assessment of AER model performance in Data Assimilation	Prepare upgrades of AER model
GRG Modelling at ECMWF	Finalise Interfacing to CTM1	Continue Validation of IFS_CTM1 Interfacing	Continue Validation of IFS_CTM1 Interfacing	Assessment of GRG model performance in Data Assimilation	Assessment of GRG model performance in Data Assimilation	Assessment of GRG model performance in Data Assimilation
Pro 1 GHG DA System & Reanalysis	Validation of GHG Assimilation System	First trial GHG reanalyses	Production of GHG reanalysis 2003-2004, with reruns as needed	Production of GHG reanalysis 2003-2004, with reruns as needed	Production of GHG reanalysis 2003-2004, with reruns as needed	Prepare upgrades of GHG data assimilation system
Pro2 AER DA System & Reanalysis	Validation of GHG Assimilation System	First trial AER reanalyses	Production of AER reanalysis 2003-2004, with reruns as needed	Production of AER reanalysis 2003-2004, with reruns as needed	Production of AER reanalysis 2003-2004, with reruns as needed	Prepare upgrades of AER data assimilation system
Pro3 GRG DA System & Reanalysis	Validation of GHG Assimilation System	Validation of IFS_CTM1 Interfacing in 4D-Var	First trial GRG reanalyses	Production of GRG reanalysis 2003-2004, with reruns as needed	Production of GRG reanalysis 2003-2004, with reruns as needed	Production of GRG reanalysis 2003-2004, with reruns as needed
Pro 4 Technical Support &CTM Interfaces	GUI for Process control of IFS, OASIS4, CTM1	Complete GUI for Process control of IFS, OASIS4, CTM1	Interface IFS_CTM2, PREPIFS support for GEMS, incuding l remote users	Interface IFS_CTM3 and PREPIFS support for GEMS, incuding l remote users	Support for CTM interfaces & PREPIFS support for GEMS, incuding l remote users	Support for CTM interfaces & PREPIFS support for GEMS, incuding l remote users
Pro5 Technical observation processing	Complete data acquisition & re-formatting for 2003-2004	Begin data acquisition for 2000- 2002 & 2005-2006	Data formats and converters for GEMS observations and field variables	Data formats and converters for GEMS observations and field variables	Data formats and converters for GEMS observations and field variables	Data formats and converters for GEMS observations and field variables
Pro 6 Web interface and verification tools	Build web access to boundary conditions	Complete web-access to boundary conditions Begin archive of LAM runs	RAQ Data acquisition, Displays & Verification tools	RAQ Data acquisition, Displays & Verification tools	RAQ Data acquisition, Displays & Verification tools	RAQ Data acquisition, Displays & Verification tools

GMES Initial Operational Configuration

National, City, EEA & ECMWF IT Links



Courtesy: Chet Wayland, US EPA

Funding issues for the operational transition of GEOLAND, MERSEA, GEMS

- Current Funding
  - GEOLAND funded until end 2006
  - MERSEA funded until end 2008
  - GEMS funded until Feb 2009

- Ongoing / new activities of interest to GEMS CO2 capabilities:
  - ONC land carbon model & assimilation
  - CSP assimilation of Leaf Area Index (LAI)
  - Global fire assimilation
  - Funding is needed for these activities beyond 2006

- No further GMES funding until 2008, earliest (in FP_7)

Satellite issues for the early operational stage of GEOLAND, MERSEA, GEMS

- METOP on track for mid-2006 launch
- Serious cost over-runs on NPP & NPOESS. Extent of delays not yet known
- ESA ocean mission (GMES-1) launch-date?
- Prospects for a LANDSAT continuation?
- After ENVISAT & AURA, no prospect for a chemistry mission before 2015
  - Despite NASA's severe funding difficulties on the Space Station and the Shuttle, we must persuade NASA to continue operation of TERRA, AQUA, AURA as long as possible,
- Issues of access to OCO data

Some of the many science issues for the early operational stage of GEOLAND, MERSEA, GEMS

- Use of GEMS Aerosol product in Land, Ocean retrievals from MERIS, MODIS, VIIRS?
- What is the most effective method to blend surface & in-situ in surface flux synthesis inversions?
- When will we have modelling / assimilation of ocean bio-geochemistry? What will be needed from the Atmosphere, Land projects?
- What is the role of ocean surface wave breaking in ocean-atmosphere gas exchange?

Thank you for your attention