Welcome!

ESSENCE meeting, 01.12.2006
Meeting overview

Management (Henk/Wilco, 14.05-14.15)

- Data analysis and visualization projects
- PR policy

Status (Andreas, 14.15-14.35)

- Runs
- Data processing and tools

First results standard runs (Andreas et al., 14.35-14.45)

Break (14.45-15.00)

Project overview (5 min per project, 15.00-15.55)

Planning (Henk/Wilco, 15.55-16.00)
Projects

DEISA

ESSENCE (170,000 CPU h, NEC-SX8)

Visualization tools for the ESSENCE project (NCF)

SG-06-267: 10,000 CPU h ASTER

CAVE-06-023: 320 uur visualization ondersteuning

NRG-2006.06: E 15,000 data analysis ondersteuning

Enlighten Your Research (with SARA, submitted to SURF)
Tiled Panel Display

Useful for ‘discovery’

Visualization meetings 12-12 at SARA (input before 5/12 to Andreas)
PR policy

Publication

Overview paper (Sterl et. al., 2007)
Manuscript OK
Nature/Science papers with project leaders
Acknowledgement

Press

CKO (KNMI/IMAU) project
Harry Geurts

Presentation

SARA/NCF (May 2007)

Data sharing

Within ‘approved’ project with NL first author
ESSENCE - tussenstand

- voortgang integraties
- toegang /organisatie / bewerking data
- visualisatie SARA
- projecten en eerste resultaten (bijdrage van iedereen)

http://www.knmi.nl/~sterl/Esience
Voortgang integraties

<table>
<thead>
<tr>
<th>run no.</th>
<th>experiment</th>
<th>PI</th>
<th>state</th>
<th>postprocessing</th>
</tr>
</thead>
<tbody>
<tr>
<td>001-020</td>
<td>standard; constant forcing</td>
<td>-</td>
<td>stopped</td>
<td>completed</td>
</tr>
<tr>
<td>021-038</td>
<td>standard; SRES A1b</td>
<td>-</td>
<td>completed</td>
<td>completed</td>
</tr>
<tr>
<td>037</td>
<td>standard; SRES A1b; extra output</td>
<td>-</td>
<td>running</td>
<td></td>
</tr>
<tr>
<td>041-045</td>
<td>HOSING 1</td>
<td>Drijfhout</td>
<td>completed</td>
<td>completed</td>
</tr>
<tr>
<td>046-050</td>
<td>HOSING 2</td>
<td>Drijfhout</td>
<td>running</td>
<td>running</td>
</tr>
<tr>
<td>051-055</td>
<td>SOIL</td>
<td>v/d Huij</td>
<td>running</td>
<td>running</td>
</tr>
<tr>
<td>101-220</td>
<td>HEAT</td>
<td>Vossepoel</td>
<td>running</td>
<td>completed</td>
</tr>
</tbody>
</table>
Vertragingen door bottleneck postproces.  
project einde: 1 januari 2007  
HOSING 2: op schema (voor kerst klaar)  
runo37: op schema (dit jaar klaar)  
SOIL:  
gestart op 30 november  
150 jaar = minimaal 25 dagen  
=> wordt krap  
5 x 100 jaar: nog ruimte
DATA

<table>
<thead>
<tr>
<th>File Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oce</td>
<td>monthly means of ocean fields (2D and 3D)</td>
</tr>
<tr>
<td>2D 3hrl</td>
<td>2D surface fields with a resolution of 3 hours</td>
</tr>
<tr>
<td>2D daymean</td>
<td>daily means of 2D surface fields</td>
</tr>
<tr>
<td>2D monmean</td>
<td>monthly means of 2D surface fields (from 8-hourly output)</td>
</tr>
<tr>
<td>2D monmean 3h</td>
<td>monthly means of 2D surface fields (from 3-hourly output)</td>
</tr>
<tr>
<td>3D daymean</td>
<td>daily means of 3D fields (model levels)</td>
</tr>
<tr>
<td>3D daymean 500</td>
<td>daily means of selected quantities at 500 hPa height</td>
</tr>
<tr>
<td>3D daymean gh</td>
<td>daily means of geopotential at selected heights</td>
</tr>
<tr>
<td>3D monmean</td>
<td>monthly means of 3D fields (model levels)</td>
</tr>
<tr>
<td>ATM</td>
<td>monthly means of 3D fields on pressure levels</td>
</tr>
<tr>
<td>strimau</td>
<td>monthly means of several cloud-related variables</td>
</tr>
<tr>
<td>ZO ozone</td>
<td>monthly zonal means of Ozone</td>
</tr>
</tbody>
</table>

An example of a complete file name is

```
/home/sterl/DATA/run005/oce/THO_005_1950-1970.nc
```
Bewerking data

op SARA: alleen eenvoudig (budget)
Datatransfer vs. rekentijd
cdo pakket: /home/essence/bin/cdo
(http://www.mpimet.mpg.de/fileadmin/software/cdo)
ATM: regular grid (192 x 96)
OCE: curvilinear => interpolation
vektor: eerst draaien, dan interpoleren
Visualisatie SARA

12 december ‘s middags
TPD: effectief een groot scherm
vele plaatjes naast/onder elkaar
(20 x 40)
scroll- en zoombaar
=> snel overblik over alle runs/lagen of
meerdere grootheden naast elkaar
tot nu 2 voorstellen
trend

t_surf

TREND*24*30*12
trend-trend_ave, t_surf
Extreme:

Extreme weather events and their change in a changing climate
Questions:

1. What are the 100 year and 1,000-year return values, respectively, of these quantities?
2. How do these values compare to values estimated form available observations?
3. How do the extreme values change in a future climate?
4. Is there a “second population” in the extremes of these quantities that only shows up in a large data set?
Goal: investigate effect variations in strength of THC on ENSO: period, amplitude, pattern

- mean state of equatorial Pacific
- seasonal cycle
- couplings/feedbacks

Essence data:

- ocean temperature (T, thermocline depth)
- surface wind stress
- SLP
- vertical velocity (MOC)
Project group members:

Lianke te Raa (project leader), Geert Jan van Oldenborgh, Sjoukje Philip, Henk Dijkstra, possibly collaboration with MPI (Johann Jungclaus) and/or Axel Timmermann

Time schedule (??):

Dec- Feb: data transfer, first analysis
Mar- May: discussion first results
June- August: further analysis, draft paper
Sept: submission paper
Storm track changes

Rein Haarsma, Frank Selten, Henk vd Brink

- **Position:**
  - Poleward shift? Related to changes in NAO?
  - Impact for the Netherlands: Change in dominant wind direction? Change in windspeed?

- **Intensity:**
  - How do the PDF changes?
  - Change in frequency of intense storms?
Data and time schedule

Data

Daily mean data: surface wind, slp, rain, u500, v500

Monthly mean data: slp, gh500

Time schedule

Start analyzes: January 2007

Main results: Medio 2007

Publication: Before end 2007
How to ‘measure’ land-atmosphere coupling?

- Compare two multi-year simulations:
  - One normal (‘coupled’) simulation
  - One ‘uncoupled’ simulation with fixed land cond’s

- See what is the effect on variability of $T, P$
Contribution of land-atmosphere coupling

- Change in interannual variability

*Seneviratne et al., 2006*
Plans in ESSENCE (2 exps)

- **CLIMSOIL**
  - prescribe ensemble mean (‘climatological’) daily soil/snow fields to measure the impact of soil moisture anomalies on meteorol.anomalies.
  - **Q:** Can long blocking events in Europe occur when the soil is not excessively drying? *(exp is running now)*

- **GLACE- FUT**
  - repeat Sonia’s ensemble experiment for a full GCM with 6 members, each using the soil/snow field from one reference member.
  - **Q:** are areas with strong land-atm feedback indeed shifting when climate is changing, also when also all degrees of freedom in the atm.circulation are maintained *(in contrast to Sonia’s RCM exp.)*?
Michiel v/d Broeke

ESSENCE and the polar regions

1) Changes in sea ice cover

2) Changes in ice sheet mass balance

UCU student bachelor research:
5 weeks in period January-May 2007
Sea Ice

General
How is recent sea ice decrease represented how are air/sea temperature increase and sea ice decrease related, what is the role of atmospheric circulation (SAO/SAM) in the various scenario’s?

NH
How well is recent sea ice decrease represented?
If OK: timing of ice free summers in Arctic basin with upper/lower limit estimates based on scenario’s.

SH
How well is sea ice cover represented?
If OK: threshold for decrease setting in with upper/lower limit estimates based on scenario’s
Ice sheet mass balance

General
How does the climate change over the large ice sheets of Greenland and Antarctica?

Greenland
Due to its limited size and narrow ablation zone, Greenland is probably not well represented in the model. It will be hard to say something about increased melting.

Antarctica
Should be better. Increased accumulation increases mass balance? When does increased melt overtake increased snowfall in the various scenario’s?
ESSENCE: HEAT EXPERIMENT
Femke C. Vossepoel & Peter Jan van Leeuwen

Methodology
- 120 ensemble members
- period 2000-2005, starting from initial conditions STANDARD ensemble member
- vary heat-transfer coefficient over ocean (c=0.75-1.5, “uniform distribution”) and compute 120 mean SSH fields
- assimilate SSH (altimetric and in situ) fields

Objectives
- assess sensitivity of ocean circulation to heat exchange
- obtain an estimate of spatial variations in heat transfer coefficient
- eventually improve formulation of coupling
Status, plans and open question

**Status**

- 120 simulations have been performed
- ensemble variance largest in Southern Ocean
- observations ready for assimilation

**Plans**

- assimilate Rio (05) mean dynamic topography based on altimetry and GRACE geoid
- apply local weighting
- evaluate resulting

**Open question**

- To what extent does model agree with the data (bias problem)?

RMS SSH HEAT ensemble (cm)
Changes in skewness of Arctic Oscillation

- Probability density function of Arctic Oscillation is skewed
- Indications: this skewness is sensitive to change
- Does it change with global warming?
- Does it change smoothly with time or abruptly?
- Do we understand these changes?
- What are the implications of this for regional climates?
Changes in skewness of Arctic Oscillation
Changes in skewness of Arctic Oscillation

- Daily data of streamfunction at 200/500/800 hPa, temperature, precipitation, SLP in winter
Atlantic Hosing project (1)
W. Hazeleger, S.S. Drijfhout, H.A. Dijkstra, A. Sterl, B. vd Hurk, G. Lenderink?

Goal:
Assess impact of strong reduction of Atlantic Meridional Overturning Circulation on European climate under climate change

Motivation:
Strong reduction of AMOC has occurred before (8.2kyr) in Holocene with strong impact on Europe. Global warming may trigger collapse of AMOC through changes in the hydrological cycle. Impact on European climate and extremes needs to be addressed.

How:
* ECHAM5/OM1 with strong fresh water flux in the North Atlantic in an ensemble of 5 members from 2000 on (artificial spread of 1 Sv over a large part of the North Atlantic).
* Analyse response (AMOC, temperature, precipitation, circulation etc.) compared to standard ensemble.
* Possibly downscaling with RACMO to assess regional impact.
Done before by Jacob et al, but not with climate change (ie increasing GHG) and not in ensemble mode:

Drier and cooler climate over western Europe (more cold spells).
Collapsed Atlantic MOCs for hosing runs (years 90-100)
Atlantic Hosing project (2)
H.A. Dijkstra, S.S. Drijfhout, W. Hazeleger

Goal:
Assess response of AMOC to a realistic fresh water anomaly at different stages in the 21st century

Motivation:
Under global warming the AMOC reduces in strength. Under reduced MOC, a stronger reduction due to freshening may be more likely.

How:
* ECHAM5/OM1 with realistic strong fresh water flux in the North Atlantic (obtained from the control ensemble) starting in 2000, 2020, 2040, 2060 and 2080.

Status:
Ongoing, first runs finished
Maximum annual fresh water anomaly
Trend in fresh water flux over the Atlantic
Why is Europe warming faster than the climate models indicate?

Geert Jan, Aad, Andreas, …
“plan”

- Statistical analysis, apply VSM of van Ulden & van Oldenborgh to Europe: signal vs noise, circulation or other terms
- If not noise: physical analysis of the most important contributions. Usual suspects: aerosols, N-Atl SST, soil moisture, radiation
First indications: JJA

- Accidental or systematic?
- Extremes or mean?
Return values JJA De Bilt every 30 years 1950-2100