RT2A Progress and Plans

Production of seasonal to decadal hindcasts and climate change scenarios (Model Engine Part 1)

Jean-François Royer

Erich Roeckner

and RT2A WP leaders:

Philippe Rogel

Eigil Kaas

Ulrich Cubasch

Francisco Doblas-Reyes

+ RT2A partners

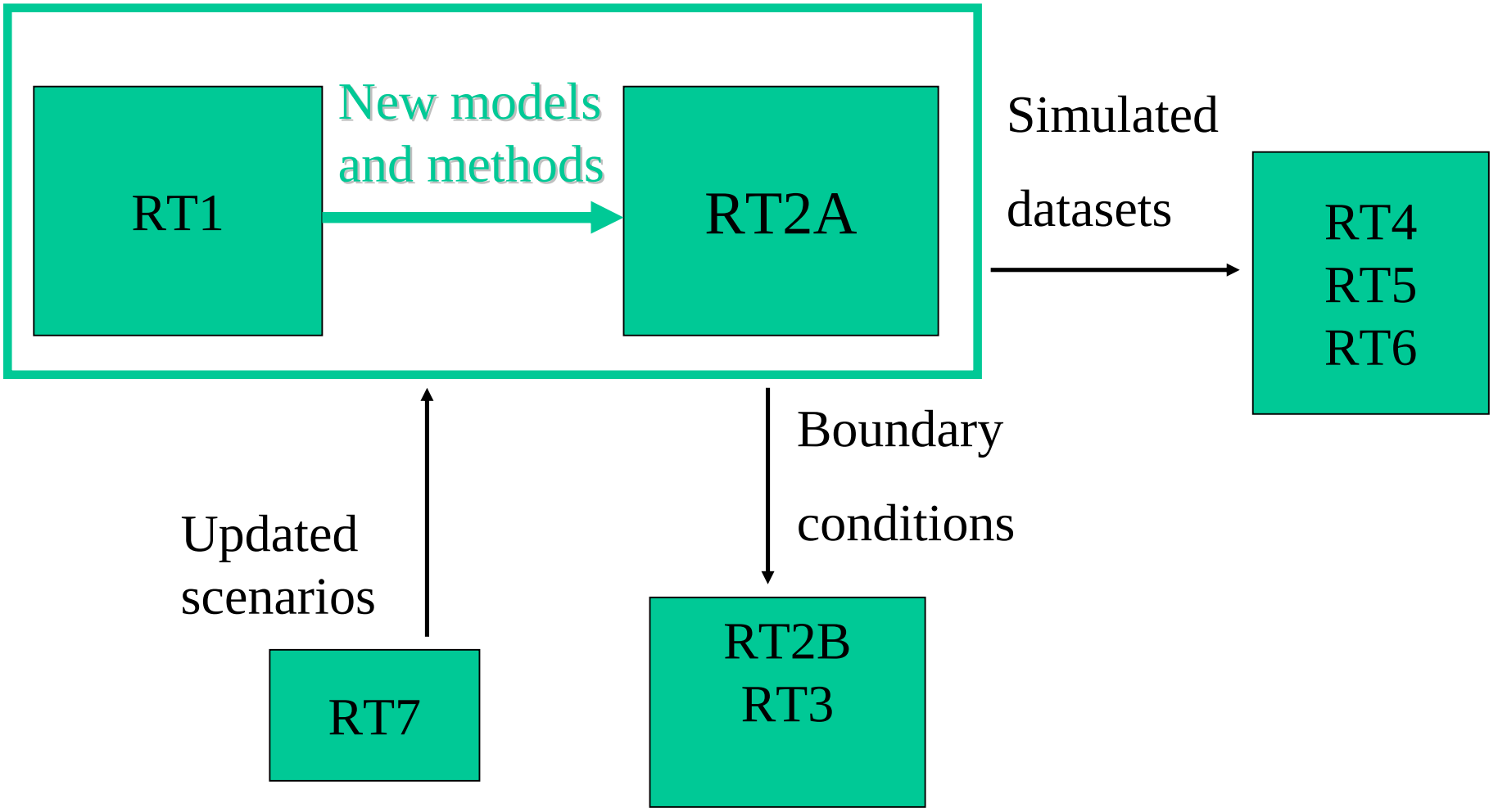
Overview of RT2A

- Production of ensembles of global climate simulations with earth system models
  - Seasonal to decadal (s2d) (WP2A.1)
  - Multidecadal
    - Historical (1860-2000) (WP2A.2)
    - Climate scenarios (21st century) (WP2A.3)

    stream 1 (year 1-2) stream 2 (year 3-4)

- provision of model results needed in other RTs (WP2A.4)
  - S2d ECMWF
  - Multidecadal MPIMET-M&D

Links to other RTs



Output to provide to other RTs

- Forcing fields needed as boundary conditions for regional models in RT2B and RT3 over the period 1950-2100 by start of year 3

- GCM results from the first stream of simulations will be provided to RT4, RT5, RT6, RT7 from the start of year 2 for climate hindcasts, and start of year 3 for climate scenarios

- GCM output from the second stream of simulations will be provided to RT4,RT5, RT6, RT7 from the start of year 4 onwards

WP2A.1: Creation of multi-model seasonal to decadal hindcasts

Leader: CERFACS (P Rogel)

Participants: CERFACS (P Rogel), CNRM (M Déqué), ECMWF (F Doblas-Reyes, A Weisheimer), METO-HC (M Huddleston)

- objectives:
  - To produce ocean analyses over two periods: a recent one (1991-2001) and a long one (ERA40, 1960 onwards) later in the project.
  - To produce sets of seasonal to decadal hindcasts over these two periods
  - The starting point is the ocean analysis and seasonal hindcast systems and products of DEMETER and ENACT.

Ensemble set-up for the seasonal-to-decadal hindcasts

stream 1 **month 18-24**

Three approaches to tackle model uncertainty:

- Multi-model: 7 coupled GCMs, each 9 IC ensemble members
- Perturbed physics: 2 coupled GCMs, each 9 IC ens. members
- Stochastic physics: 1 coupled GCM, 9 ensemble members

- hindcast production period: 1991-2001
- seasonal runs (7 months): two start dates per year (May, Nov)
- annual runs (14 months): at least one start date per year (Nov)
- multi-annual/decadal runs (10 years): starting in 1965 and 1994
- model level data available for 3 of the multi-model GCMs

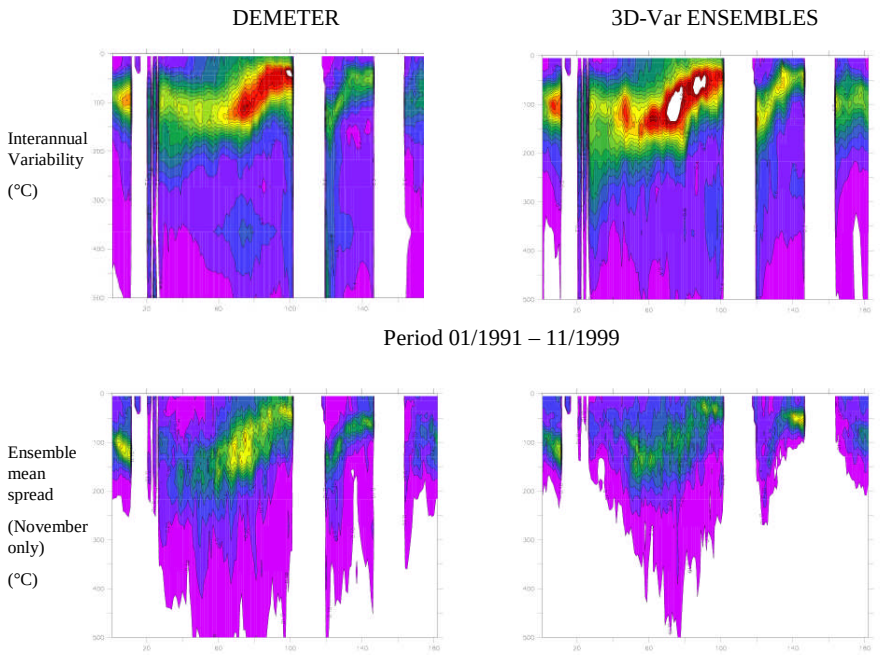
stream 2 **month 48**

- multi-model of 5 coupled GCMs
- hindcast production period 1960-2001
- 4 start dates per year
- one annual run per year, one multi-annual run every 5 years

Several years of ocean analyses
WP2A.1, D2A.1 (1/2)

- **ECMWF, METO-HC and CERFACS have produced ocean analyses for the Stream 1 set of hincasts**
  - **Initial conditions in May 1st and November 1st 1991 to 2001**
  - **Additional ICs in November 1st 1965**
  - **Ensembles obtained either through the perturbation of ocean initial conditions or through the construction of ensembles of analyses**

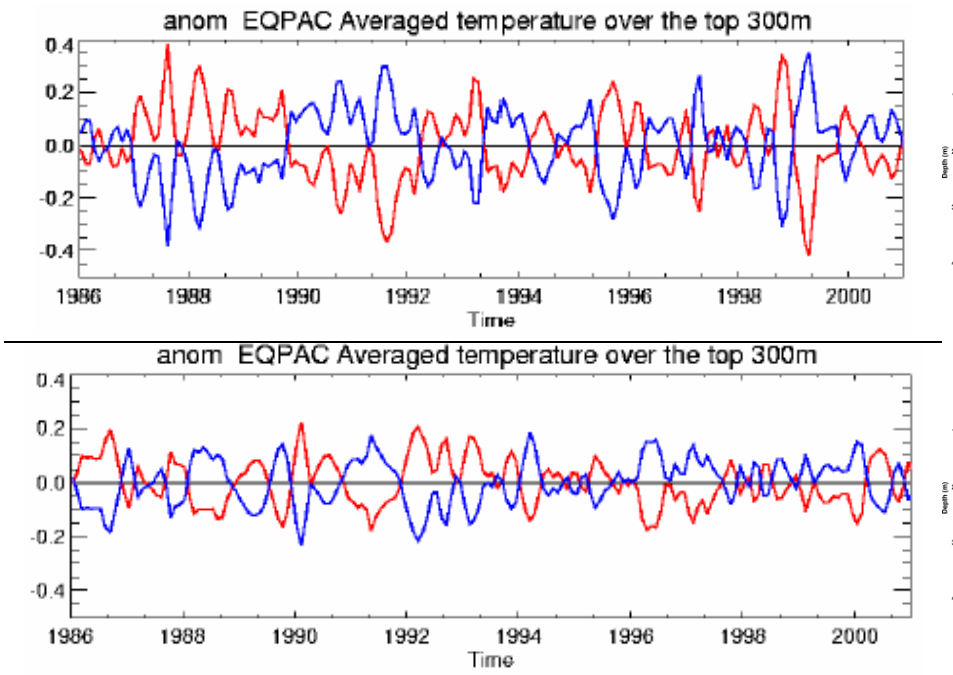
Comparison of (top): the variability of the CERFACS 3D-Var analyses obtained in DEMETER (left) and in ENSEMBLES (right), and (bottom) of the corresponding spread for the November 1st ensembles.



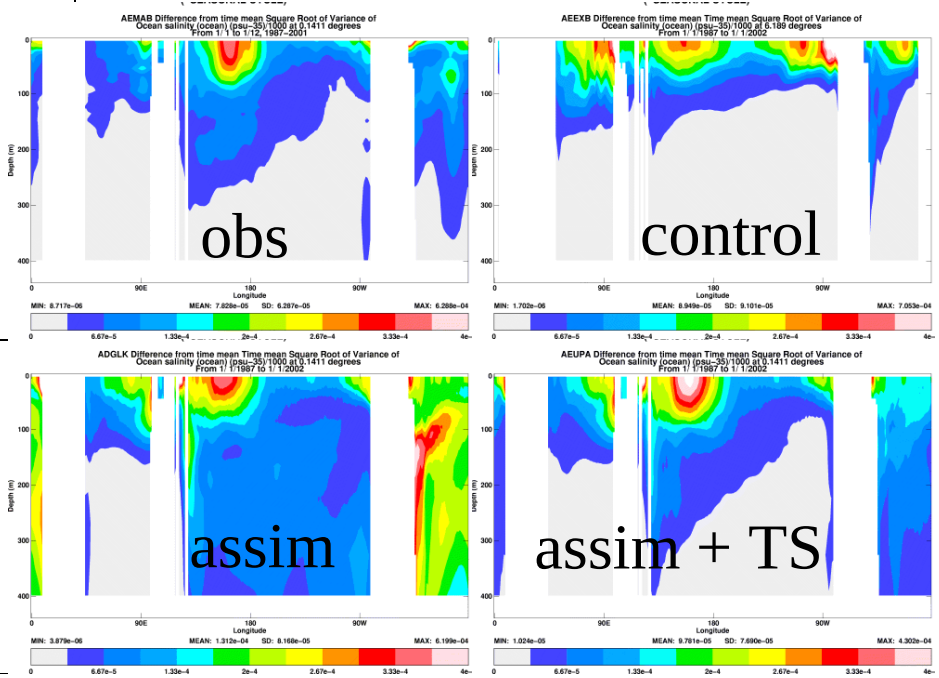
Several years of ocean analyses
WP2A.1, D2A.1 (2/2)

Investigation of other aspects of ocean initialisation

Impact of the DEMETER wind stress perturbations (top) and the new ones produced for ENSEMBLES (bottom) on the top 300m temperature of the ECMWF model.



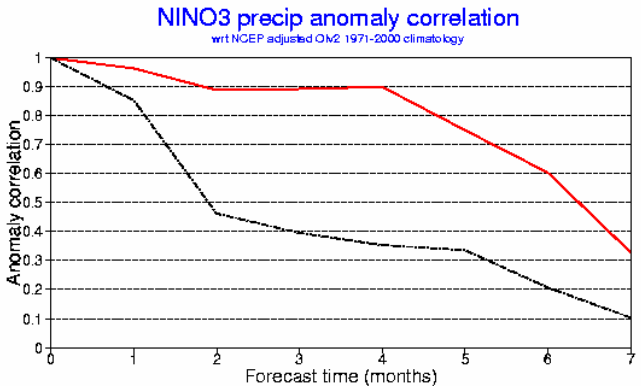
A comparison of sub-surface salinity variance in equatorial-depth sections for the ENSEMBLES ocean analyses generated for 1987-2001 in four METO-HC ocean model runs and analyses showng the positive impact of preserve water mass properties (compare top left and bottom right).

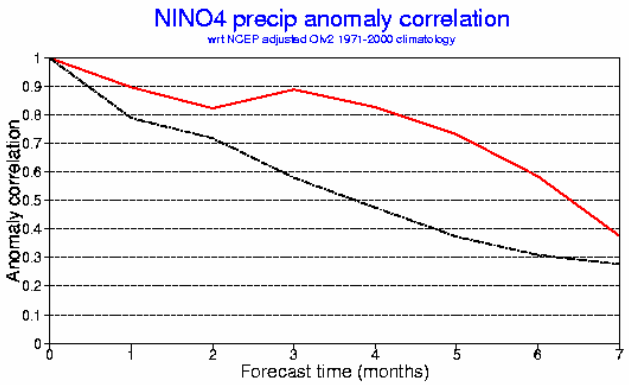


WP2A.1 contribution to Stream 1 S2D simulations

- **WP2A.1 has contributed to Stream 1 simulations (multi-model results, cf James Murphy's talk and Michel Déqué's discussion in S2D session)**

Stream 1 multi-model Nino3 and Nino4 SST scores (ACC)





Stream 1 multi-model global SST plumes (start dates 1965 and 1994)

More results at http://www.ecmwf.int/research/EU_projects/ENSEMBLES/ , then "results"

WP2A.2 - Creation of multi-model hindcasts for the 20th Century, including variations in external forcing

Leader: DMI (E Kaas)

Participants (PI): CNRM (JF Royer), DMI (E Kaas), FUB (U Cubasch), METO-HC (P Stott), INVG (M Vichi), IPSL (JL Dufresne), MPIMET (E Roeckner), NERSC (H Drange), UiO (I Isaksen)

- objectives:
  - assess the capability of the different AGCMs, coupled AOGCMs and ESMs
    - to simulate the longer-term climate anomalies observed during the 20th century in response to
      - natural forcings (volcanic eruptions, solar variability)
      - anthropogenic forcings (GHG emissions, aerosols, alteration of the land-surface)
  - gain a probabilistic estimate to which degree of certainty the 20th century climate can be simulated

Combination of atmosphere-ocean models used in stream 1 simulations

Partners	Model	Atmosphere	Resolution	Ocean	Resol.	
METO-HC	HadGem1	HadGam1	1.25x1.875° L38	HadGom1	0.33-1° L40	
IPSL +UCL-ASTR	IPSL-CM4	LMDZ-4	2.5x3.75° L19	OPA8.1	0.5-2° L31	
MPI	ECHAM5 /MPI-OM	ECHAM5	T63 L31	MPI-OM	1.5° L40	
FUB	EGMAM	ECHAM4-MA	T30 L39	HOPE-G	0.5-2.8° L20	
CNRM	CNRM-CM3	ARPEGE V3	T63 L45	OPA8	0.5-2° L31	
NERSC	ARPEGE V3-MICOM-OASIS	ARPEGE V3	T63 L31	NERSC Modified MICOM2.8	1.5° L35	
DMI	ECHAM5 /MPI-OM	ECHAM5	T63 L31	MPI-OM	1.5° L40	
UiO	OSLO CTM2	OSLO CTM2	T21 L60	---		

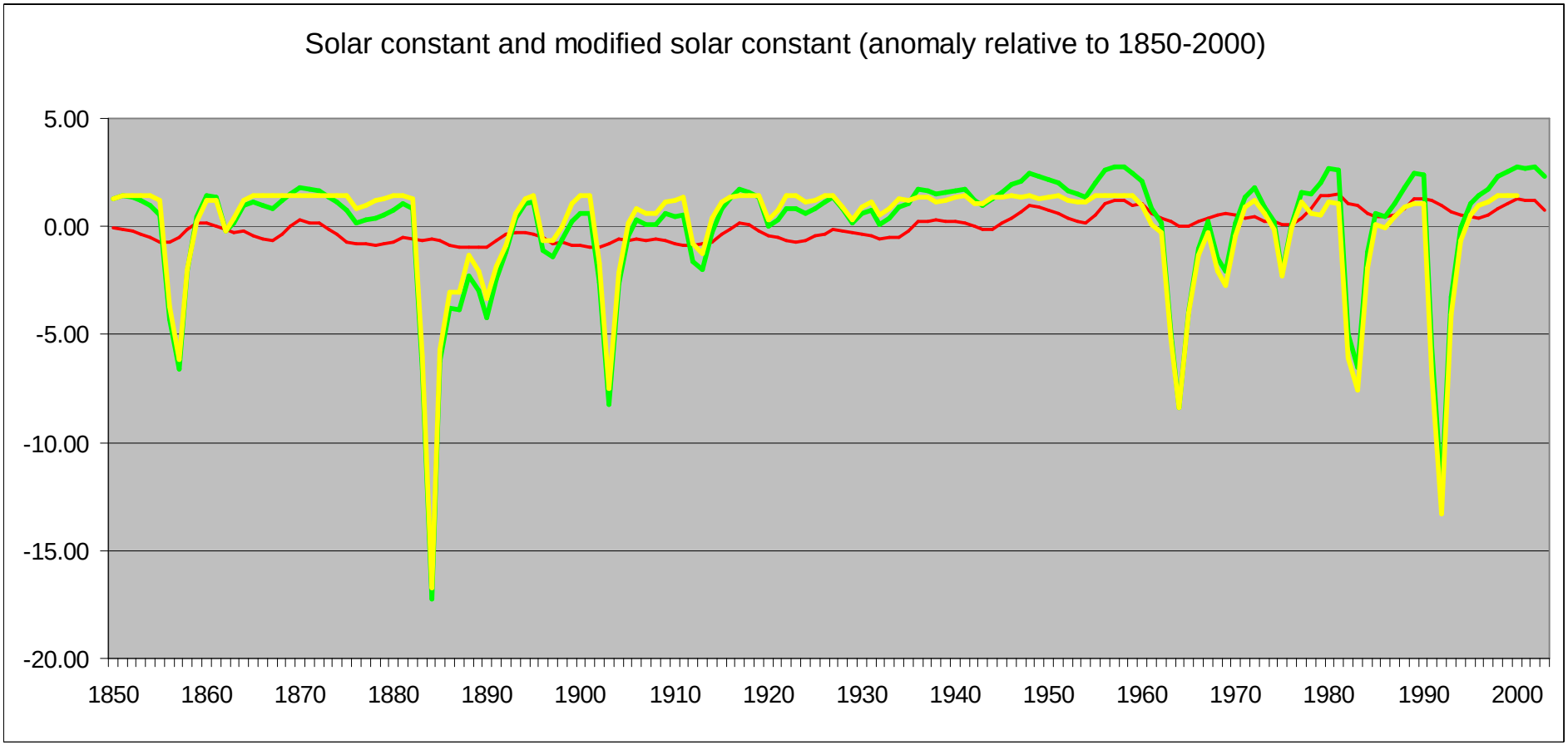
WP2A.2: What has been accomplished?

Use of a common set of forcings (M2A.2)

- Control simulations (multicentennial)
  - 1860 preindustrial forcings
- 1860-2000 simulations
  - Anthropogenic only (based on IPCC)
    - CO2, CH4, N2O, CFC and other minor GHGs
    - Aerosols
  - Anthropogenic+Natural forcings
    - solar irradiance: Solanki and Krivova (2003)
    - volcanic forcing: update of Sato et al. (1993)
  - Other combinations
    - Natural only (FUB)
    - Ant.+Nat.- Black carbon aerosol (METO-HC)
    - Different formulations of aerosols (MPI, IPSL)
    - High resolution control for current climate (UREADM)

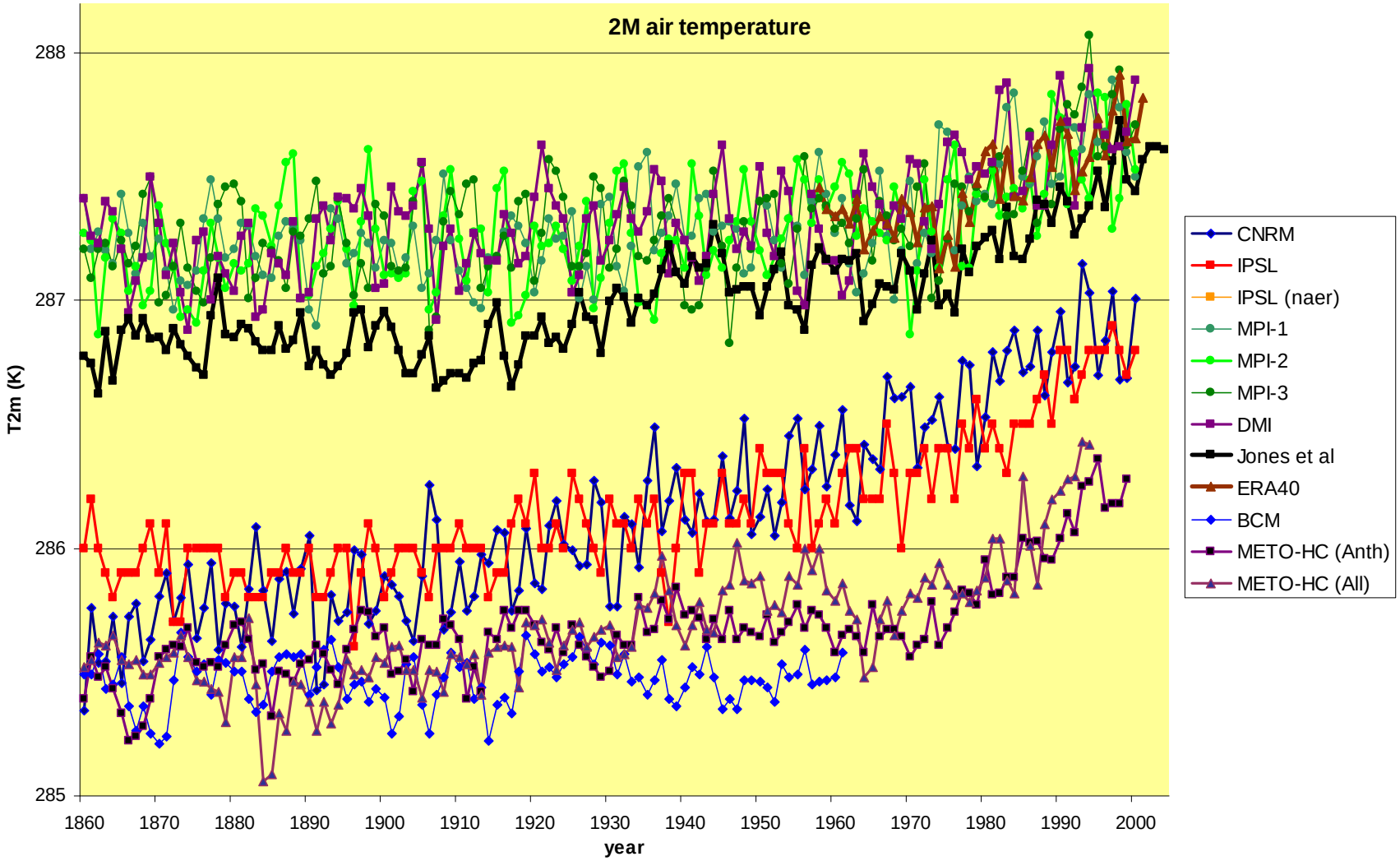
Natural forcings (DMI, E Kaas)

Anomalies of solar forcing and estimated volcanic forcing used in WP2A.2. The red curve is the Solanki and Krivova solar forcing, the yellow the estimated Sato volcanic forcing and the green the combined solar and volcanic forcing. The units are solar constant in W/m2 for all curves. This means that all curves must be multiplied by a factor of (1-A)/4, where A is the planetary albedo, in order to obtain the usual radiative forcing.

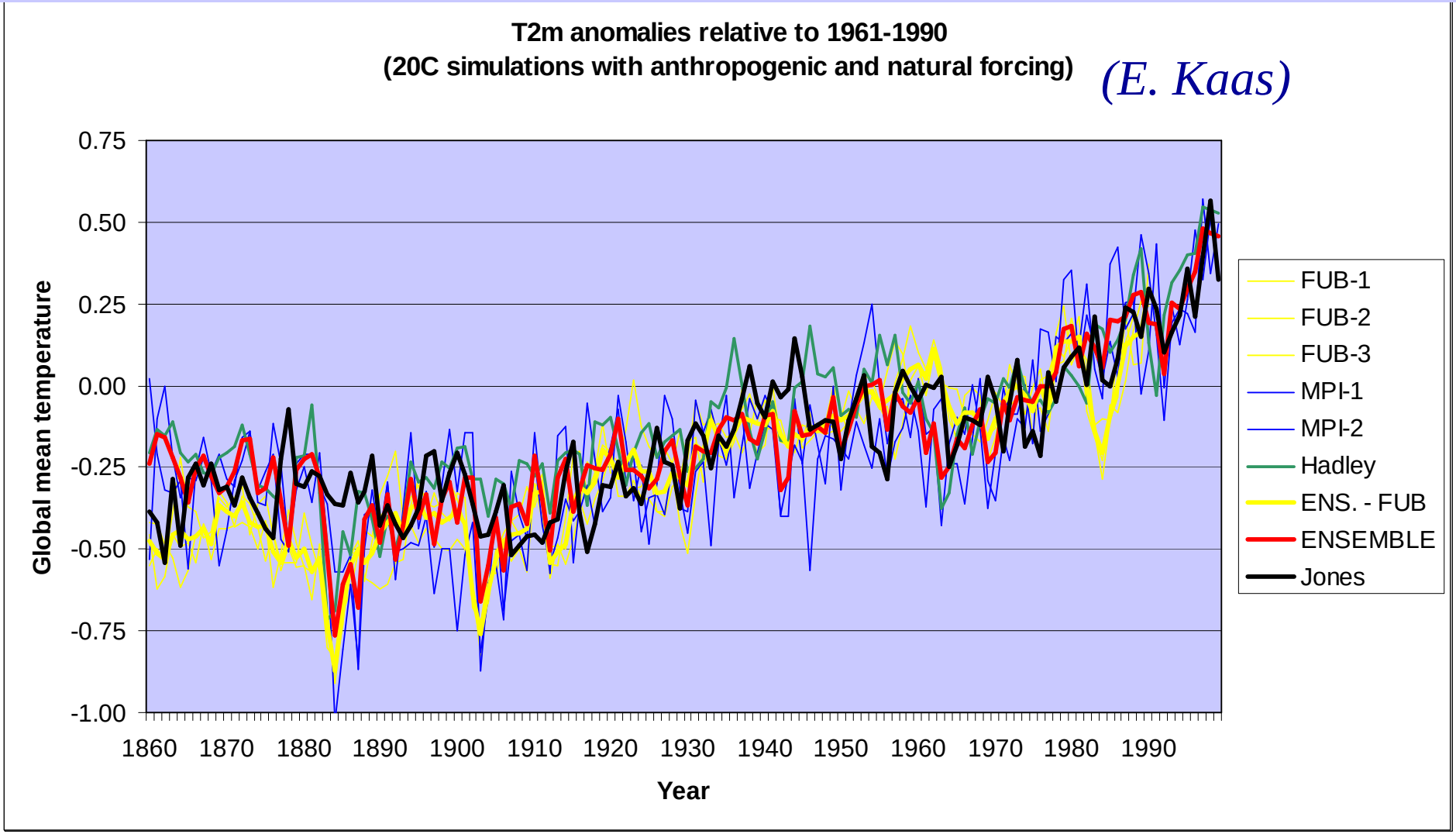


RT2A historical simulations

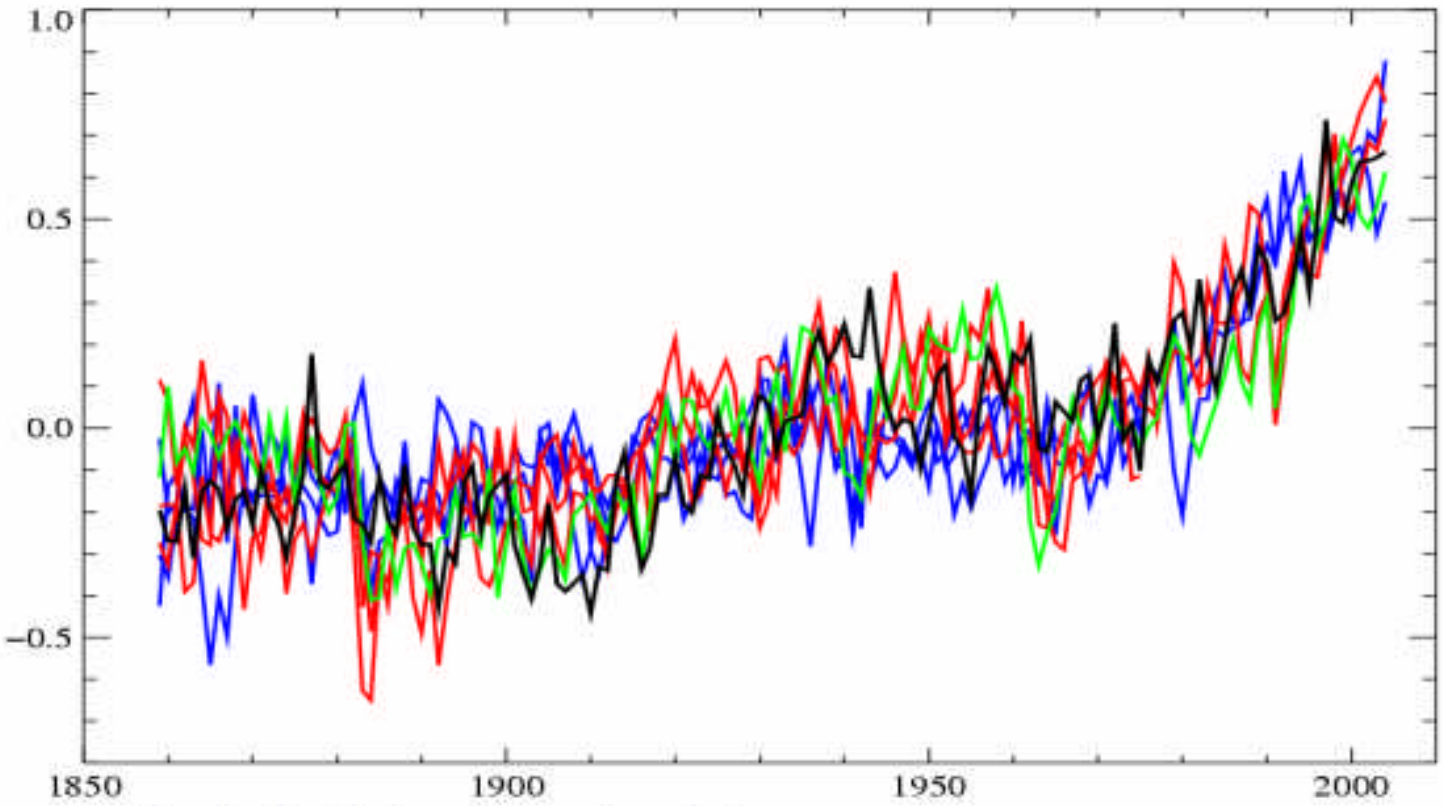
global annual mean air temperature at 2m height



Analysis of multimodel ensembles (T2m anomalies)



HadGEM1 simulations now include forcings not considered in HadCM3 including black carbon and land use changes

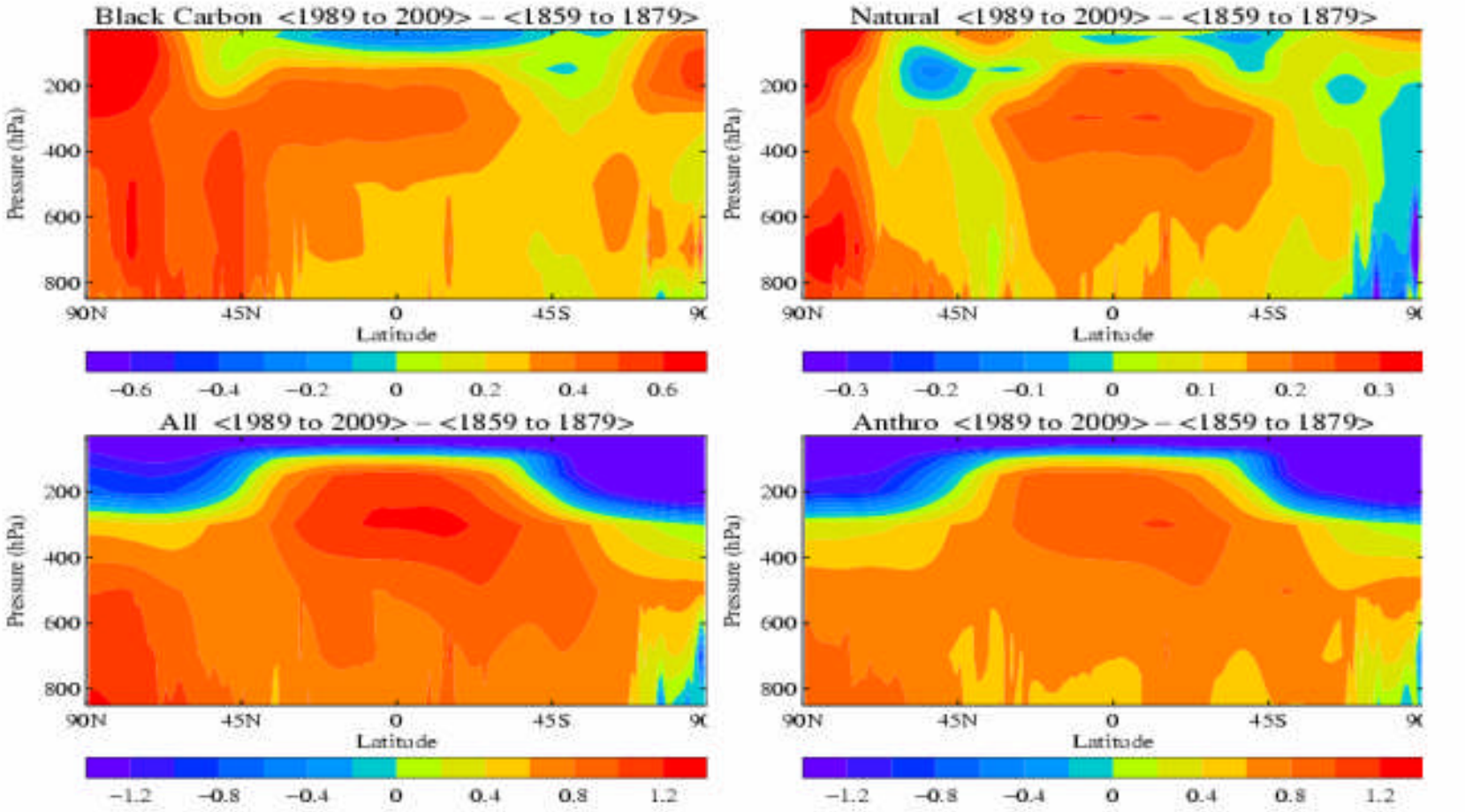


Red : 3 All forcings simulations

Blue : 3 Anthropogenic forcings simulations

Green : One simulations with All forcings – Black Carbon

HadGEM1 patterns of response to different forcings



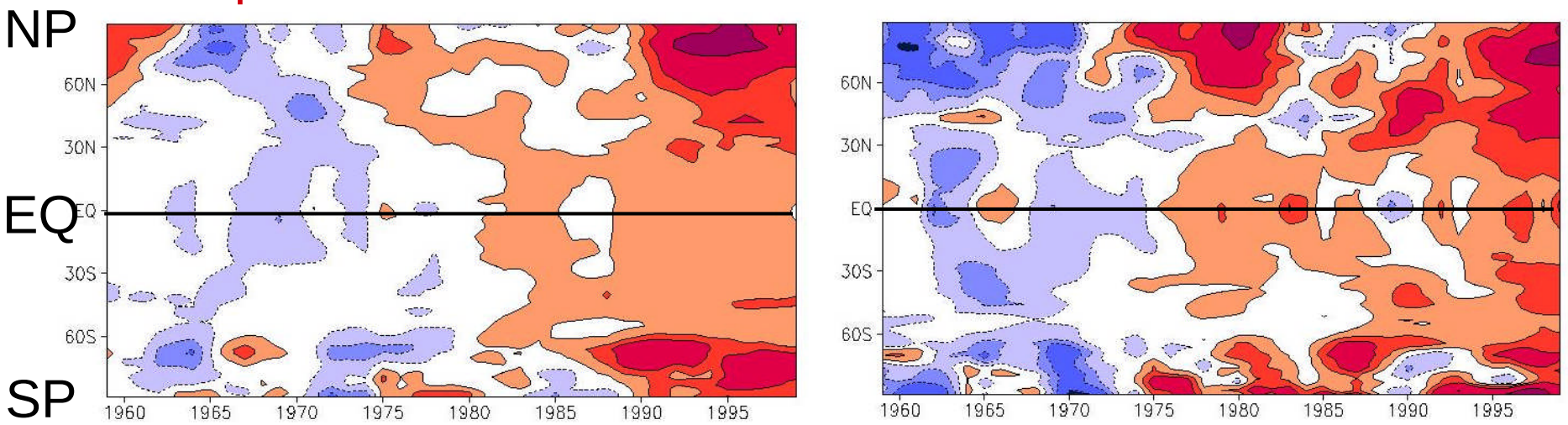
Zonal mean sfc air temp 1958-2000
(deviation from the 1961-1990 mean)

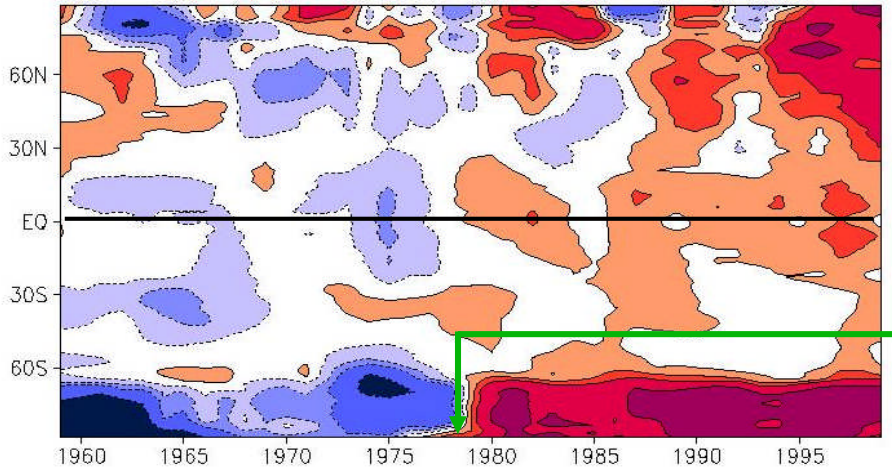
ECHAM5 / MPI-OM

E Roeckner

Anthropogenic forcing
SO4 prescribed

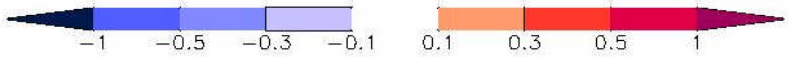
All forcings
With aerosol model





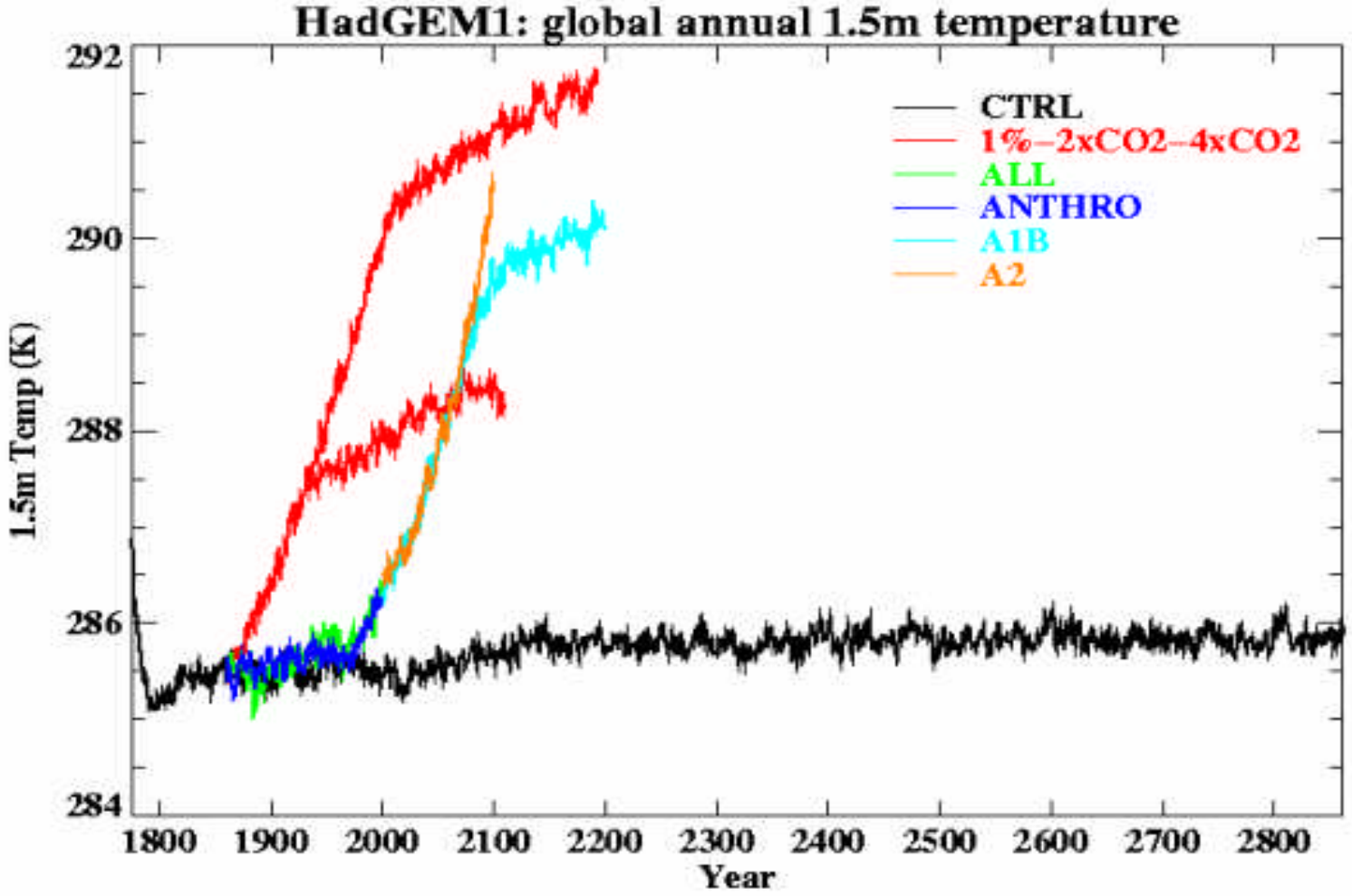
ERA40

Caution:
beginning of
satellite era



[°C]

HadGEM1 experiments – the big picture



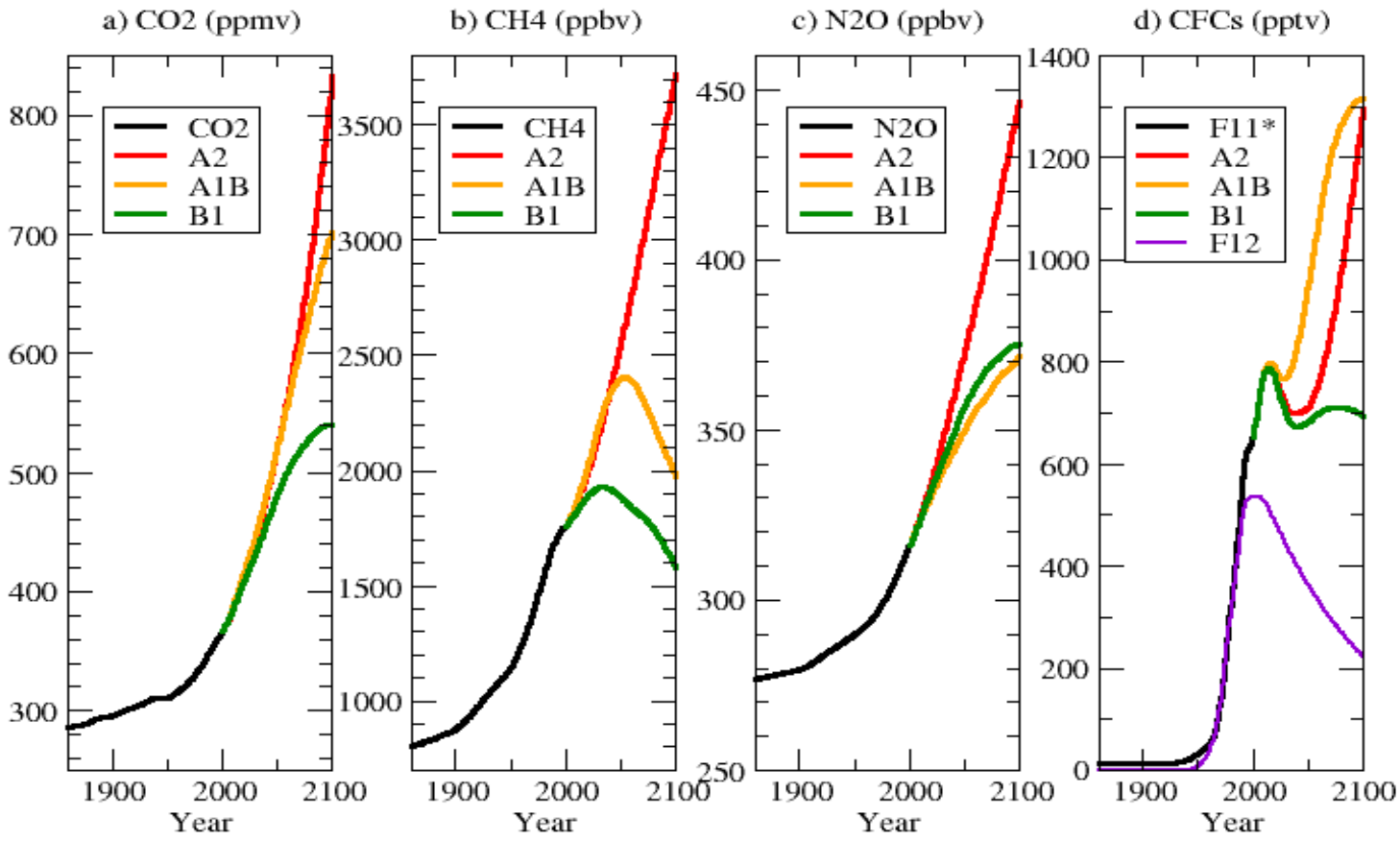
WP2A.3 - Creation of multi-model climate change scenarios for the 21st Century

Leader: FUB (U Cubasch)

Participants (PI): CNRM (JF Royer), DMI (E Kaas), FUB (U Cubasch), METO-HC (T Johns), IPSL (JL Dufresne), INVG (E Manzini), MPIMET (E Roeckner), NERSC (H Drange), UCL-ASTR (T Fichefet), UREADMM (J Slingo), UiO (B Rognerud)

- objectives:
  - make a significant European contribution to the IPCC process by providing an ensemble of new multi-model scenario experiments for the 21st century
    - experiments run by many different models
    - a few multiple experiments run with a limited number of models
  - produce a projection of the future climate together with a better estimate of the uncertainties
    - model formulation, initial state of the climate system, and scenario choice.

Concentration of GHGs in RT2A simulations

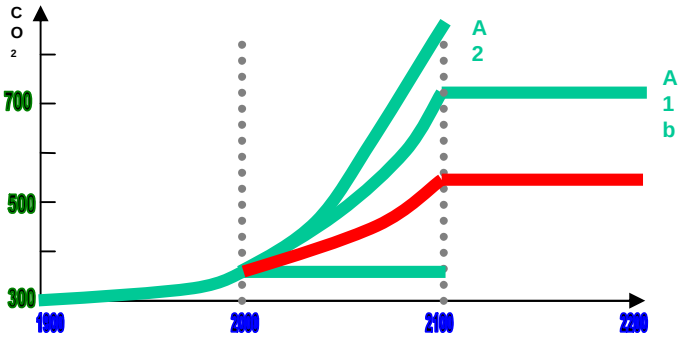


WP2A.3: What has been accomplished?

- IPCC scenarios
  - started as a continuation of the anthropogenic 20th century simulation

– A2 and A1B
  – 11 simulations with 6 models

– B1
  – 9 simulations with 5 models



– Stabilisation runs (2100-2300)
  - 720 and 550 ppm

– idealized experiments with 1% CO2 increase per year
  – stabilisation at 2xCO2 and 4xCO2

WP2A.3: What has been accomplished? (2)

  - time-slice simulations of O3 concentrations produced by UiO(for use in stream 2)
  - Analysis of sea ice variability (UCL-ASTR)

- Completion of the stream 1 simulations
  - Mostly as planned (D2A.2.1 and D2A.3.1))
  - Slight delays
    - DMI (additional simulations)
    - FUB (warm bias)
    - NERSC (cold bias)
    - B1 with HadGem1

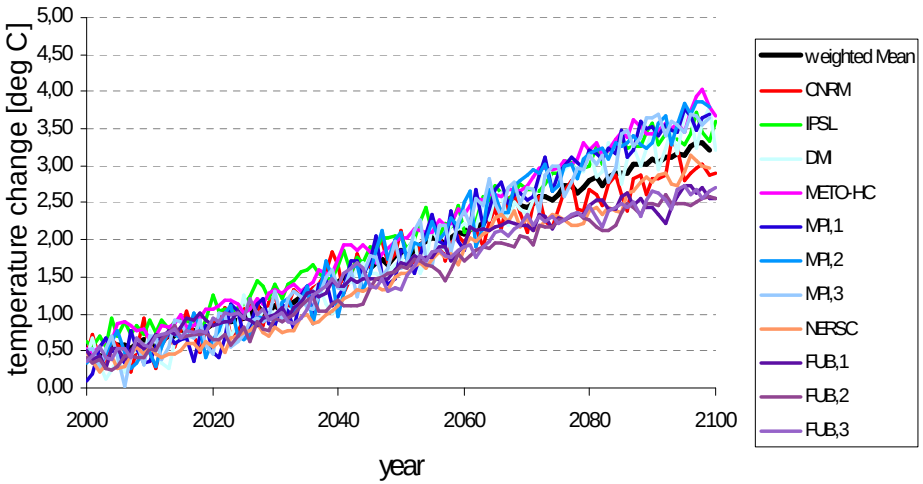
X = available
+ = planned

Multidecadal simulations (June 2006)

Partners	1860-2000	B1	A1B	A2	1% CO_2	IPCC AR-4	Availability of daily fields	Model levels
METO-HC	2X 2X X	?	2X	2X	xx	X	+ (BADC)	(X) For some simulations
IPSL	X X X	X	X	XX	XX	X	DODS	X
MPI	3X 2X 3X	3X	3X	3X	XX	X	CERA	X
FUB L 19 L 39	5*3x XXX	3X	3X	3X		+?	On request	X
CNRM	X X	X	X	X	XX	X	DODS	(+) on request for one scenario
NERSC	X +	X +	X +	X +	XX	X	On request	X
DMI	X X		X			+	+	X
UiO	Time-slice	2090-2100	2090-2100	2090-2100				

Analysis of multimodel scenarios (FUB)

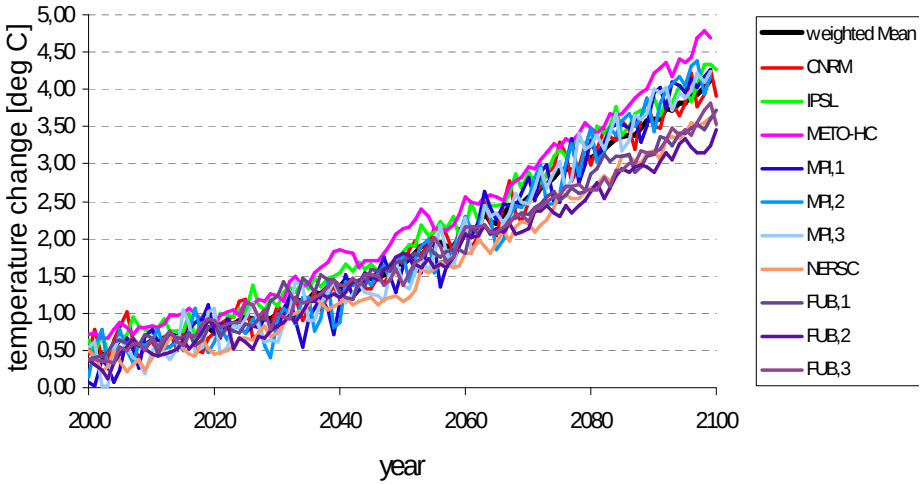
Scenario A1B



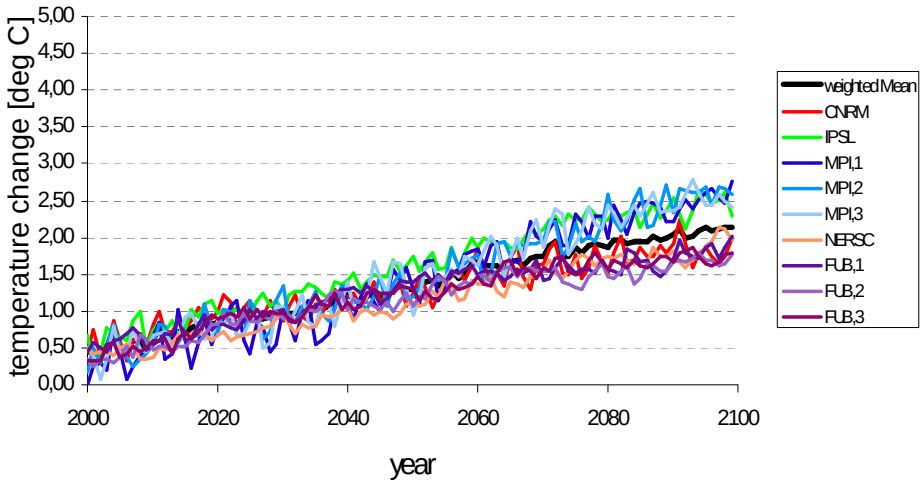
Temperature change

(F. Niehörster)

Scenario A2

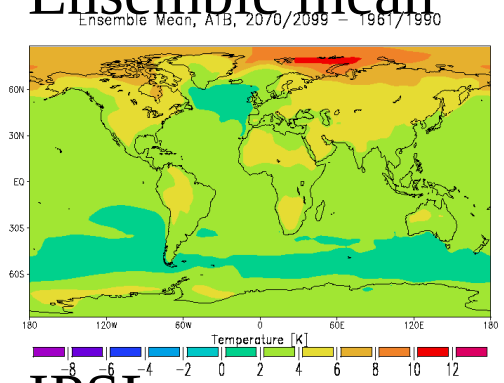


Scenario B1

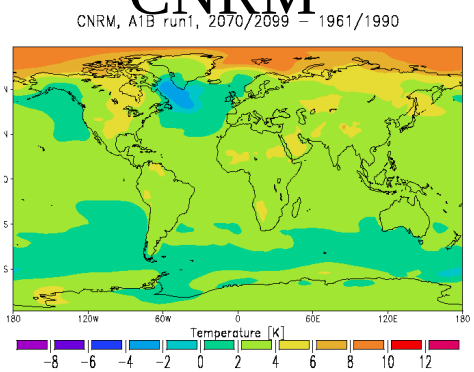


distribution of the near surface temperature change (A1B)

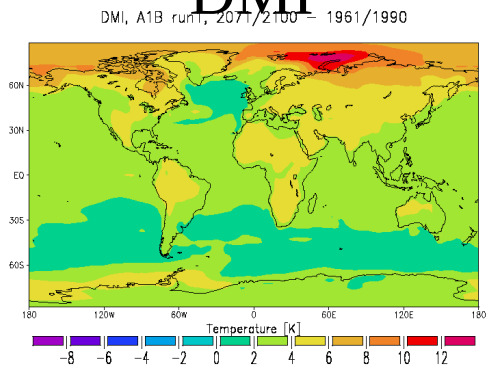
Ensemble mean



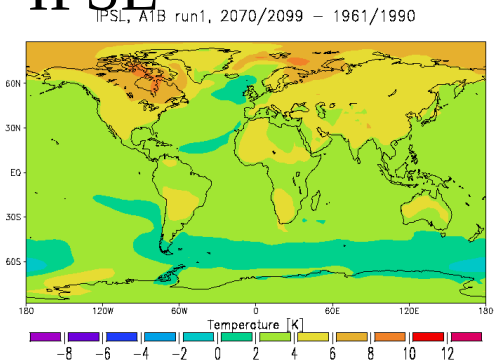
CNRM



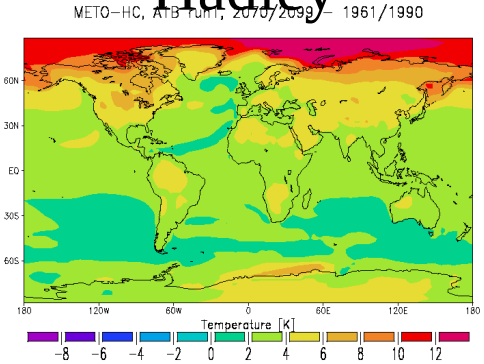
DMI



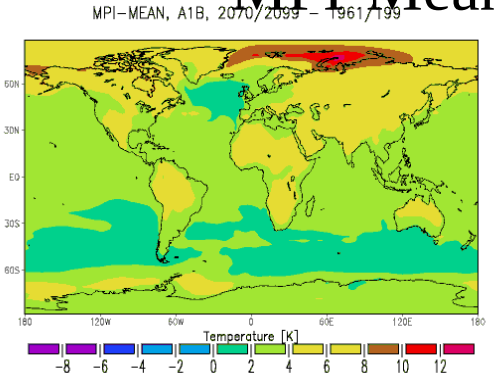
IPSL



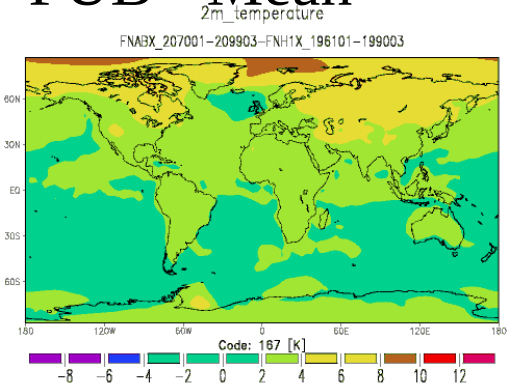
Hadley



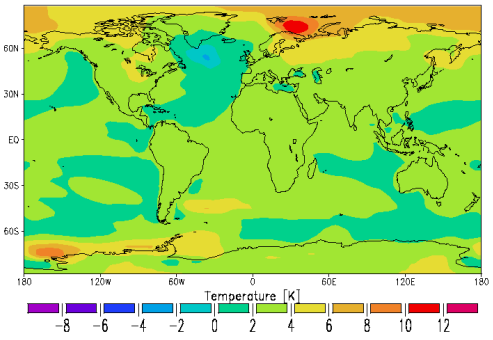
MPI-Mean



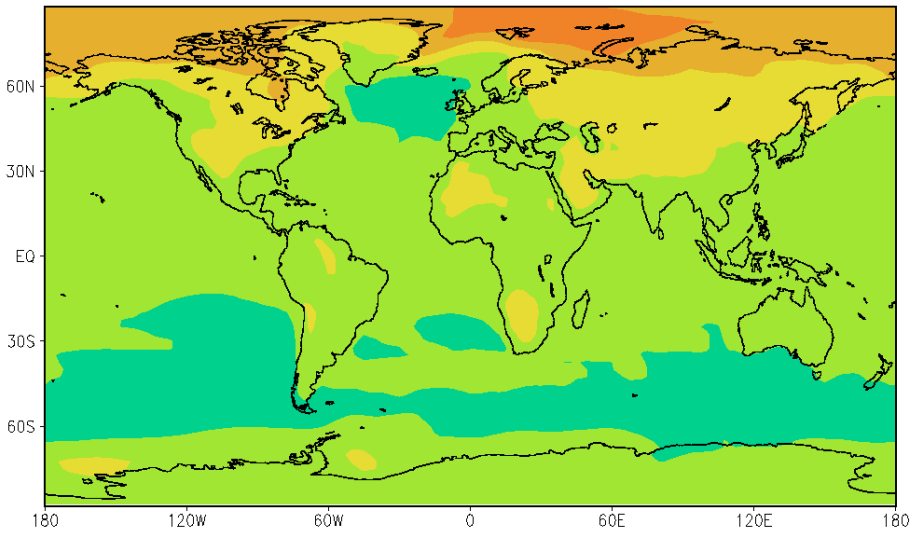
FUB - Mean



NERSC

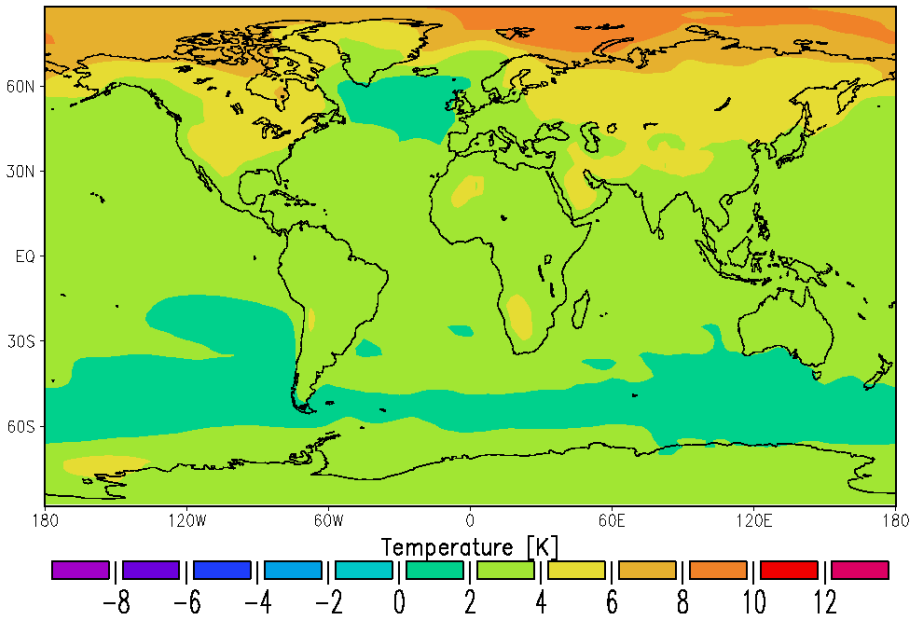


Ensemble Mean – 2, A1B, 2070/2099 – 1961/199



all simulations equally weighted

Ensemble Mean – W2, A1B, 2070/2099 – 1961/199

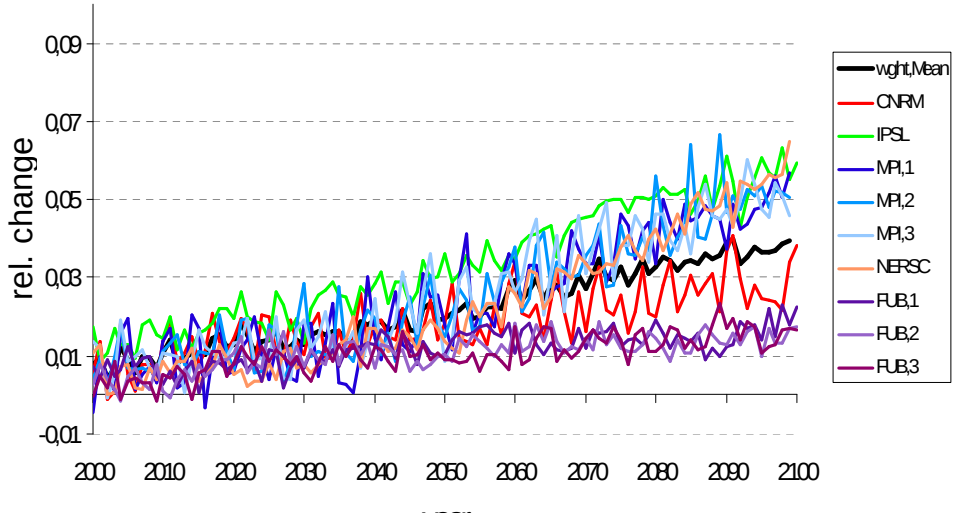


all models equally weighted

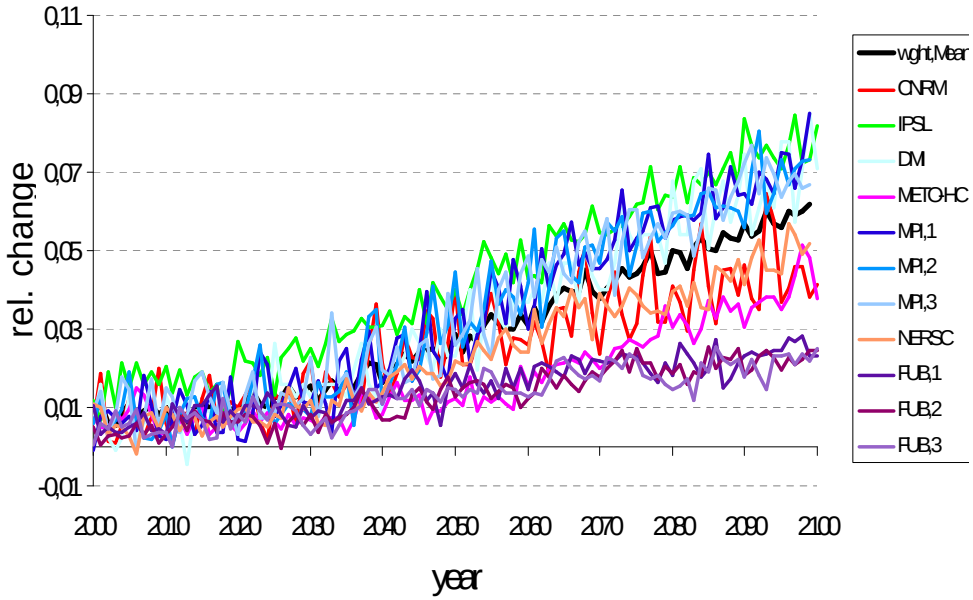
Change in precipitation

(F. Niehörster)

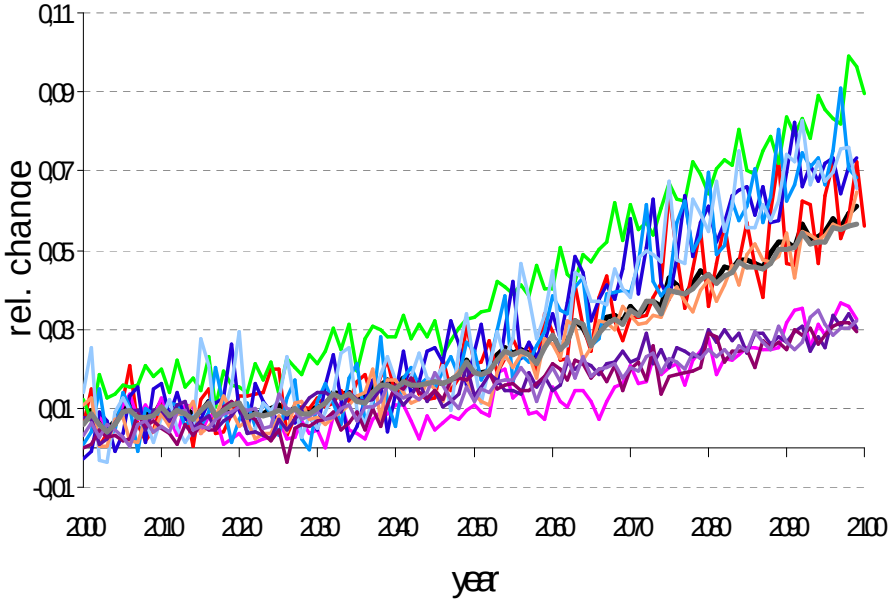
Scenario B1



Scenario A1B



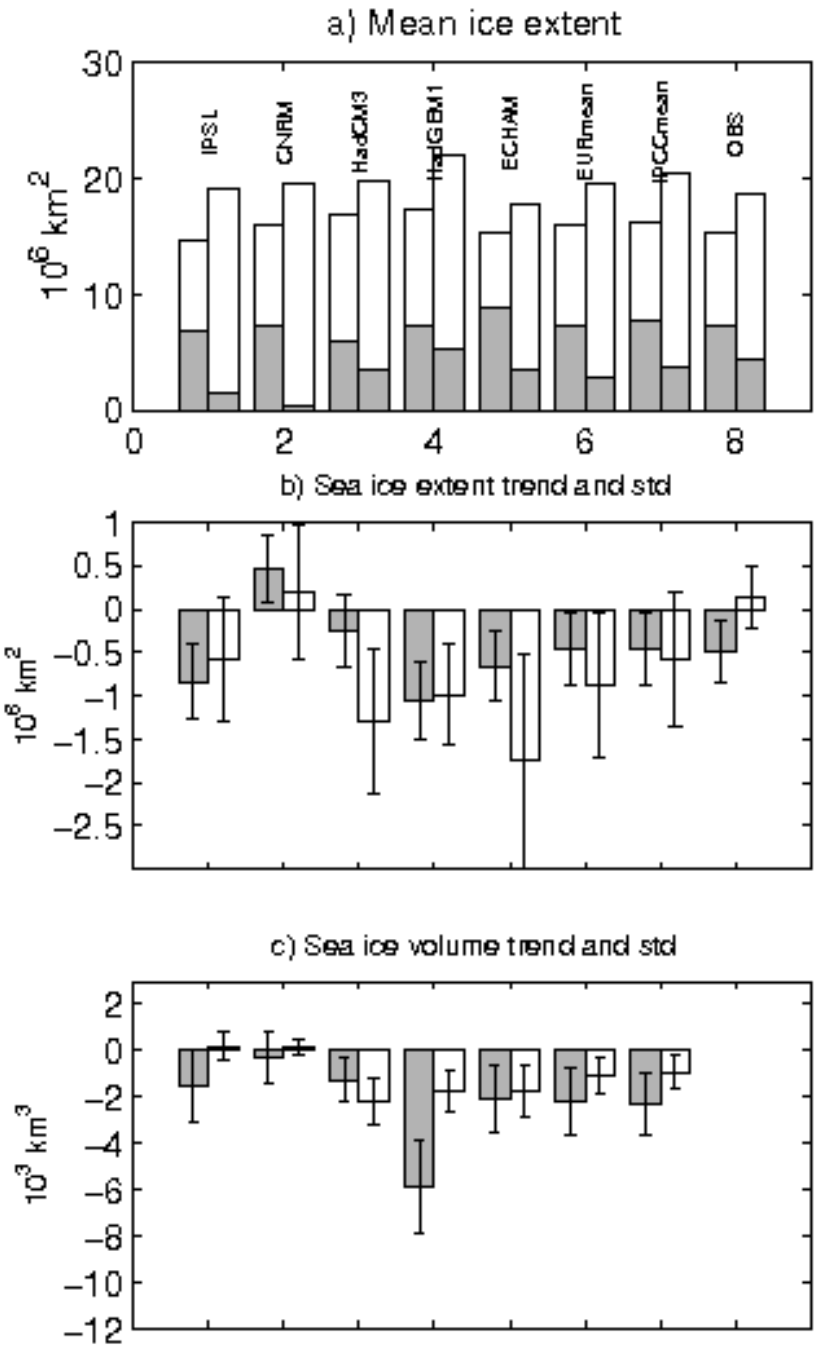
Scenario A2



Sea ice and its trends (UCL-ASTR)

- Arctic (left) and Antarctic (right)
- 1981-2000 average
  - minimum (grey)
  - maximum (white)
    - -OBS from NSIDC
    - -EUR mean = 5 models
    - -IPCC mean = 16 models

-linear trends in mean annual extent and volume and standard deviation (bars)

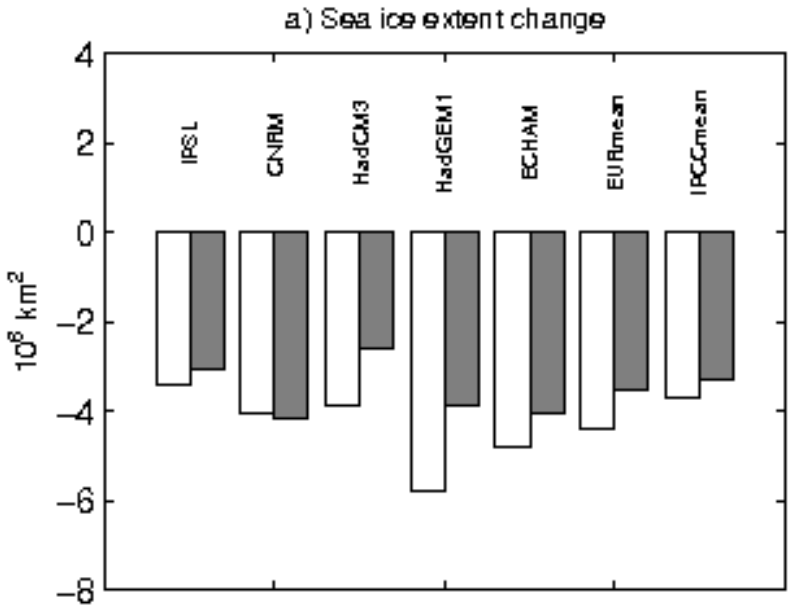


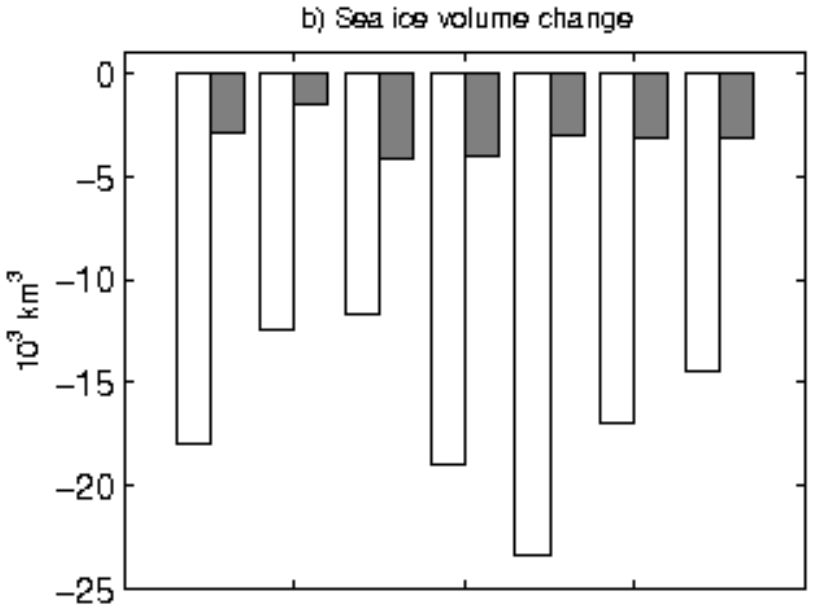
Sea ice change at the end of 21st Century (UCL-ASTR)

•No significant difference was found between the results obtained with the European models and those obtained with the full set of IPCC AR4 models (i.e., 16 models)

•The conclusions obtained by Arzel et al. (2006) for the whole IPCC AR4 models are also valid for the ENSEMBLES models

*Arzel, O., T. Fichefet, and H. Goosse, 2006: Sea ice evolution over the 20th and 21st centuries as simulated by current AOGCMs. Ocean Modelling, **12**, 412-427*





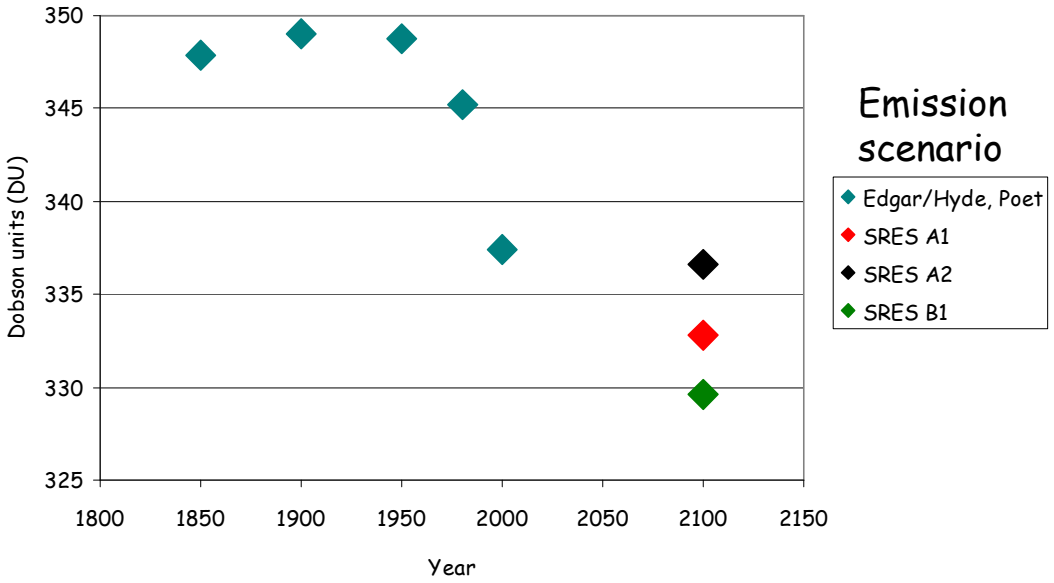
Time slice simulations using the Oslo CTM2 model, have been performed for the past and the future.

past: 1850, 1900, 1950, 1980, 2000 using the Edgar/Hyde and POET database

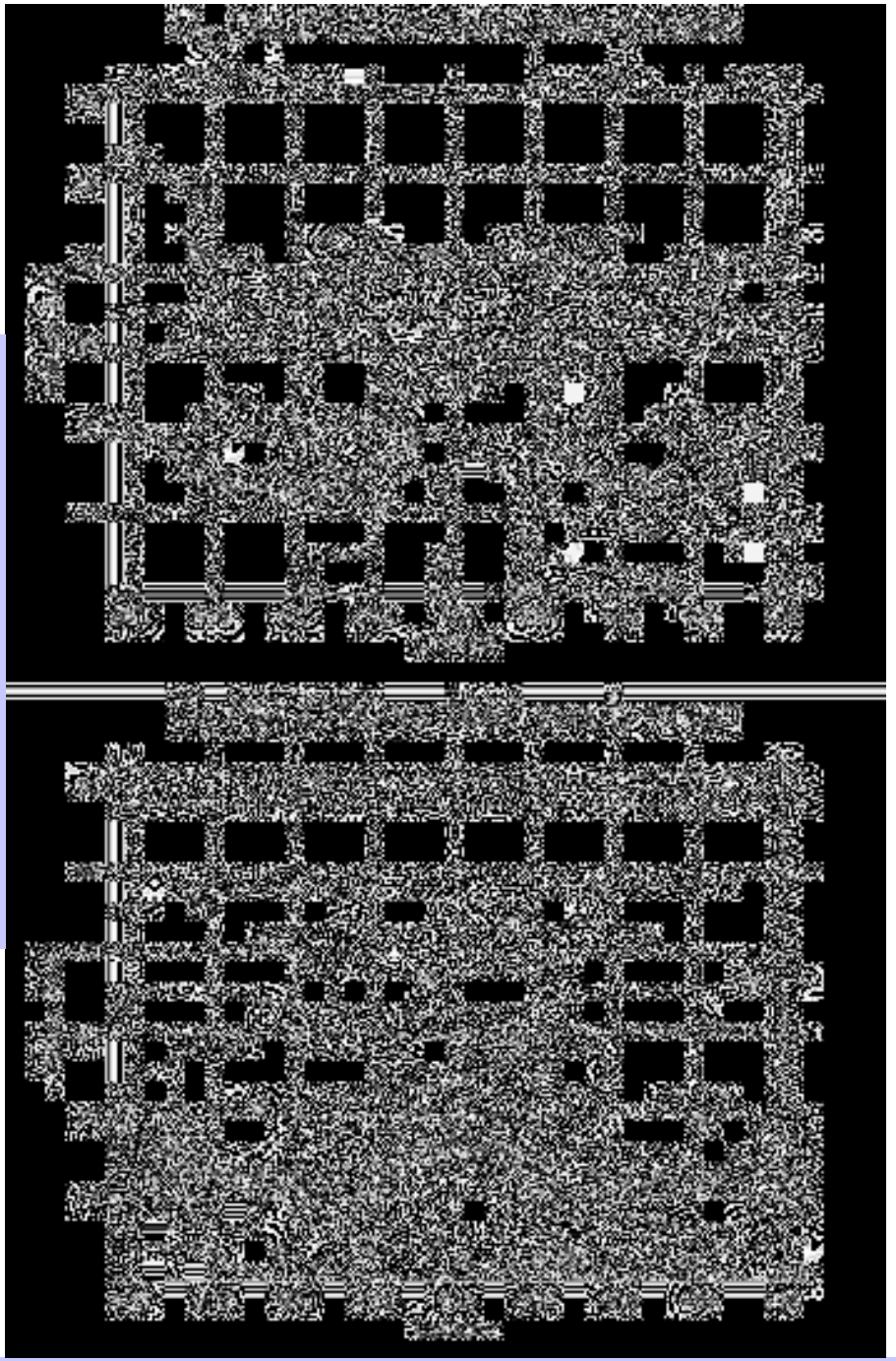
future: 2100 using IPCC SRES A1B, A2 and B1 scenarios

Figure 1:

Global mean ozone column (Dobson units) for the 8 time slice simulations



Calculated yearly and zonally percentage changes in O_3 between year 1850 and 2100 as a function of latitude and altitude for scenario A2p (upper plot) and B1p (lower plot). [Source: UiO]



Further analysis of stream one simulations
Deliverable D2A.3.2

"Data and report/manuscript of stream one simulations for the prediction of future climate" due in September (project month 24, lead participant: FUB)

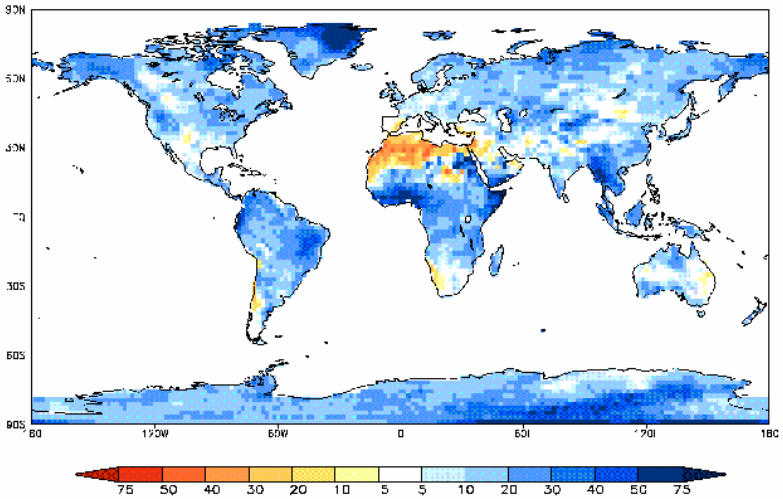
Ideas (F Niehörster) :

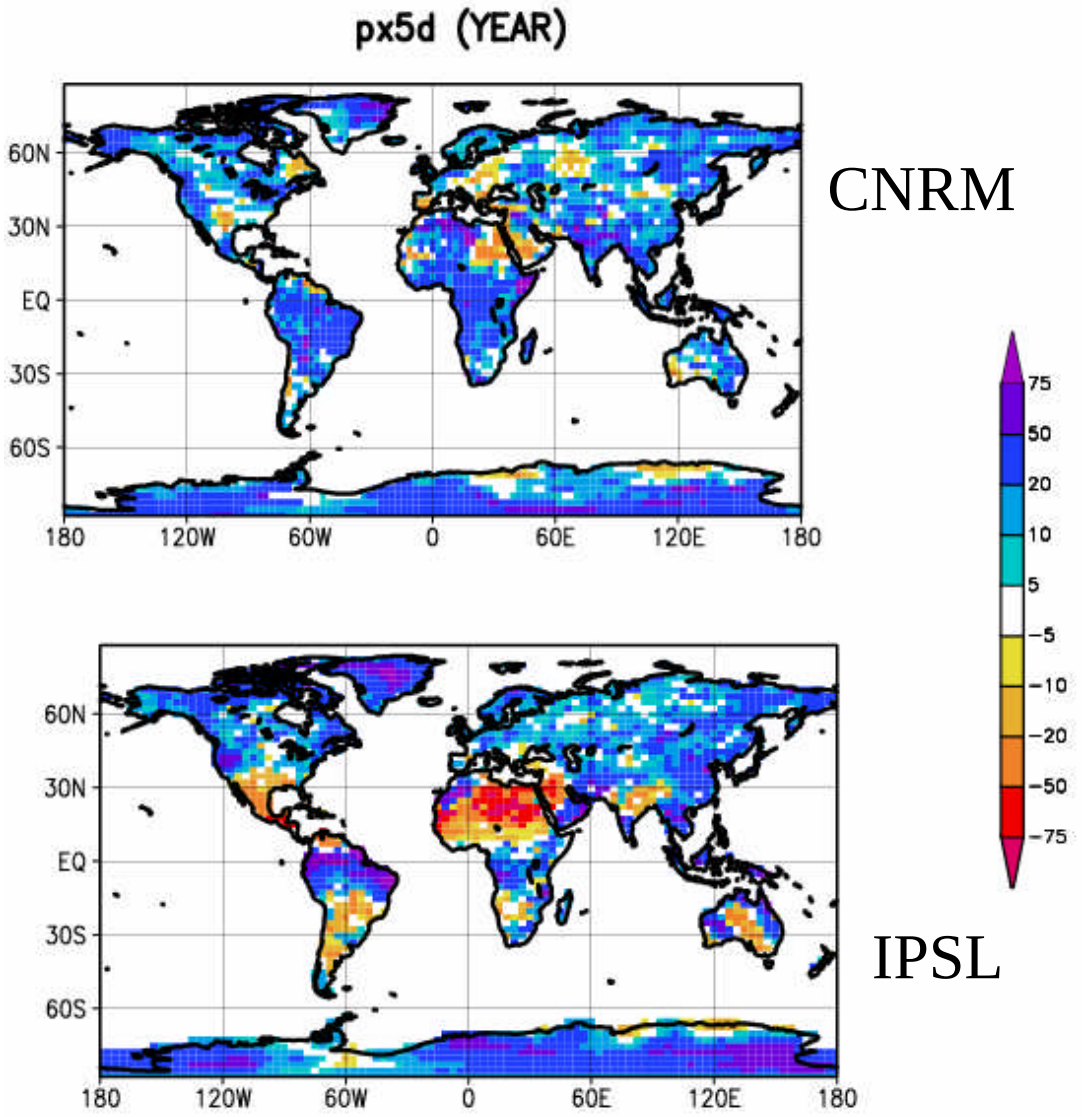
- statistical properties of the multi-model ensemble
- probabilities of certain changes / hot spots
- climate sensitivity
- robust indicators for climate change
- …

Feedback of all partners are welcome!

Relative change of extreme precipitation (5-day maximum during a year) A1B (2071-2100) vs. (1961-1990)

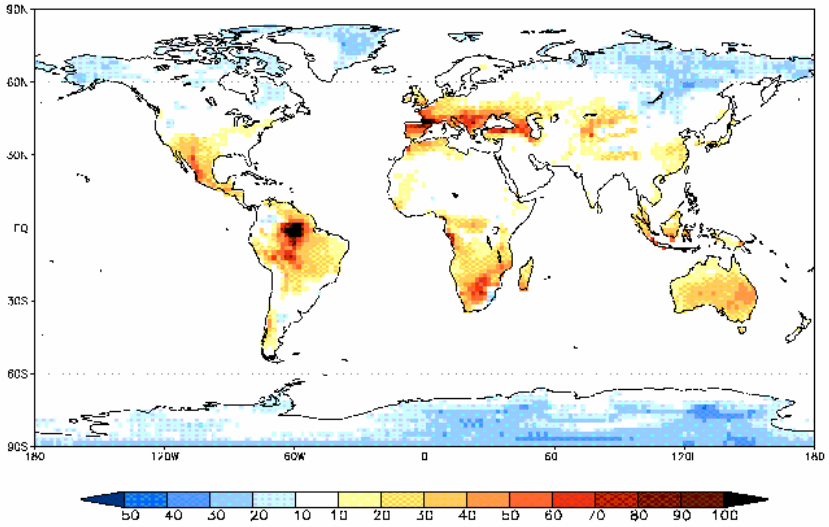
ECHAM5/ MPI-OM

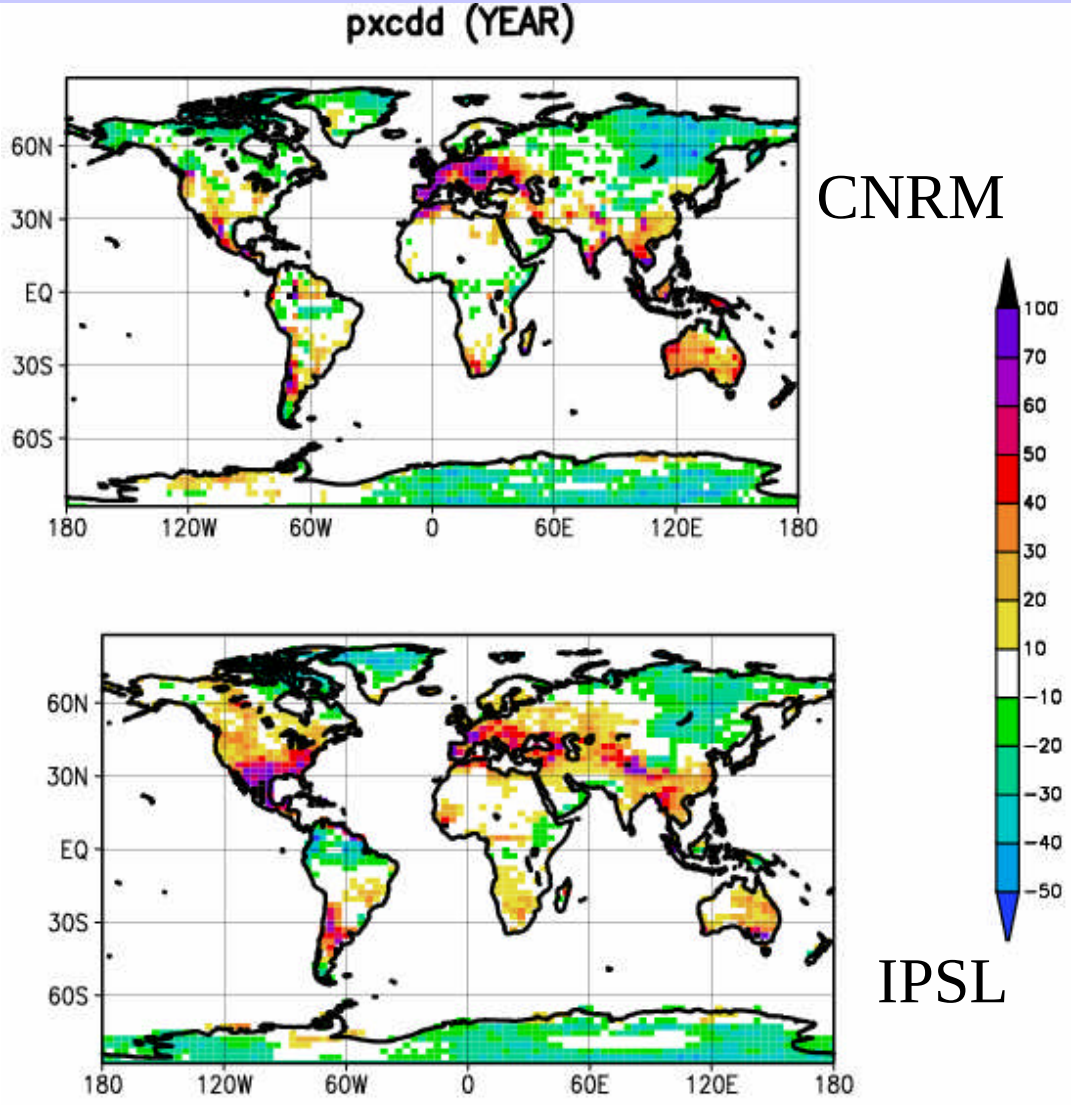




Relative change of dry spells (longest period with prec < 1 mm/day during a year) A1B (2071-2100) vs. (1961-1990)

ECHAM5/ MPI-OM





WP2A.4 - Storage, extraction and creation of distributed databases for provision of the results

Leader: ECMWF (F Doblas-Reyes).

Participants: ECMWF (F Doblas-Reyes), MPIMET-MD (M Lautenschlager)

- objectives:
  - to develop a database system with a common format allowing easy access to all the partners to archive and retrieve selected datasets of the global ensemble simulations
    - seasonal to decadal simulations (WP2A.1) will be stored in the Mass storage system of ECMWF
    - 20th and 21st century simulations will be stored by the Model and Data Group in Hamburg (MPIMET-MD)

WP2A.4: Progress towards objectives

- Definition of common list of variables
  - ECMWF for seasonal-to-decadal integrations, including daily and monthly data (Task 2A.4.a, part of D2A.4.1)
    http://www.ecmwf.int/research/EU_projects/ENSEMBLES/news/index.htm
    - Atmospheric data archived in MARS in GRIB format
    - ocean output in NetCDF using a common grid
    - conventions (part of D2A.4.2) to create the files (Task 2A.4.b) are available
  - MPIMET.MD for centennial simulations under the rules of World Data Centre on Climate (WDCC) has specified
    - lists of variables and formats (as part of D2A.4.1)
    - metadata (as part of D2A.4.2)
    - Storage in NetCDF format

List of variables for the seasonal-to-decadal hindcasts

List of common variables

- **Atmosphere**
  - 4 pressure levels (850, 500, 250, 50 hPa): Z,T,u,v,q
  - surface data
  - daily data (at 00 GMT or accumulated) and monthly means
  - common 2.5°x2.5° grid
- **Ocean**
  - monthly means of 3D and 2D fields
  - common Levitus regular grid (ENACT convention)
- **Additional**: 6-hourly model-level data (3 GCMs)

See also:

http://www.ecmwf.int/research/EU_projects/ENSEMBLES/data/common_variables.html

http://www.ecmwf.int/research/EU_projects/ENSEMBLES/data/enact_ocean_archiving.html

List of experiments already available in MARS

http://www.ecmwf.int/research/EU_projects/ENSEMBLES/table_experiments/

model	version	origin	expid	method	system	expvers	stream	years	lead	start dates	IC members	MARS	comments
all													
IFS/HOPE	29r2	ECMWF	eplo	1	1	1004	mmsf,msmm	1991-2001	7 months	May 1st	9	ENSEMBLES, rd	control
IFS/HOPE	29r2	ECMWF	epn9	1	1	1004	mmsf,msmm	1991-2001	14 months	Nov 1st	9	ENSEMBLES, rd	control
IFS/HOPE	29r2	ECMWF	epoh	2	1	1001	mmsf,msmm	1991-2001	7 months	May 1st	9	ENSEMBLES, rd	CASBS
IFS/HOPE	29r2	ECMWF	eq04	2	1	1001	mmsf,msmm	1991-2001	14 months	Nov 1st	9	ENSEMBLES, rd	CASBS
IFS/HOPE	30r1	ECMWF	eqhl	1	1	1005	mmaf,mmam	1965	120 months	Nov 1st	9	ENSEMBLES, rd	control
IFS/HOPE	30r1	ECMWF	eqju	1	1	1005	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES, rd	control
IFS/HOPE	30r1	ECMWF	eqq2	2	1	1005	mmaf,mmam	1965	120 months	Nov 1st	9	ENSEMBLES, rd	CASBS
IFS/HOPE	30r1	ECMWF	eqqg	2	1	1005	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES, rd	CASBS
GloSea		MetOffice		1	1	1001	mmsf,msmm	1991-2001	14 months	May & Nov 1st	9	ENSEMBLES	control
GloSea		MetOffice		1	1	1002	mmsf,msmm	1991-2001	12 months	May 1st	9	ENSEMBLES	lagged ens
GloSea		MetOffice		1	1	1002	mmsf,msmm	1991-2001	14 months	Nov 1st	9	ENSEMBLES	lagged ens
GloSea		MetOffice		1	1	1003	mmsf,msmm	1991-2001	7 months	mid April & Oct	9	ENSEMBLES	
GloSea		MetOffice		1	1	1004	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES	
GloSea		MetOffice		1	1	1004	mmaf,mmam	1965	120 months	Nov 1st	9	ENSEMBLES	
DePreSys		MetOffice		10-18	51	1501	mmaf,mmam,mmsf,msmm	1991-2001	120 months	May & Nov 1st	1	ENSEMBLES	pert. param., method->ens memb
DePreSys		MetOffice		10	51	1502	mmaf,mmam,mmsf,msmm	1991	120 months	May 1st	1	ENSEMBLES	pert. param., test IC ens
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmsf,msmm	1991-2001	7 months	May 1st	9	ENSEMBLES	
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmsf,msmm	1991-2001	14 months	Nov 1st	9	ENSEMBLES	
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmaf,mmam,mmsf,msmm	1965	120 months	Nov 1st	9	ENSEMBLES	
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmaf,mmam,mmsf,msmm	1994	120 months	Nov 1st	9	ENSEMBLES	
seasonal multi-model													
IFS/HOPE	29r2	ECMWF	eplo	1	1	1004	mmsf,msmm	1991-2001	7 months	May 1st	9	ENSEMBLES, rd	control
IFS/HOPE	29r2	ECMWF	epn9	1	1	1004	mmsf,msmm	1991-2001	14 months	Nov 1st	9	ENSEMBLES, rd	control
GloSea		MetOffice		1	1	1001	mmsf,msmm	1991-2001	14 months	May & Nov 1st	9	ENSEMBLES	control
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmsf,msmm	1991-2001	7 months	May 1st	9	ENSEMBLES	
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmsf,msmm	1991-2001	14 months	Nov 1st	9	ENSEMBLES	
seasonal stochastic physics													
IFS/HOPE	29r2	ECMWF	epoh	2	1	1001	mmsf,msmm	1991-2001	7 months	May 1st	9	ENSEMBLES, rd	CASBS
IFS/HOPE	29r2	ECMWF	eq04	2	1	1001	mmsf,msmm	1991-2001	14 months	May 1st	9	ENSEMBLES, rd	CASBS
seasonal perturbed physics													
DePreSys		MetOffice		10-18	51	1501	mmsf,msmm	1991-2001	120 months	May & Nov 1st	1	ENSEMBLES	pert. param., method->ens memb, 1IC
decadal multi-model													
IFS/HOPE	30r1	ECMWF	eqhl	1	1	1005	mmaf,mmam	1965	120 months	Nov 1st	9	ENSEMBLES, rd	control
IFS/HOPE	30r1	ECMWF	eqju	1	1	1005	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES, rd	control
GloSea		MetOffice		1	1	1004	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES	
DePreSys		MetOffice		10-18	51	1501	mmaf,mmam	1991-2001	120 months	May & Nov 1st	1	ENSEMBLES	pert. param., method->ens memb, 1IC
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmaf,mmam	1965	120 months	Nov 1st	9	ENSEMBLES	
ARPEGE/OPA		MeteoFrance		1	(0) 1	1001	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES	
decadal stochastic physics													
IFS/HOPE	30r1	ECMWF	eqq2	2	1	1005	mmaf,mmam	1965	120 months	Nov 1st	9	ENSEMBLES, rd	CASBS
IFS/HOPE	30r1	ECMWF	eqqg	2	1	1005	mmaf,mmam	1994	120 months	Nov 1st	9	ENSEMBLES, rd	CASBS
decadal perturbed physics													
DePreSys		MetOffice		10-18	51	1501	mmaf,mmam	1991-2001	120 months	May & Nov 1st	1	ENSEMBLES	pert. param., method->ens memb, 1IC

Storage of Stream 1 data at MPIMET-MD

- Definition of a final list of output variables, which should be stored, and 'translation' to CF-standard in cooperation with and in accordance to RT3.

- Preparation of the infrastructure to store the ENSEMBLES data in the CERA database and beginning of storage of stream 1 data.

- Set-up of a web-site to provide an easy way to get information about the stored data, and also links to CERA and PCMDI to download the data.
  - http://ensembles.wdc-climate.de

Data availability

- Most data from WP2A.2 and WP2A.3 simulations are available for monthly fields from the PCMDI data base.

- Data from the IPSL and CNRM simulations are (or are being made) available on DODS servers
  - IPSL: http://mc2.ipsl.jussieu.fr
  - CNRM: http://www.cnrm.meteo.fr/dods/dodscm2.html

- Data from FUB, DMI and MPI are or will soon be available at the central ENSEMBLES data-base at DKRZ in Hamburg. The data from NERSC will be available here when the simulations have been accomplished.

HadGEM1 data dissemination

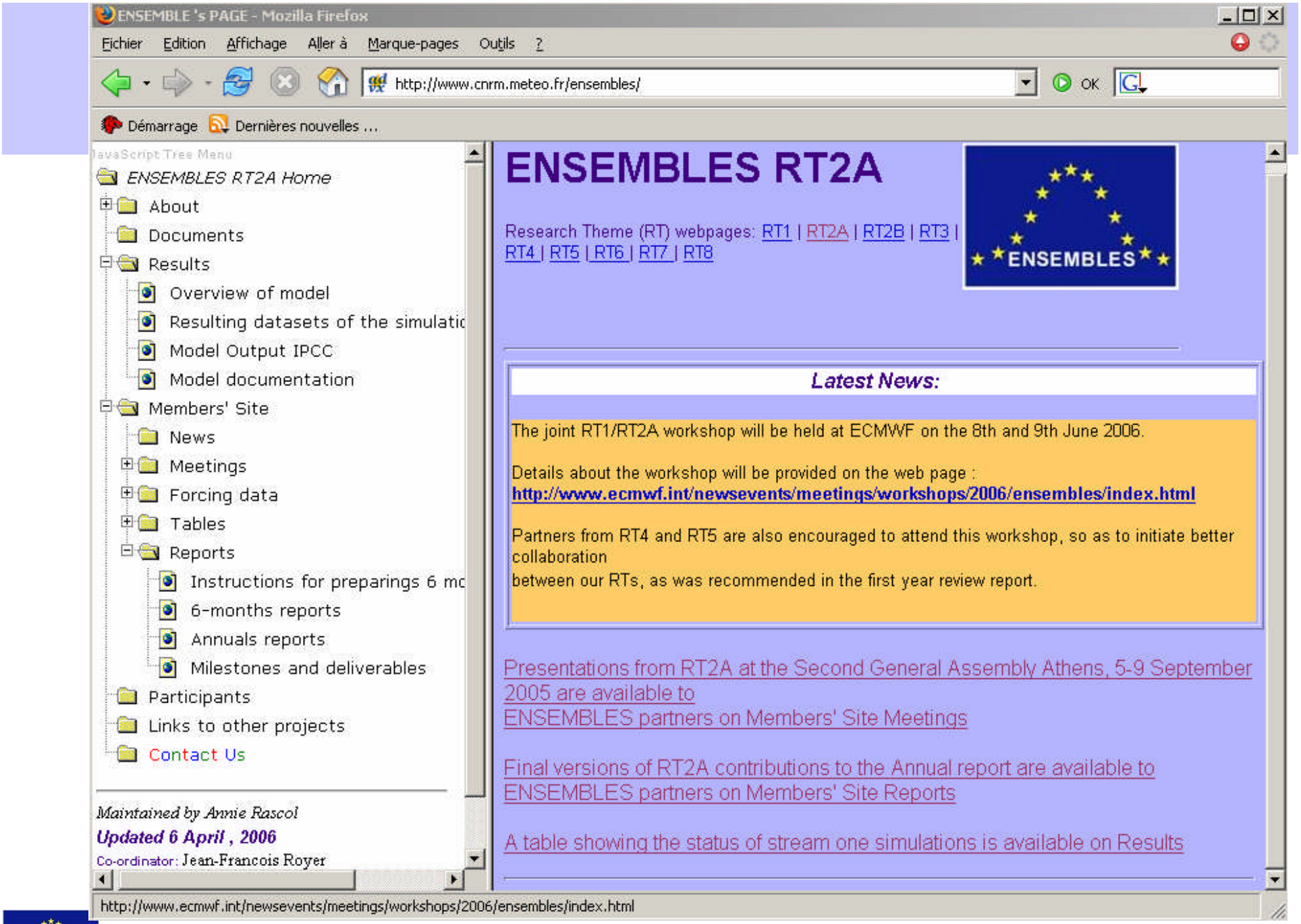
- HadGEM1 Stream 1 runs are being extracted to BADC http://badc.nerc.ac.uk/data/
  - ~11 Tbytes extracted so far in total (in native format)
  - Current extraction rate from internal archive is ~50 Gbytes/day (less than ideal, something of a bottleneck)
- We hope to extract most/all data from Control, 1% CMIP, Historical anthro-only, Historical all forcings, A1B, A2 by September, but only from single runs (not all ensemble runs).
- Processing, quality control and conversion to netCDF is work in progress – a potential bottleneck.
- The subset requested will be released to ENSEMBLES users for discovery and download via BADC.
- Any variables extracted and converted at BADC may be available, ie. more than the ENSEMBLES list in principle.
- Onward staging to DKRZ-CERA will be done later according to the data/metadata protocol agreed.

WP2A.0 : RT2A Coordination activities

Leaders: CNRM (JF Royer), MPIMET (E Roeckner)

Participants (PI): CERFACS (P Rogel), DMI (E Kaas), ECMWF (F Doblas-Reyes), FUB (U Cubasch):

- **Objectives**
  - to provide coordination of the hindcast and scenario production within RT2A
    - **provision of progress reports**
    - **organization of a meetings and yearly workshops**
    - **Management of a web site for the RT, to hold and update relevant information**


ENSEMBLE 's PAGE - Mozilla Firefox
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http://www.cnrm.meteo.fr/ensembles/
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Model Output IPCC
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Members' Site
News
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6-months reports
Annuals reports
Milestones and deliverables
Participants
Links to other projects
Contact Us
Maintained by Annie Rascol
Updated 6 April , 2006
Co-ordinator: Jean-Francois Royer
ENSEMBLES RT2A
Research Theme (RT) webpages: RT1 | RT2A | RT2B | RT3 | RT4 | RT5 | RT6 | RT7 | RT8
ENSEMBLES
Latest News:
The joint RT1/RT2A workshop will be held at ECMWF on the 8th and 9th June 2006.
Details about the workshop will be provided on the web page :
http://www.ecmwf.int/newsevents/meetings/workshops/2006/ensembles/index.html
Partners from RT4 and RT5 are also encouraged to attend this workshop, so as to initiate better collaboration
between our RTs, as was recommended in the first year review report.
Presentations from RT2A at the Second General Assembly Athens, 5-9 September 2005 are available to
ENSEMBLES partners on Members' Site Meetings
Final versions of RT2A contributions to the Annual report are available to
ENSEMBLES partners on Members' Site Reports
A table showing the status of stream one simulations is available on Results
http://www.ecmwf.int/newsevents/meetings/workshops/2006/ensembles/index.html

Publications

Hadley Centre

- Martin et al., 2006: The physical properties of the atmosphere in the new Hadley Centre Global Environmental Model, HadGEM1. Part 1: Model description and global climatology. *J Climate, **19**, 1274-130*
- Ringer et al., 2006: The physical properties of the atmosphere in the new Hadley Centre Global Environmental Model, HadGEM1. Part 2: Aspects of variability and regional climate. *J Climate, **19**, 1302-1326*
- Johns et al., 2006: The new Hadley Centre climate model HadGEM1: Evaluation of coupled simulations. *J Climate, **19**, 1327-1353*
- Stott et al., 2006: Transient climate simulations with the HadGEM1 climate model: causes of past warming and future climate change. *J Climate, **19**, 2763-2782*
- McLaren et al., 2005 (submitted): Evaluation of the sea ice simulation in a new coupled atmosphere-ocean climate model. *under review by Journal of Geophysical Research (Oceans)*

CNRM

- Chauvin F., S. Denvil and J. Caesar: Extreme indices in French IPCC scenarios. *Global and Planetary Change (submitted).*
- Salas y Mélia D., F. Chauvin, M. Déqué, H. Douville, J.F. Guérémy, P. Marquet, S. Planton, J.F. Royer, S. Tyteca (2006) : Description and validation of CNRM-CM3 global coupled climate model, Note de Centre du GMGEC N°103, décembre 2005. *Submitted to Climate Dynamics*
- Douville H, D Salas-Mélia, S. Tyteca (2006) : On the tropical origin of uncertainties in the global land precipitation response to global warming.*Climate Dyn. 26(4):367-385 (DOI 10.1007/s00282-005-0088*

Publications

MPI

- Bengtsson, L., K.I. Hodges, E. Roeckner, and R. Brokopf, 2006: On the natural variability of the pre-industrial European climate. *Climate Dynamics (submitted)*
- Bengtsson, L., K. I. Hodges, and E. Roeckner, 2006: Storm tracks and climate change. *J. Climate (in press)*
- Brasseur, G.P., and E. Roeckner, 2005: Impact of improved air quality on the future evolution of climate. *Geophys. Res. Lett., Vol. 32, L23704, doi:10.1029/2005GL023902*.
- Müller, W.A., and E. Roeckner, 2006: ENSO impact on mid-latitude circulation patterns in future climate change projections. *Geophys. Res. Lett., 33, L05711, doi:10.1029/2005GL025032*
- Roeckner, E., P. Stier, J. Feichter, S. Kloster, M. Esch, and I. Fischer-Bruns, 2006: Impact of carbonaceous aerosol emissions on regional climate change. *Climate Dynamics, doi:10.1007/s00382-006-0147-3*

UCL-ASTR

- Arzel, O., T. Fichefet, and H. Goosse, 2006: Sea ice evolution over the 20th and 21st centuries as simulated by current AOGCMs. *Ocean Modelling, 12, 412-427.*

OTHERS

Please send references of your publications (with abstracts and pdf) for inclusion on the RT2A website

Summary of months 13-30 deliverables

- **D2A.0.2**: Workshop presentations on the RT2A website (m 23)
- **D2A.1.1**: Several years of ocean analyses to be used as initial conditions for the seasonal-to-decadal hindcast production (m 18)
- **D2A.1.2: Design of decadal hindcast initialisation (m 30)**
- **D2A.2.1**: Simulations based on existing atmospheric and coupled ocean-atmosphere-sea ice models over the past 100 years (mean climate, interannual variability, and trends) (m 18)
- **D2A.2.2: Report/manuscript describing estimates of the radiative forcing used in the different stream one simulations (m 30)**
- **D2A.3.1**: First set of scenarios experiments for the prediction of future climate, using existing coupled ocean-atmosphere climate models (m 18)
- **D2A.3.2: Integrative statistical analysis of the 1st set of simulations for the prediction of future climate (m 24)**
- **D2A4.4: Preliminary version of the ENSEMBLES view into the WDCC archive (m 30)**
- **D2A4.3: Preliminary version of the ECMWF public data server for dissemination of seasonal-to-decadal simulations (m 30)**

We need to start preparation of Year 2 annual reports including months 24-42 DIP

Major milestones over full project duration

- **Provision of a first stream of updated climate simulations**
  - *Expected deliverable:* Results of the climate predictions, simulations and scenarios from the different modelling centers (month 24).
- **Provision of a second stream of updated climate simulations**
  - *Expected deliverables:* Results of the new multi-model multi-ensemble climate simulations archived in database at ECMWF and MPI-MD (month 48).
- **Dissemination of model results**
  - *Expected deliverables:* Selected results of the multi-model multi-ensemble climate simulations archived in a database at ECMWF and MPI-MD (month 60)

Questions to be raised for Stream 2 simulations

- What Models will be used for new simulations?
  - resolution?
  - What earth system components?
- What ensembles size will the partners be able to produce?
  - Number of simulations
  - Methods used to generate the ensembles
- Choice of the historical simulations?
  - What new forcings to take into account?
  - Choice of initial states
- Choice of the future scenarios?
  - IPCC scenarios: which one(s)?
  - RT7 European scenario
  - New forcings?
- What to store from ensemble scenarios?