

# EC-Earth – the first coupled run

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- **EC-Earth**
  - consortium
  - configuration
  - purpose
- **1<sup>st</sup> coupled run**
  - some results

# EC-EARTH

European Earth System Model based on ECMWF Models (Seasonal Forecast System)

Consortium of several European Institutes

Open to any ECMWF member state institutes

International Projects:

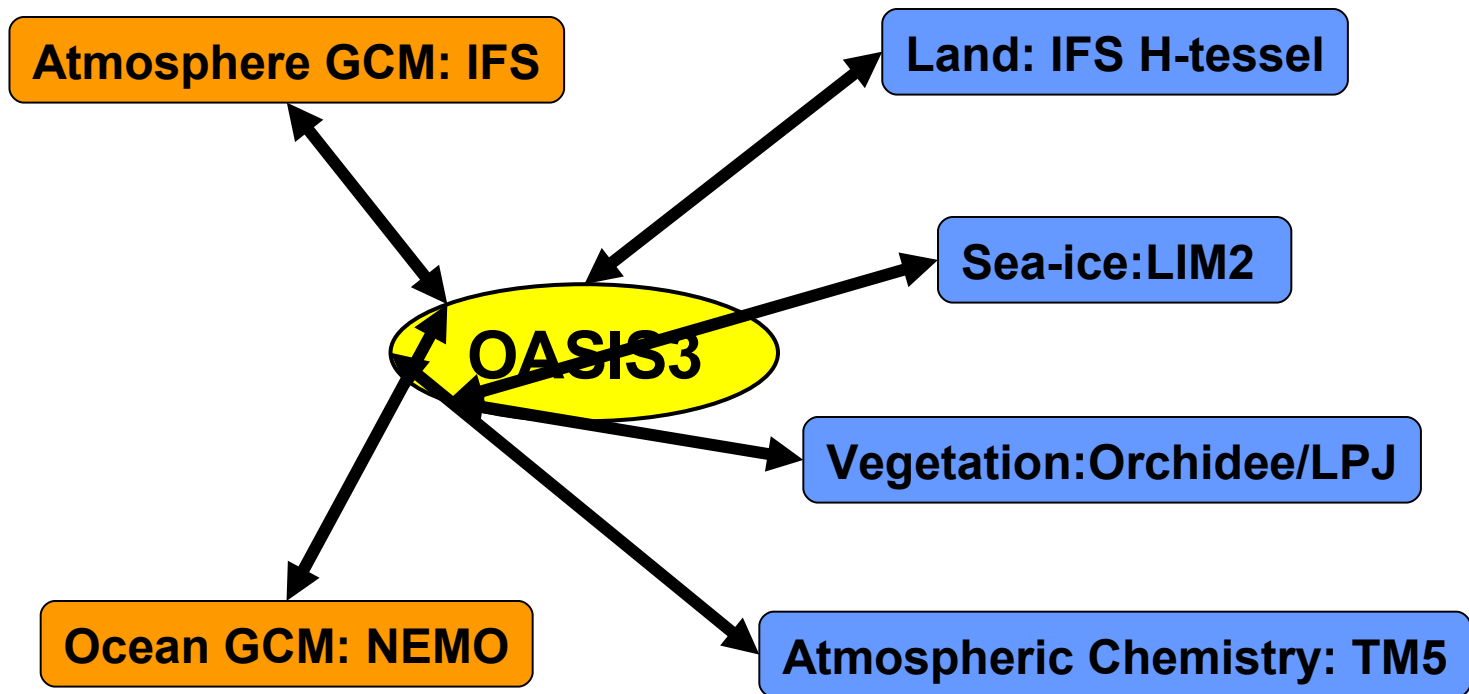
- EU-FP7 THOR
- EU-FP7 COMBINE (prop.)
- EU-FP7 IS-ENES (prop.)

DMI	Denmark
IMAU	The Netherlands
Instituto de Meteorologia	Portugal
Centro de Geofísica, University of Lisbon	Portugal
KNMI	The Netherlands
Meteorologisk Institutt	Norway
Unité ASTR	Belgium
Met Éireann	Ireland
University College Dublin	Ireland
Universiteit Utrecht	The Netherlands
Vrije Universiteit Amsterdam	The Netherlands
Meteorologiska Institutionen	Sweden
Lund University	Sweden
ICTP	Italy
SMHI	Sweden
INM	Spain
ETH	Switzerland
BSC	Spain

Observer                      ECMWF

Steering Group: W. Hazeleger (KNMI), C. Jones (SMHI), J. H. Christensen (DMI), R. McGrath (MetEireann), P. Bougeault (ECMWF, observer)

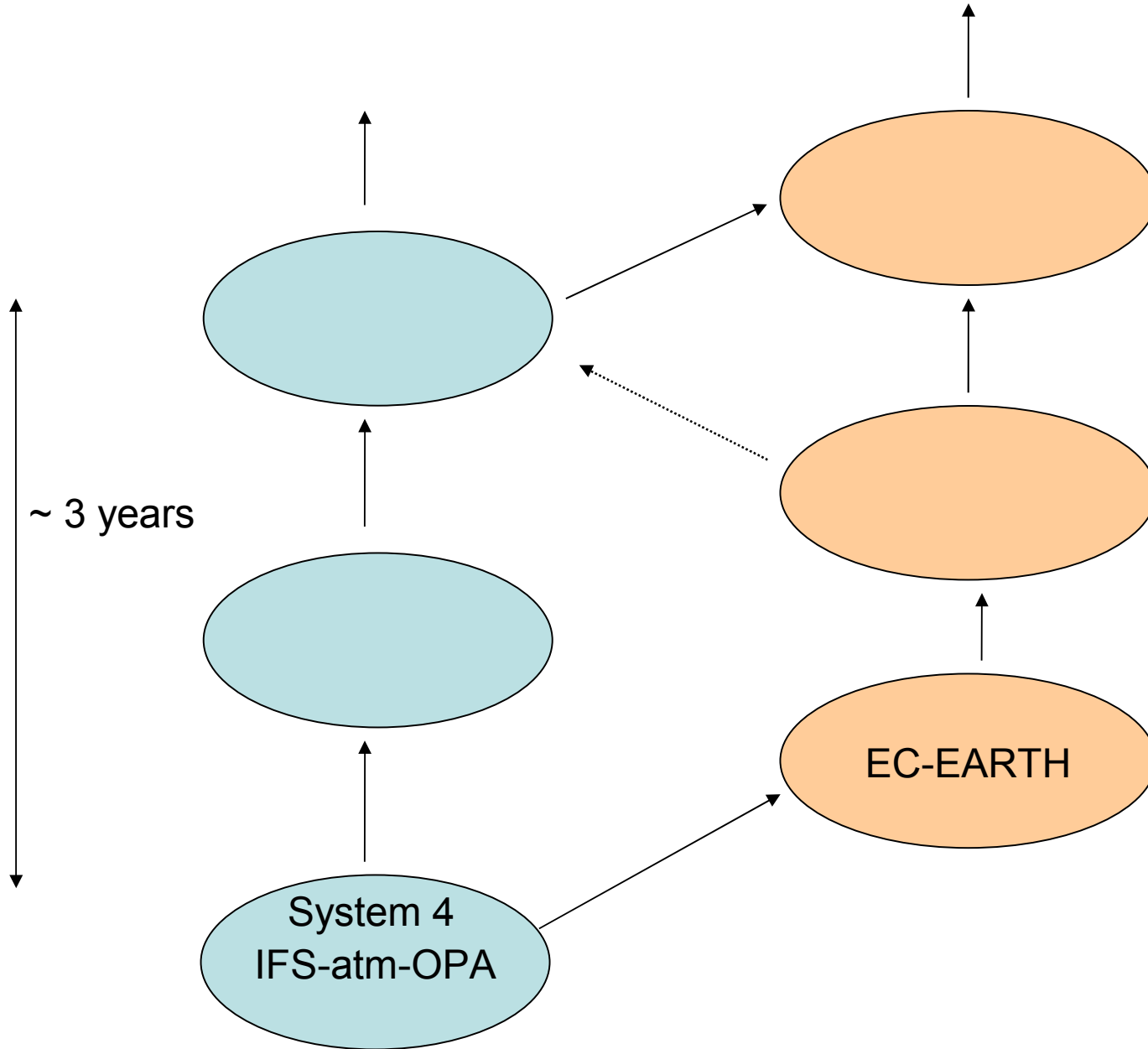
# EC-EARTH



IFS-NEMO-OASIS: ECMWF's Seasonal Forecast System

# Development EC-EARTH

In phase with ECMWF cycles of the Seasonal Forecast System



## Currently: NEMO2.0

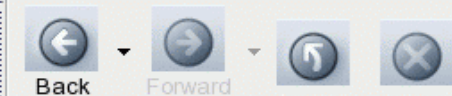
- ORCA2, 2 degrees
- IFS T95L62
- LIM2

## Standard: NEMO2.0

- ORCA1, 1 degree
- IFS T159L62
- LIM3

# Aspects of EC-Earth

- Seamless prediction strategy (weather to climate)
- High resolution
  - Large scale circulation patterns that affect local extremes: blocking, extreme storms
- Focus on hours-decadal predictions (for next IPCC)
- State-of-the-art Numerical Weather Prediction parameterisations
- Development new components: aerosols, atmospheric chemistry, land-hydrology, sea ice, ice caps, ...



# EC-EARTH

simulating the Earth's climate

Search  

June 11, 2008, at 08:47 AM EST

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# Current State

- IFS running stand-alone on non-ECMWF platforms
- Tuning underway
- Coupled to NEMO (ORCA2); 10 year run
- LIM3 (SMHI)
- Aerosols (ETH)
- ORCA1 (KNMI)
- ....

# Coupling (I)

- The land-sea masks in IFS and NEMO are not identical.
  - No conservation of fluxes
  - Change mask in IFS needs from a binary to fractional
- IFS didn't use fluxes per tile type (open ocean, sea-ice, various land surface types) in its coupling interface
- Fluxes must be conserved per tile type:  $\sum_i A_i f_i^t F_i^t$ 
  - $A_i$ : surface area of grid cell  $i$
  - $f_i^t$ : fraction of this grid cell covered by tile type  $t$
  - $F_i^t$ : Flux in this cell per file type  $t$
- In the polar regions the NEMO grid has a much higher resolution than IFS
  - Local  $T$  much different from  $T_{ave}$  used to calculate flux
  - Linear correction over sea-ice
  - Not flux conserving (additional global correction)

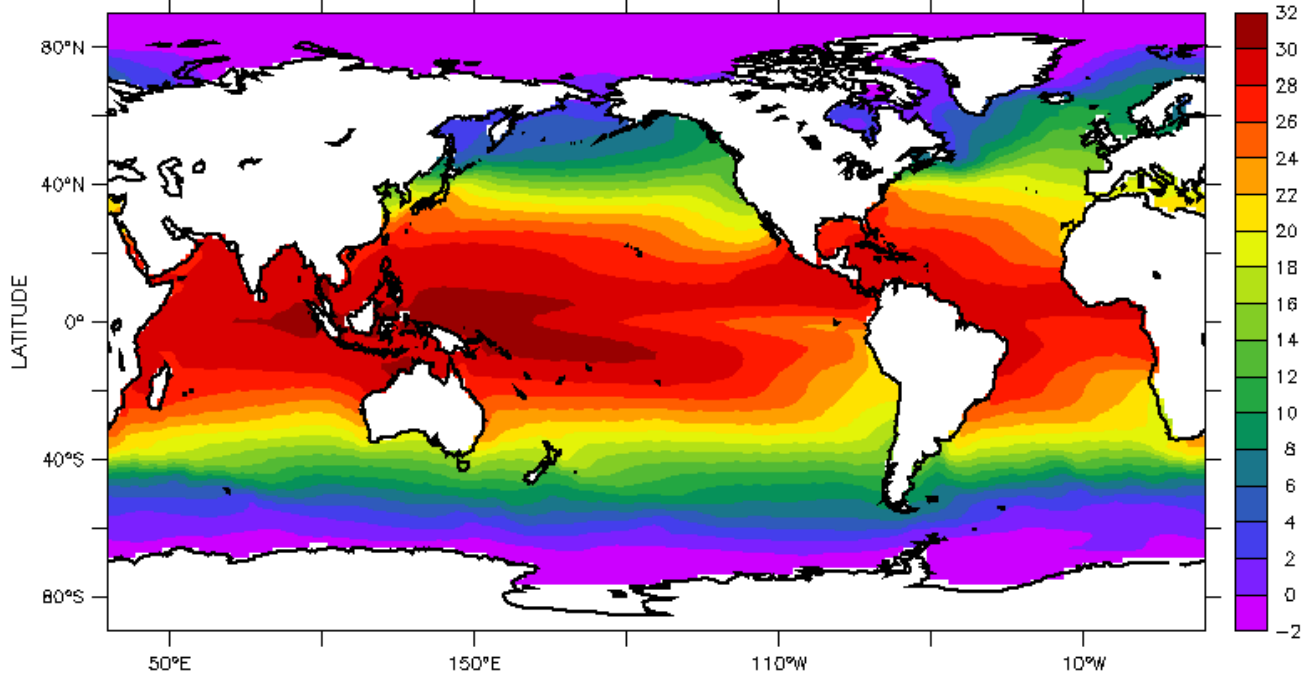
# Coupling (II)

- Restart files of forced NEMO runs miss sea-ice albedo
  - cannot be used to initialize coupled runs
  - Workaround: set albedo to a reasonable value
- In restart, LIM sets ice concentration to 0 ??????
- LIM wasn't able to read global restart files
- The SCRIP 1st order conservative regridding in OASIS3 has problem with the overlapping V points at the polar line of the tripolar C-grid used in ORCA1 / 2
- OASIS3 does not work correctly when more than one CPU is used in NEMO

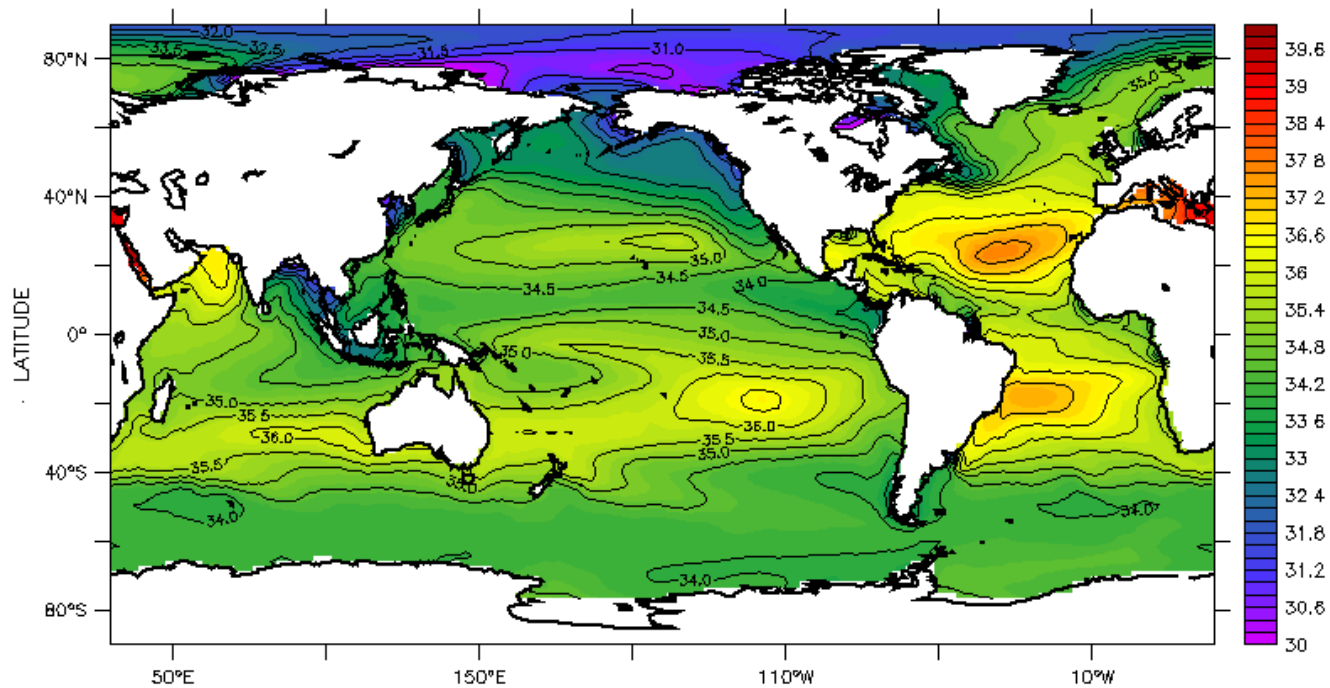
# The first coupled run

- ORCA2 / IFS T95L62
- 10 years
- About 5 days on KNMI's SGI machine
- Output file every 6 hours (!)
- Fluxes accumulated (digits in GRIB!)
- Stable
- No weird results

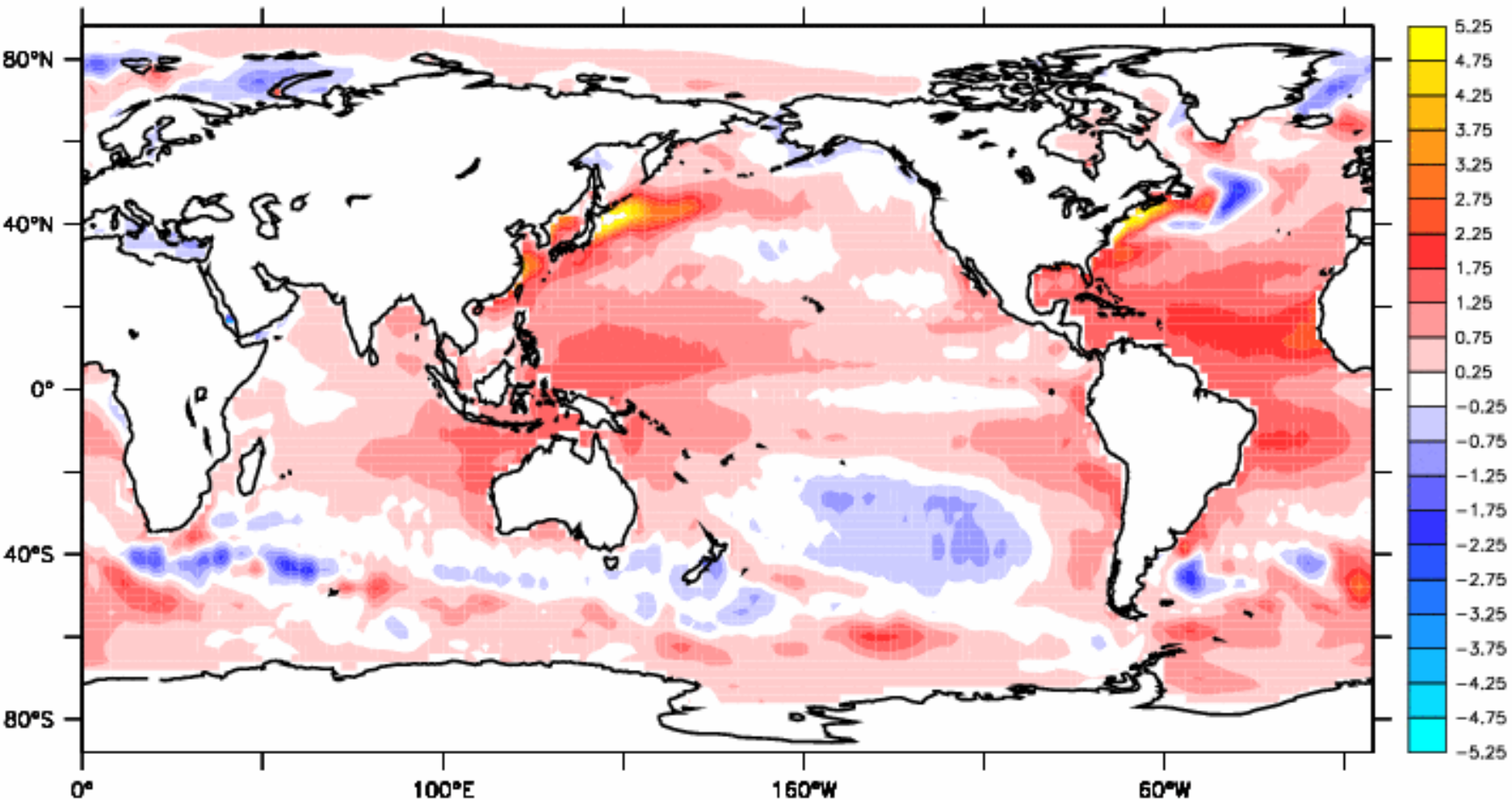
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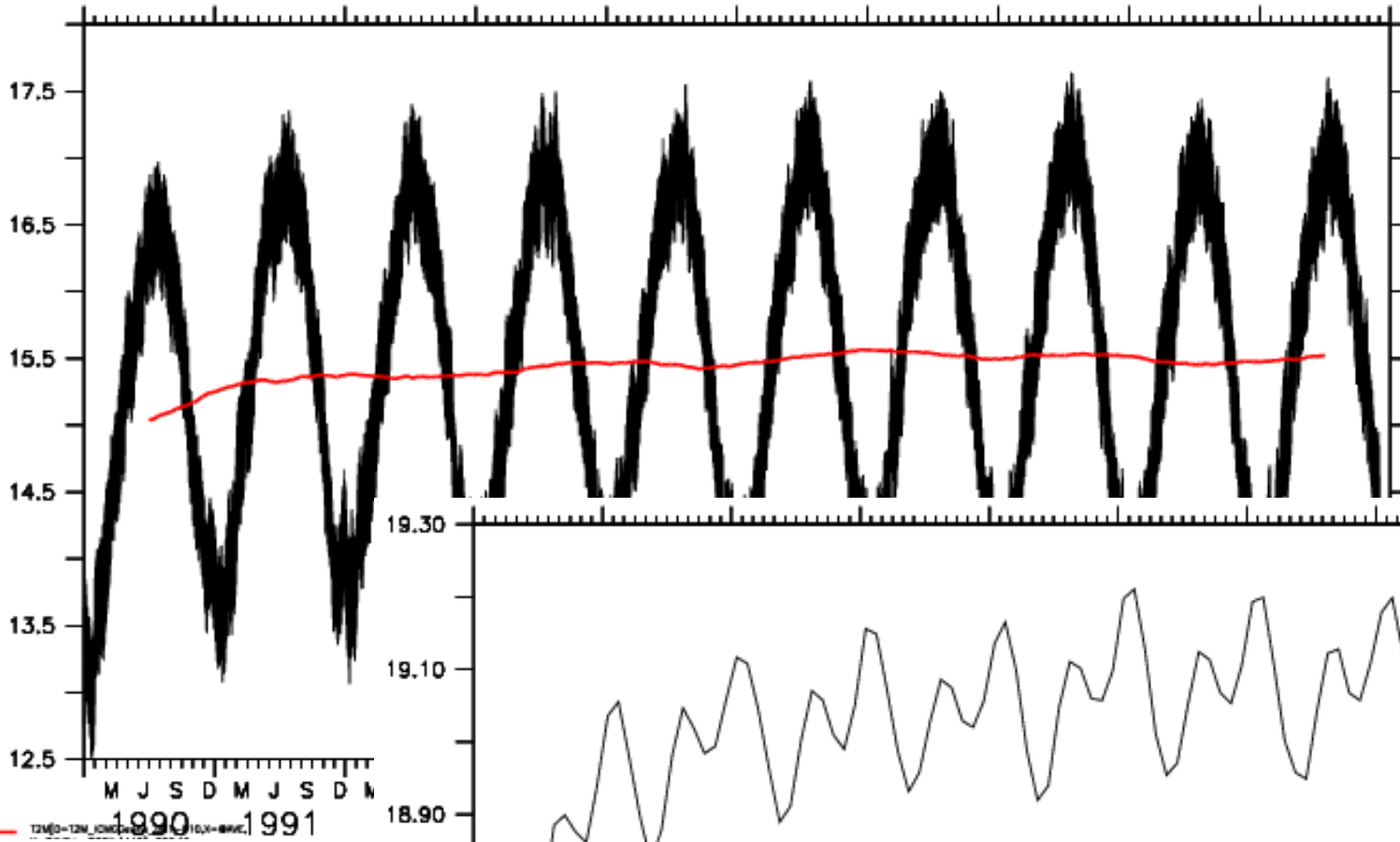


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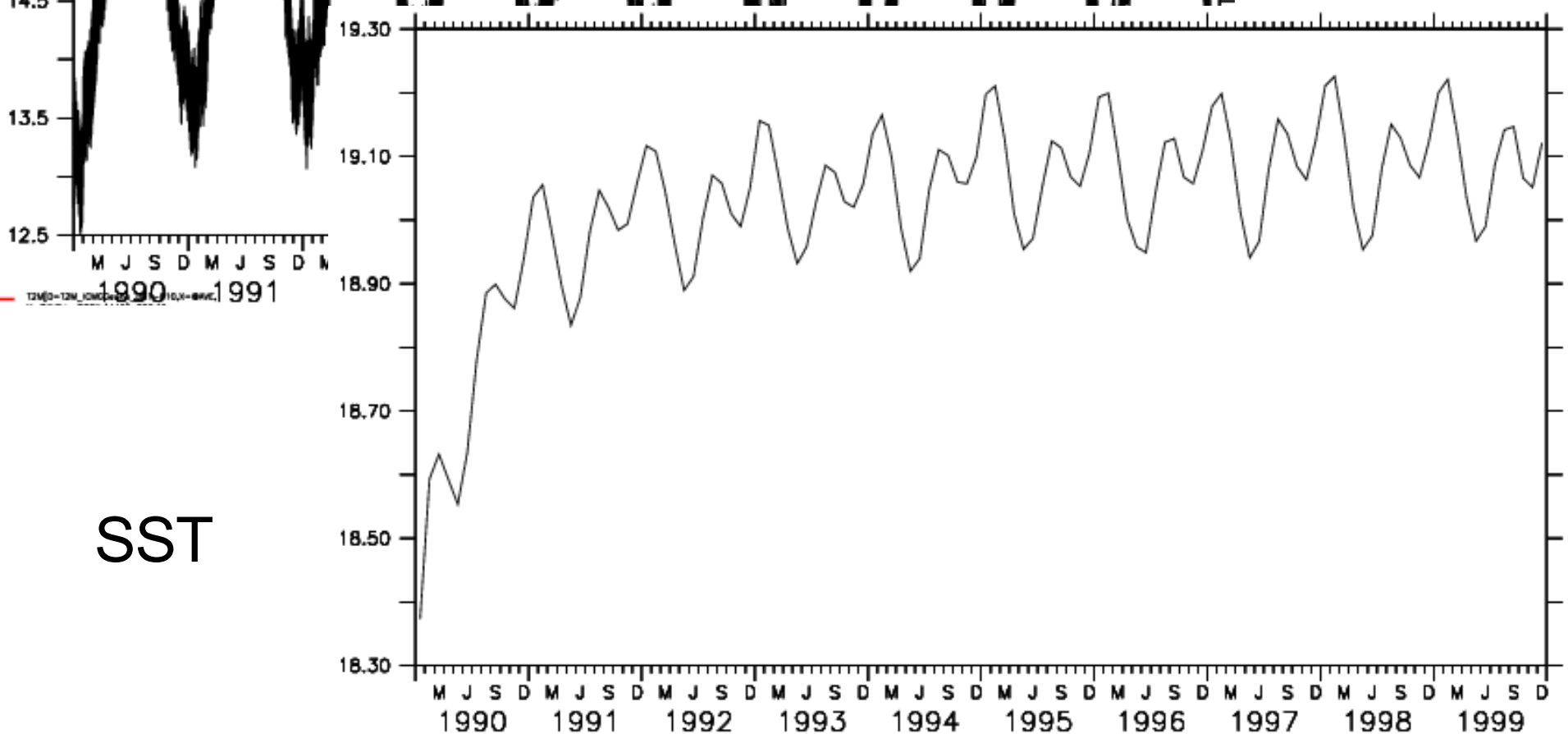


# SST difference EC-Earth-ERSST2



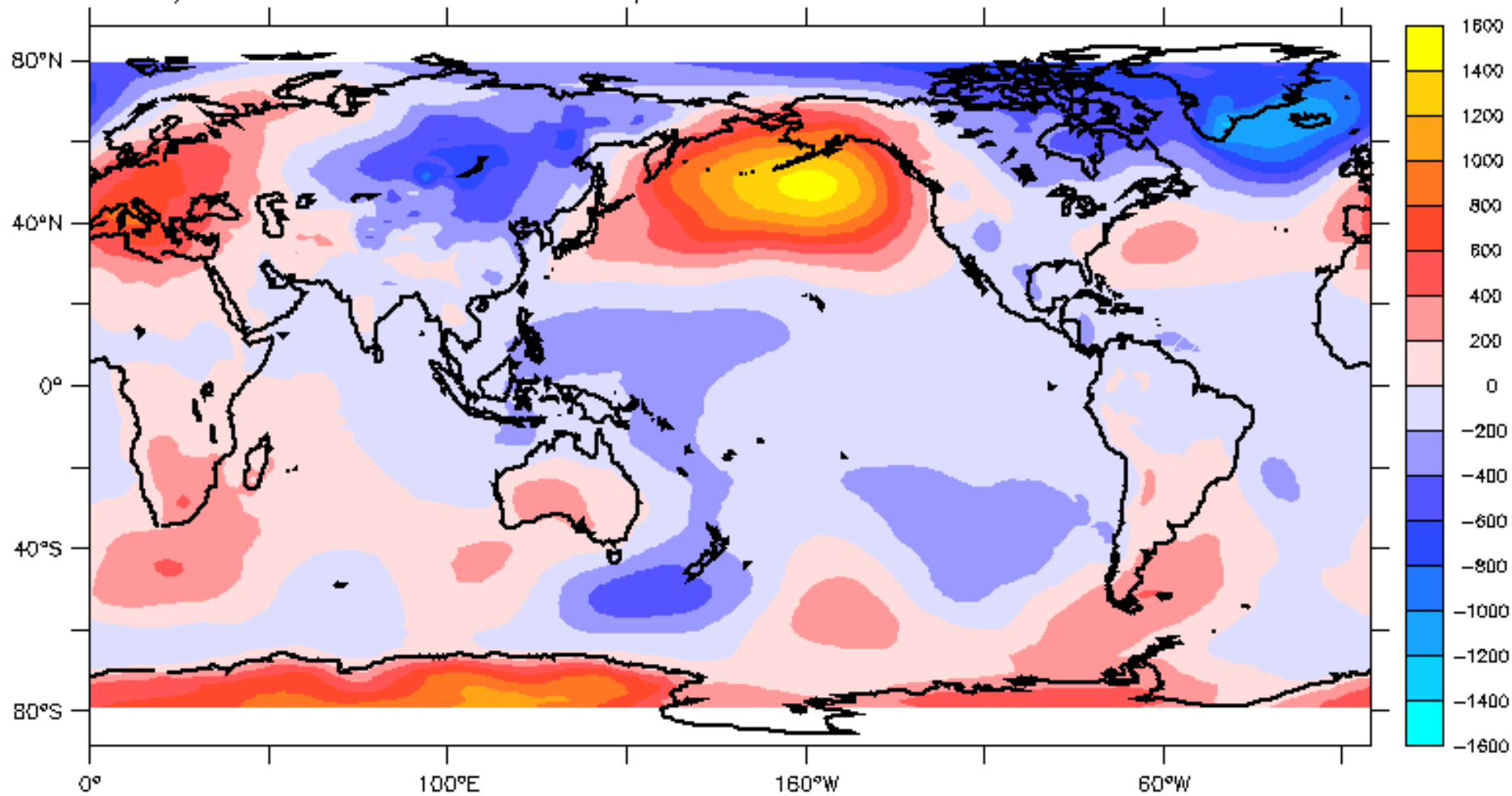


$T_{2m}$

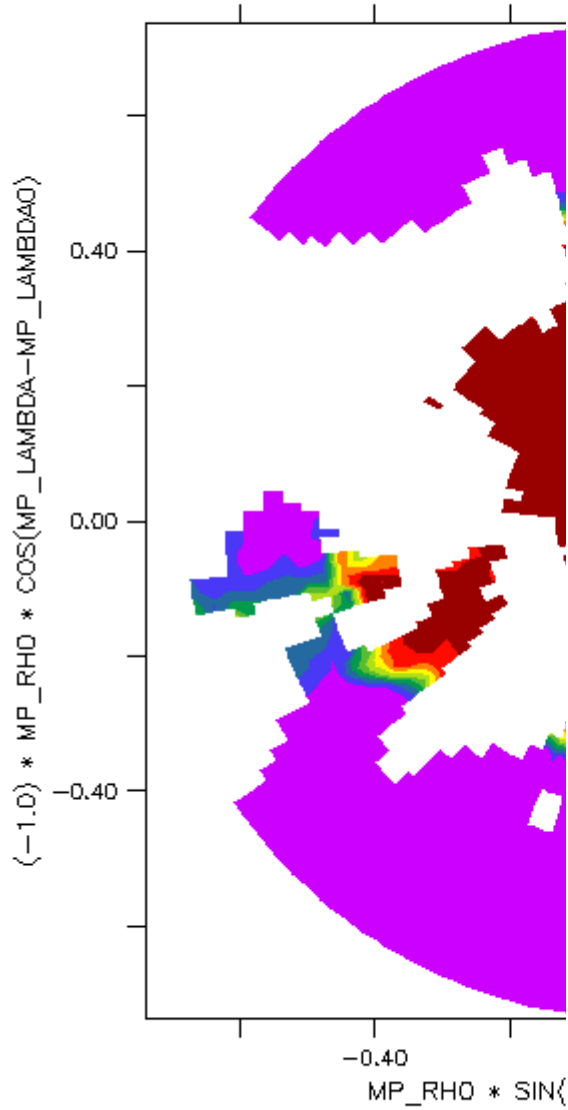


SST

# SLP, EC-Earth-ERA-40, Jan

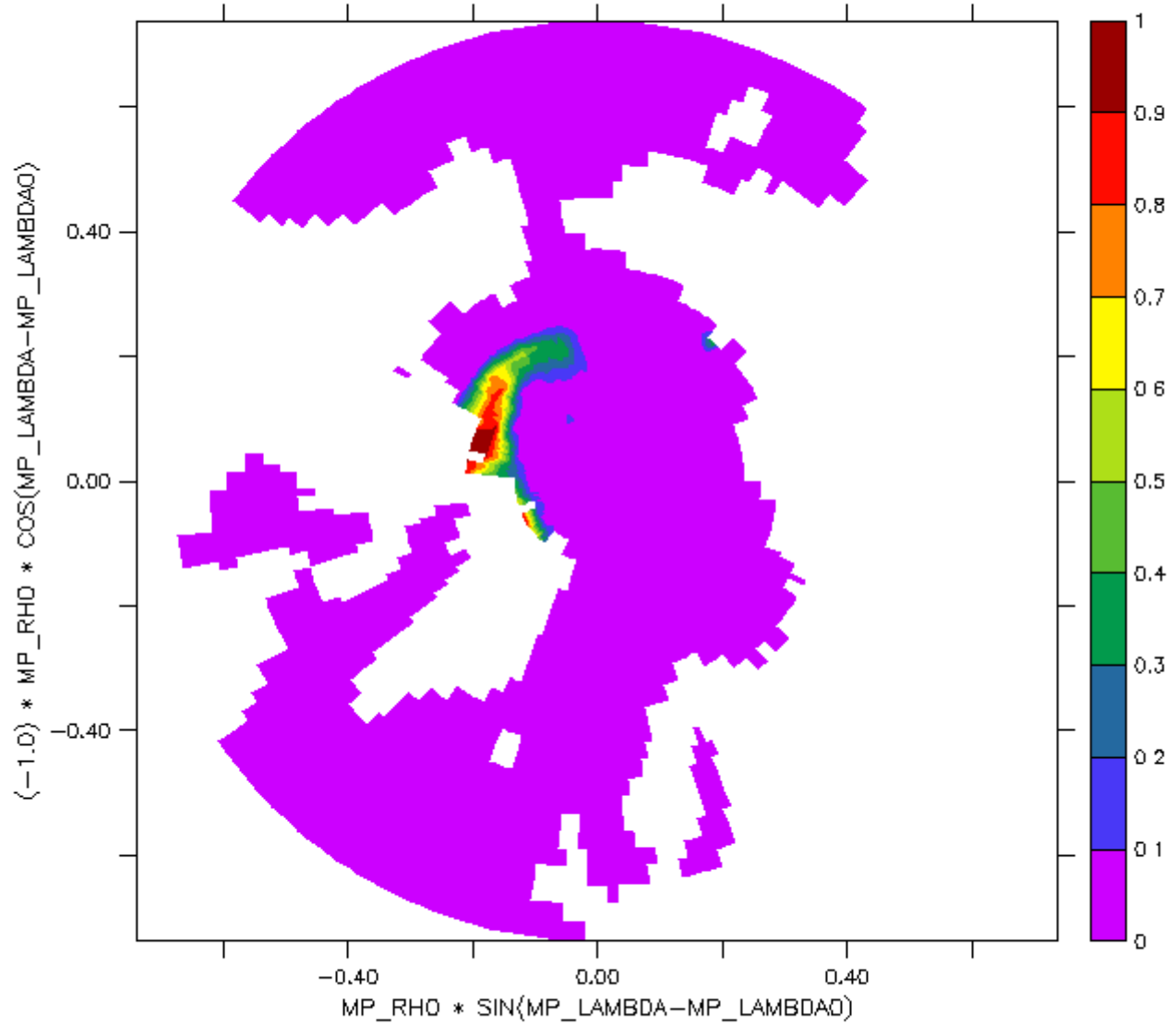


Z : 1  
TIME : 16-MAR-1999 00:00 360



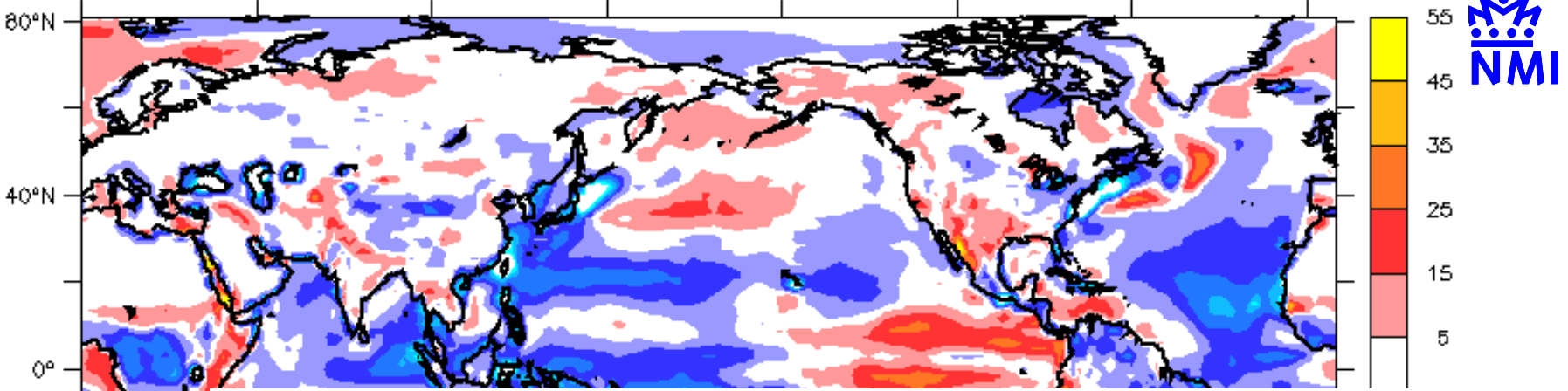
Ice C

Z : 1  
TIME : 16-AUG-1999 00:00 360\_DAY

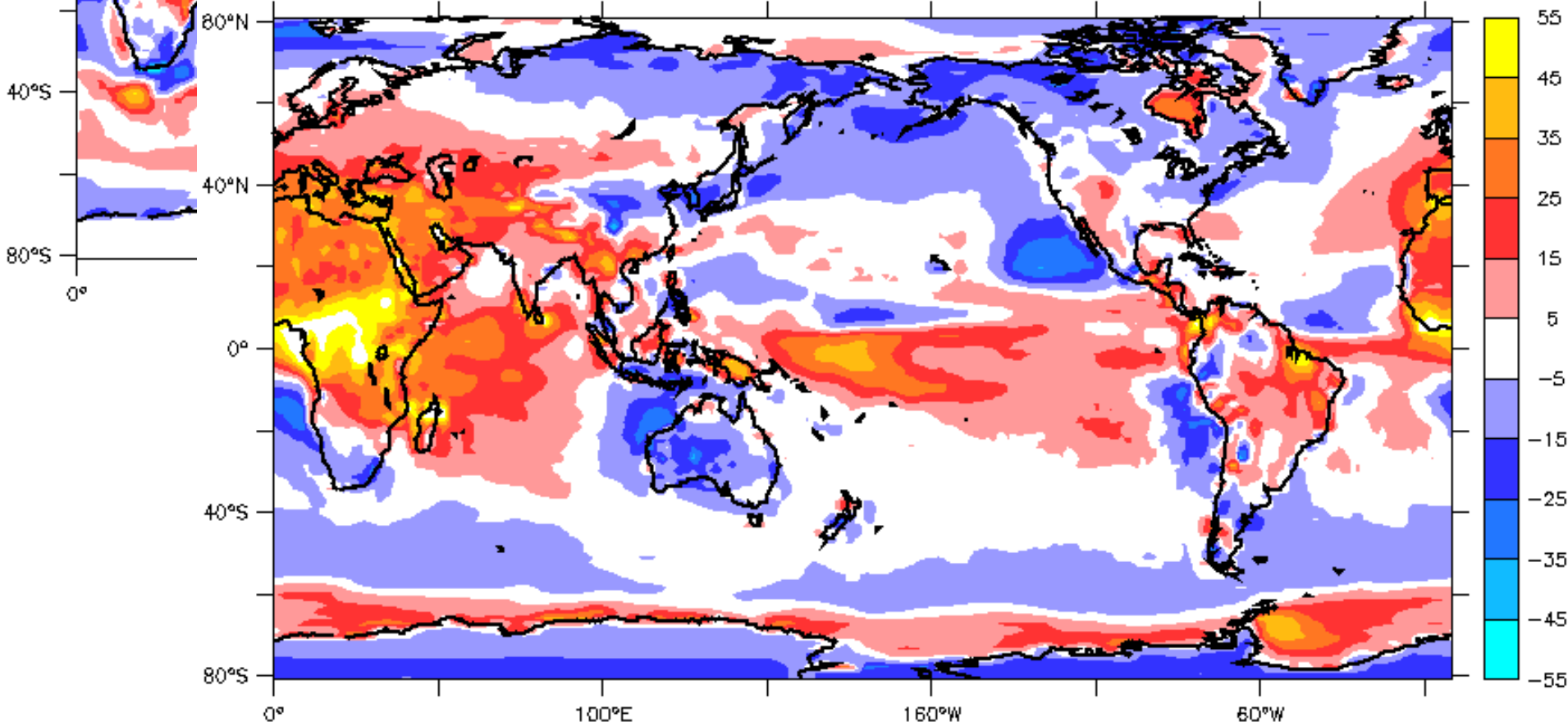


Ice Cover ([0,1])

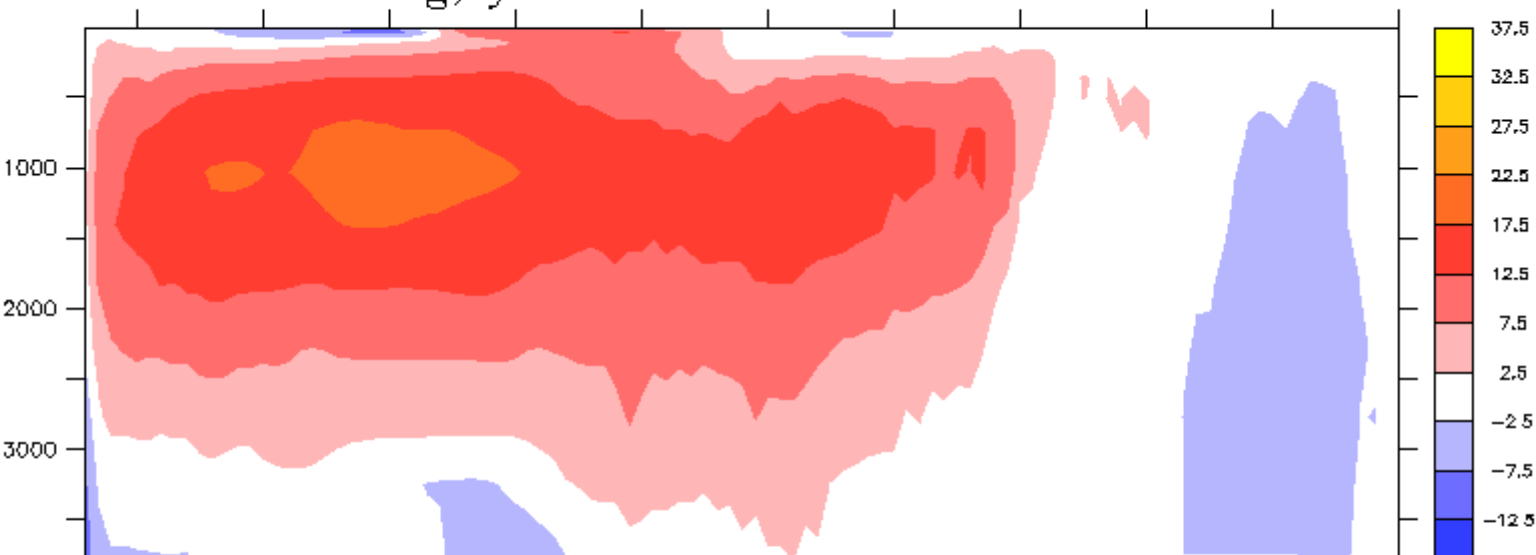
Qlat, EC-Earth=ERA-40, annual



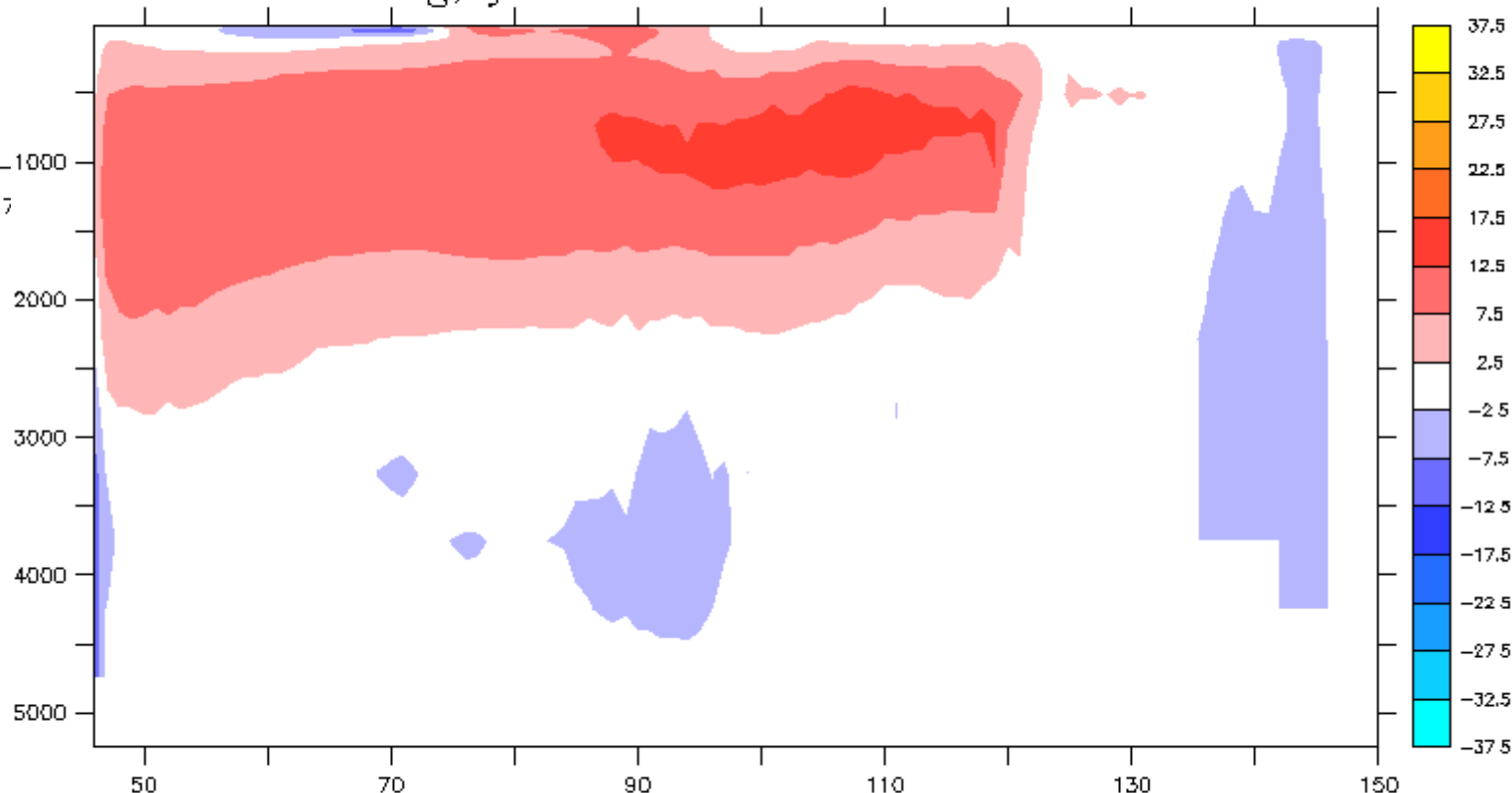
Qsw, EC-Earth-ERA-40, annual



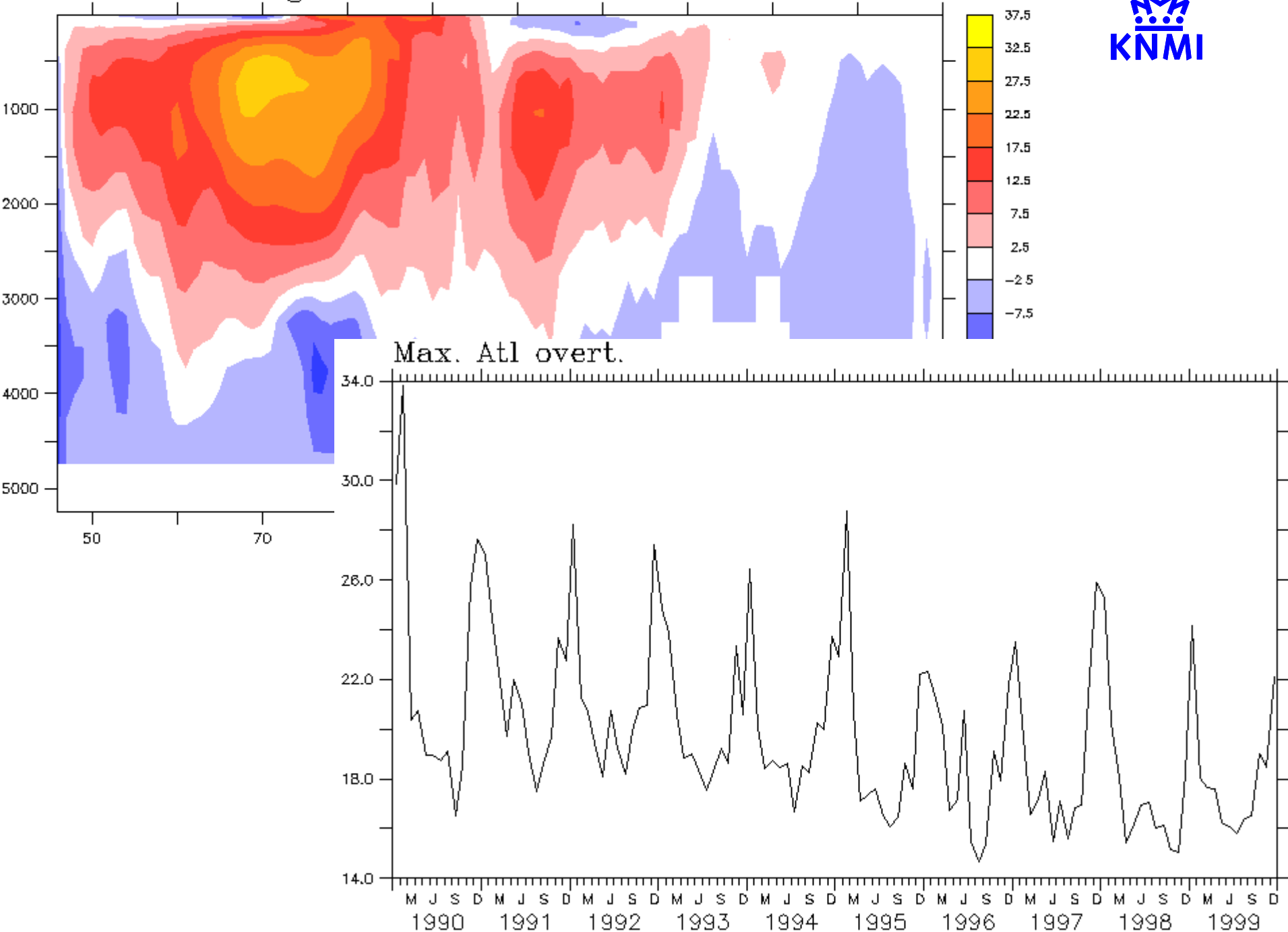
Atl Overturning, year=1



Atl Overturning, year=10



# Atl Overturning, mon=1



# Conclusion

- Coupling technically ok (ORCA2)
- Coupled model seems stable, but ...
- ... large regional biases
- ... Atlantic overturning goes down
- 50-year run under way
- **EC-EARTH is open to other partners**