Drakkar Forcing Set #3 :
A global and inter-annual forcing dataset for NEMO

DRAKKAR meeting, January 2007, Grenoble

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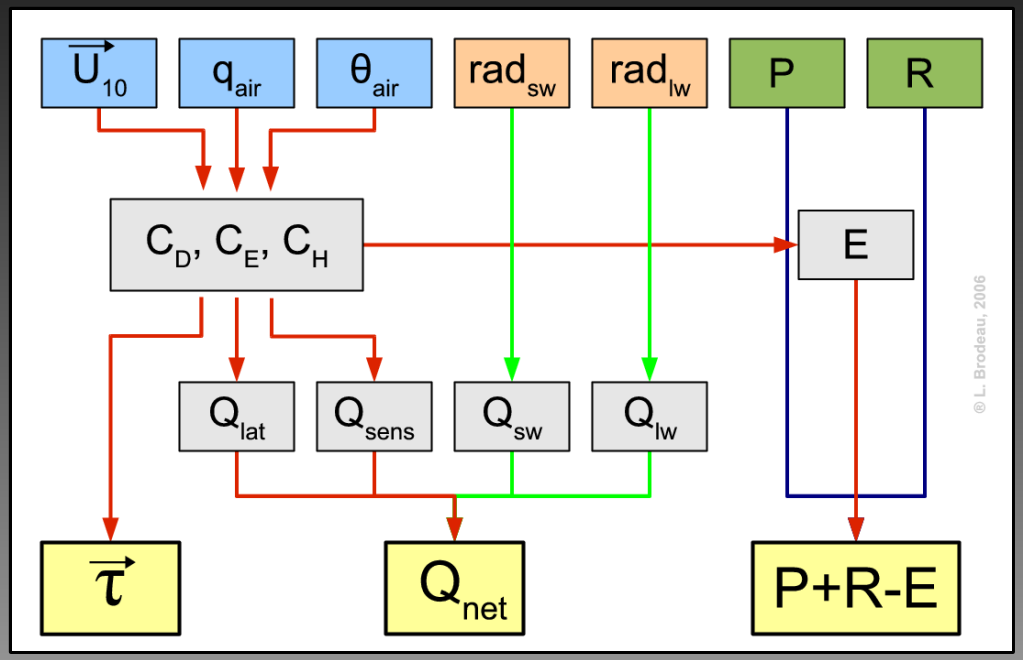
OUTLINE

- Overview of the DFS3
  - presentation
  - precipitation set (DPS3)
  - ERA40 extension after 2001
- ORCA2 simulations
  - comparison of 3 runs
- Prospect and technical aspects
  - future improvement
  - θ and q : at 2m or 10m?
  - getting started with the DFS3

DFS3 : Needed input files for bulk forcing



The 3 main air/sea fluxes and the variables implied in their estimation through bulk formulae.

→ 3 sets of input variables :

Turbulent set | **Radiative** set | **Fresh water** set

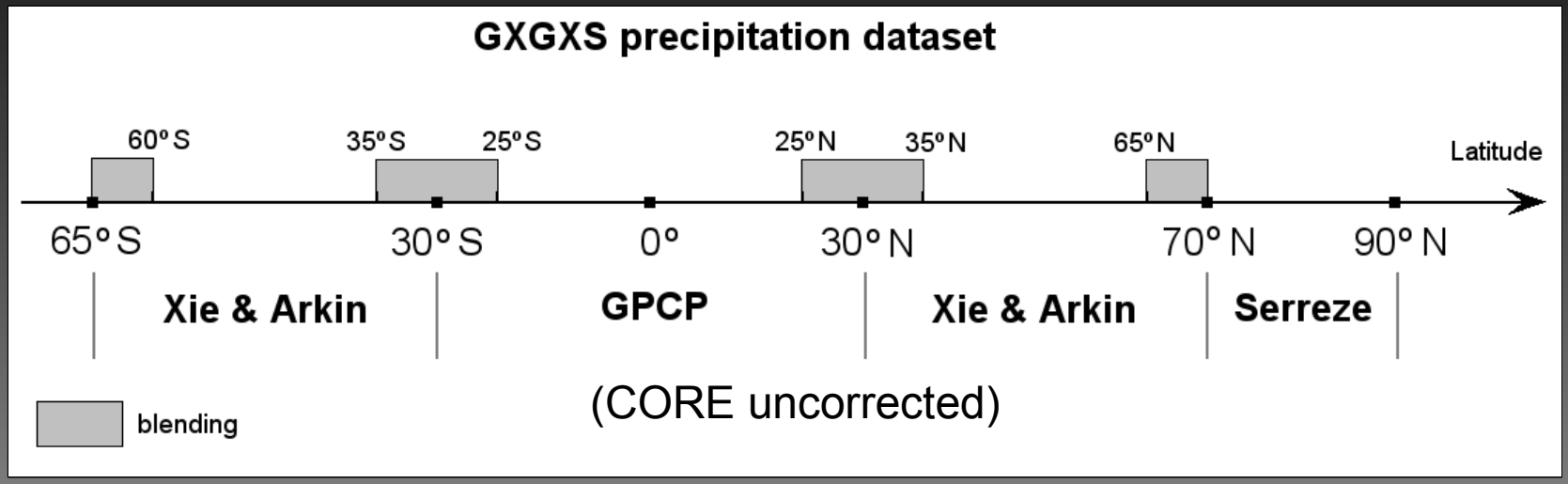
CORE pattern

Variable	*Name*	*Origine*	*Freq.*
Wind (10m)	$\mathbf{u_{10}}$, $\mathbf{v_{10}}$	Reanalyzes	6H
Air temperature (10m or 2m)	$\mathbf{\theta_{air}}$	Reanalyzes	6H
Air Spec. hum. (10m or 2m)	$\mathbf{q_{air}}$	Reanalyzes	6H
Downw. Radiative fluxes	$\mathbf{rad_{sw}}$, $\mathbf{rad_{sw}}$	Satellite	24H
Precipitation , runnofs	**P , R**	Misc.	mens.

DFS3 : An adaptation of CORE

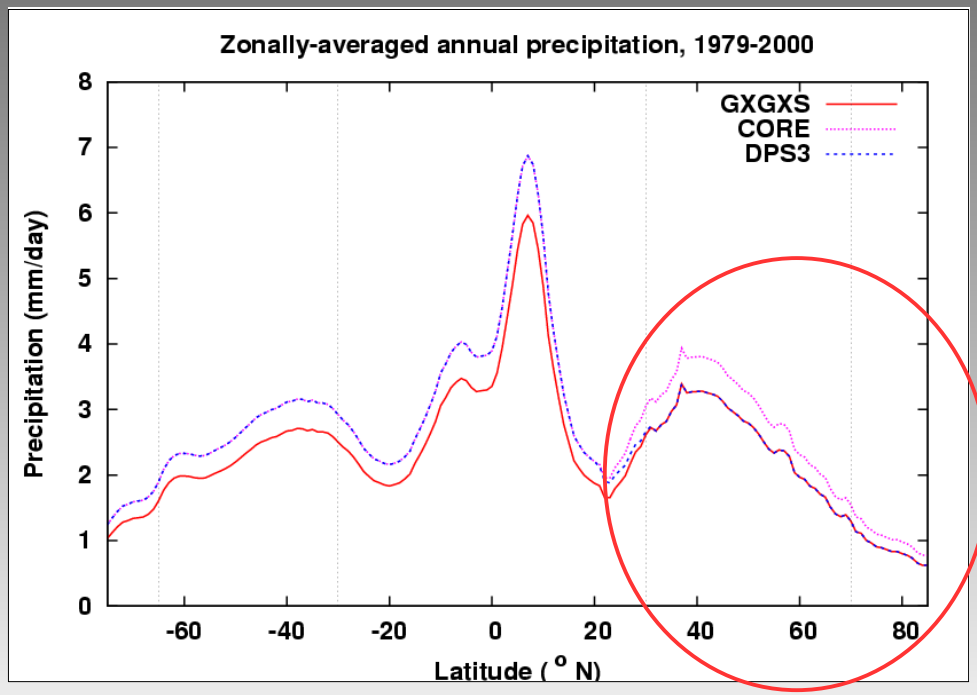
Turbulent set (surface atmospheric variables) u_{10} , v_{10} , θ_{air} , q_{air}	**Radiative set** (downwelling shortwave and longwave radiation) rad_{sw} , rad_{lw}	**Precip set** (total precip and snow) **P , snow**
CORE : NCEP/NCAR corrected 1958 → 2004	**CORE :** ISCCP corrected 1984 → 2004	**CORE :** GXGXS corrected 1979 → 2004
DFS3 : ERA40/ECMWF	**DFS3 :** Keep this	**DFS3 :** DPS3 = GXGXS adjusted

DFS3 : Drakkar Precipitation Set 3



Motivation :

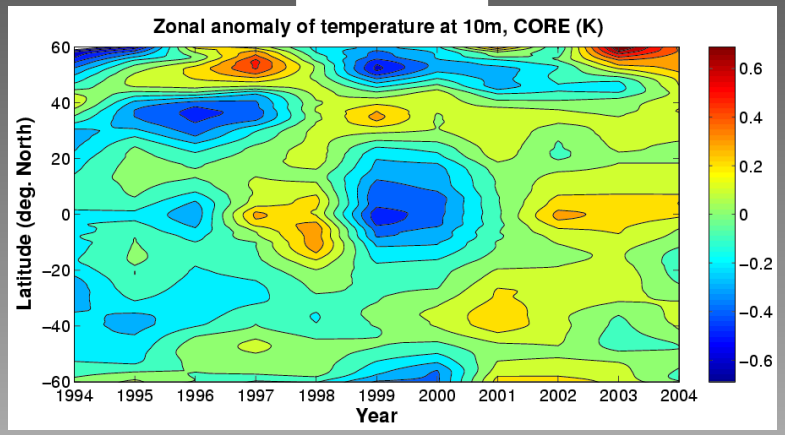
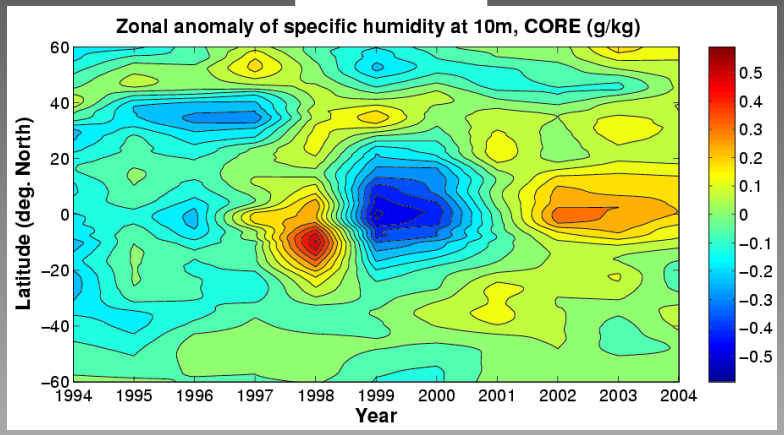
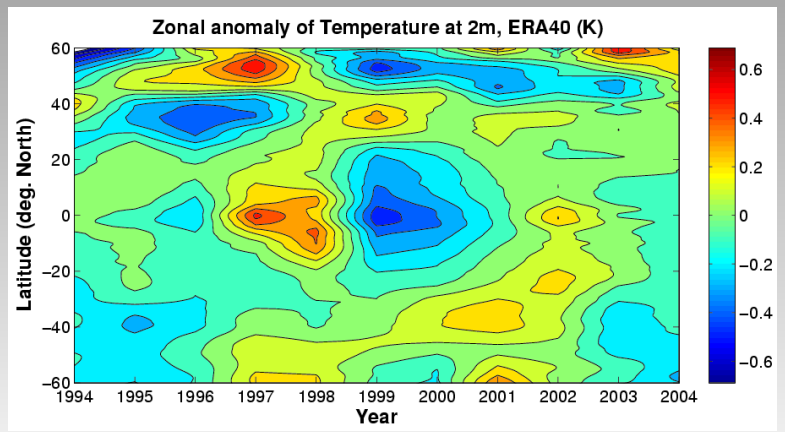
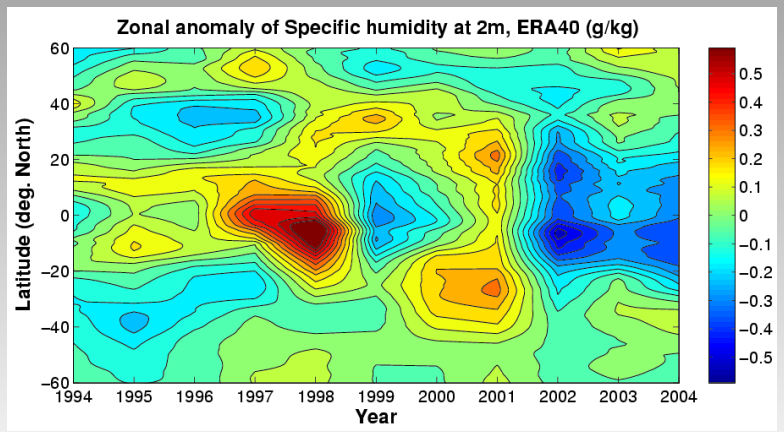
- Less fresh water injected into the northern ocean
- Enhance the north Atlantic MOC
- Minimize the global ocean rise



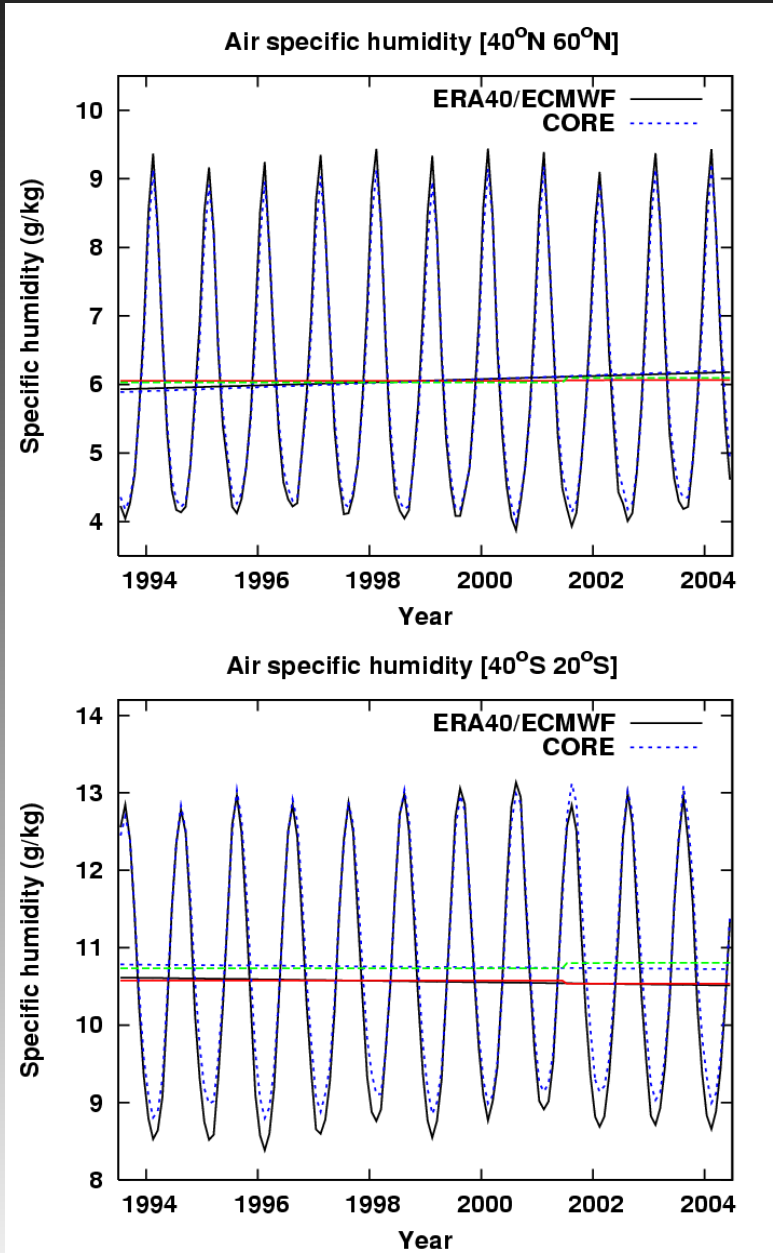
DFS3 : 2001/2002 ERA40/ECMWF transition

We need to extend turbulent set until now!
But : ERA40 ends in 2002

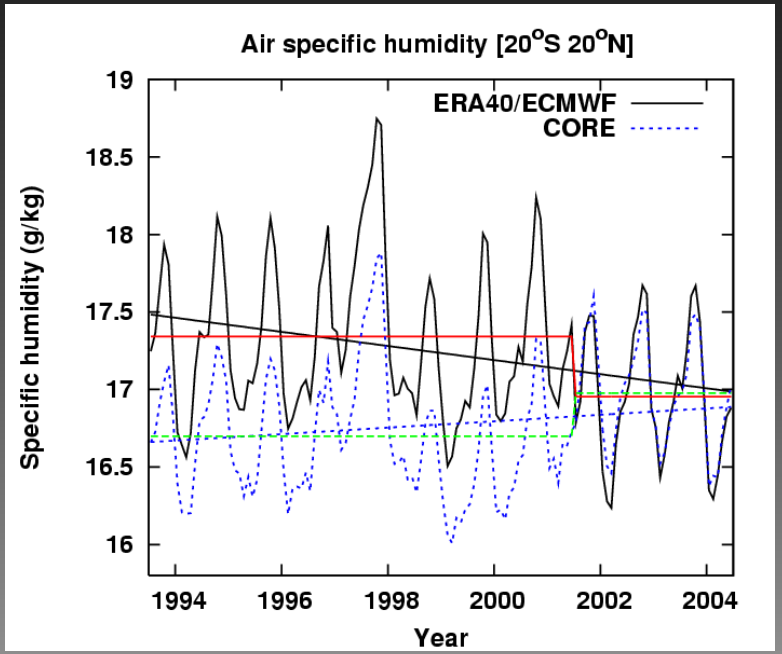
⟶ **extend using ECMWF product**

	θ_{air}	q_{air}
CORE		
ERA40 / ECMWF		

DFS3 : 2001/2002 ERA40/ECMWF transition



q_{air} monthly



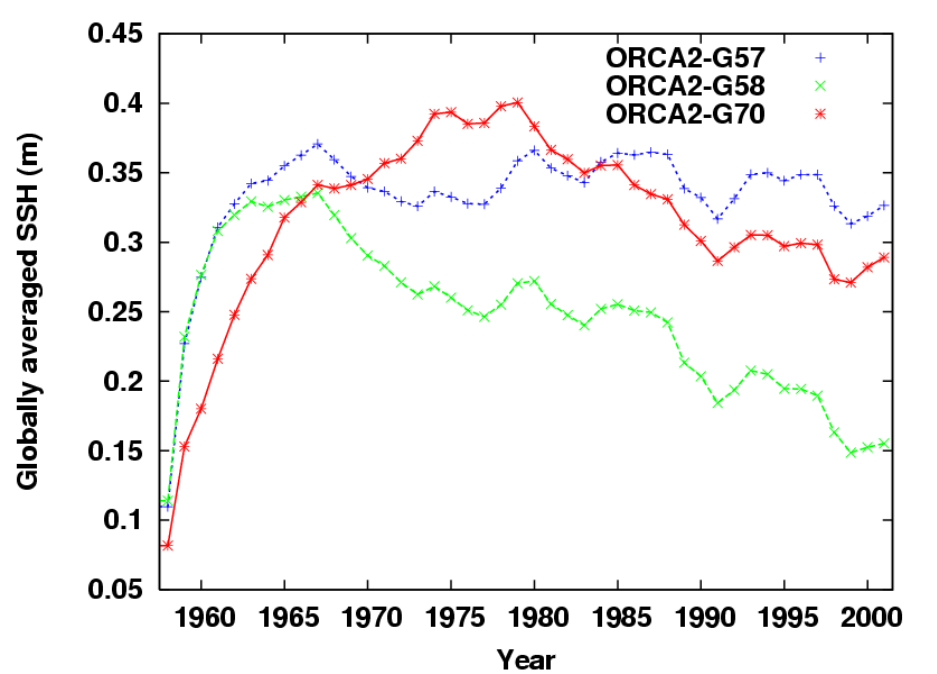
Globally acceptable transition, except for humidity under the tropics.
This is a known ERA40 bias and is corrected in ECMWF.

ORCA2 : Defining 3 runs

Run	*Turbulent set*	*Precip. set*	*Radiative set*
ORCA2-G57	CORE	CORE	ISCCP
ORCA2-G58	CORE	DPS3	ISCCP
ORCA2-G70	ERA40	DPS3	ISCCP

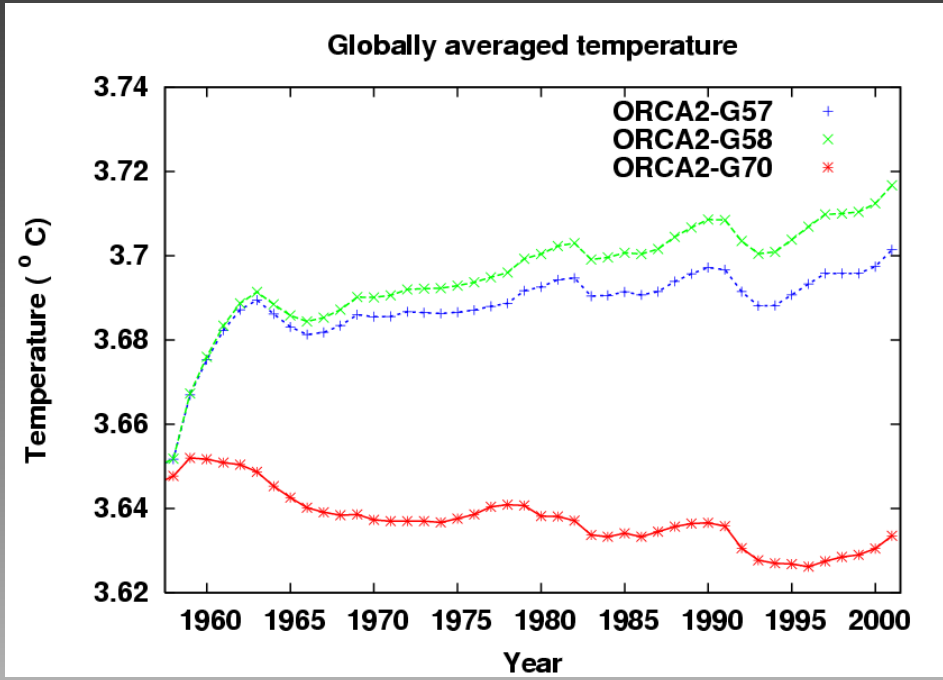
The rest of the config for each of these runs is “G70” !

ORCA2 : Comparing 3 runs



Mean SSH

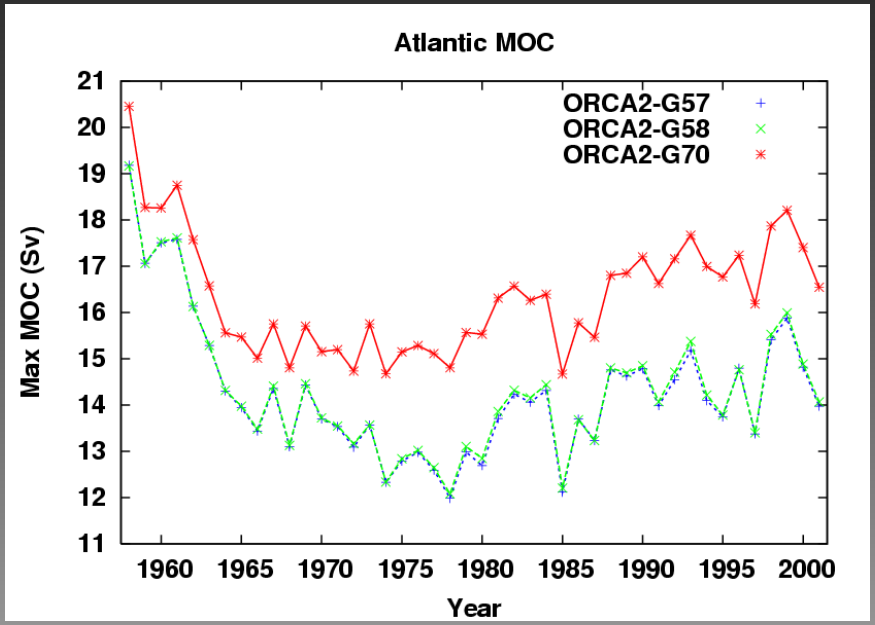
Weaker winds = less evaporation



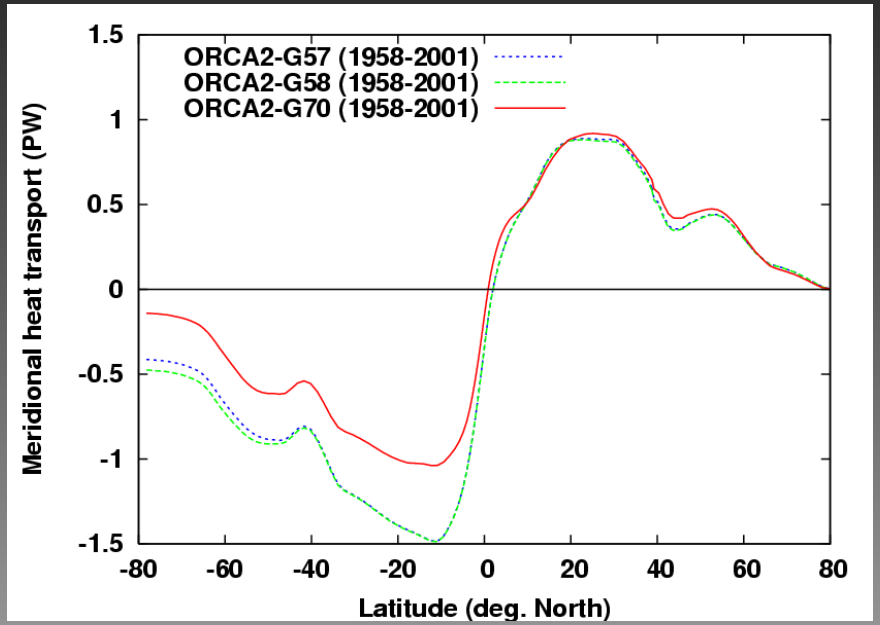
Mean T

Weaker winds = less vertical mixing?

ORCA2 : Comparing 3 runs



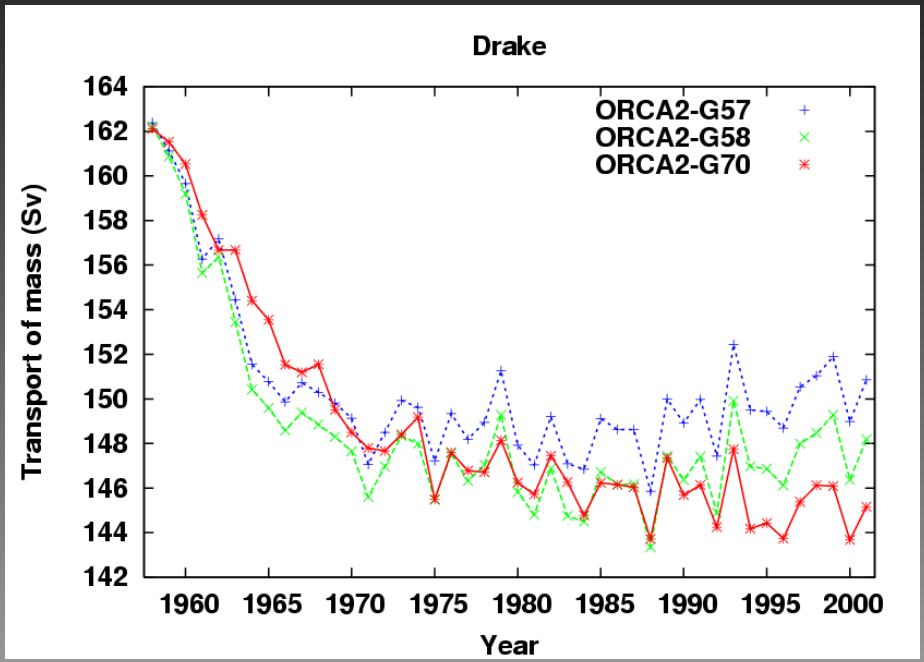
Maximum Atlantic MOC

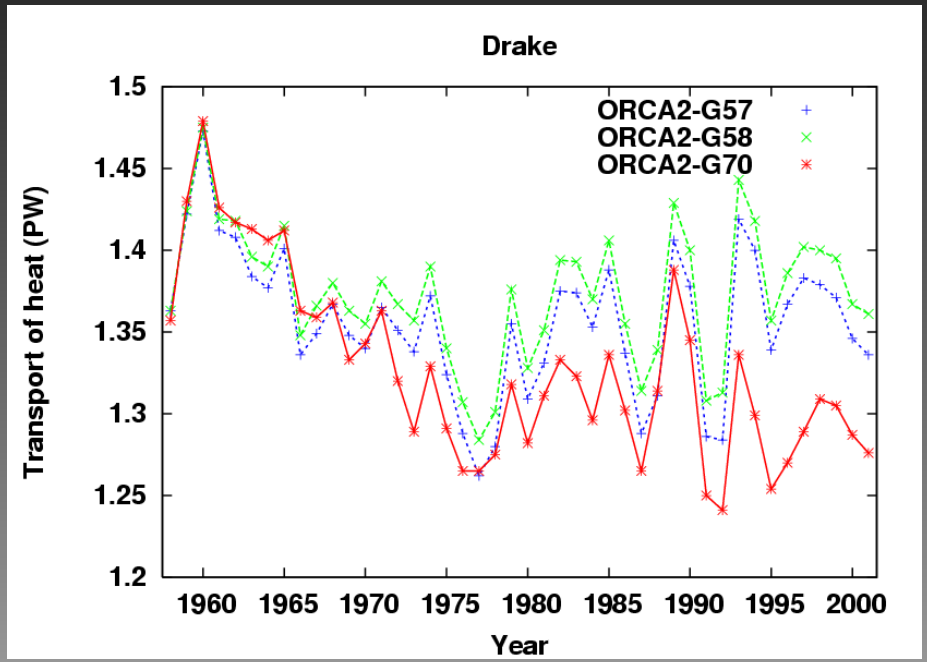


MHT from surface fluxes

Improvement is mainly due to the switch from NCEP to ERA40 for surface atmospheric variables!
The introduction of DPS3 has a minor impact on global trends except on the rise of the ocean.

ORCA2 : Transports



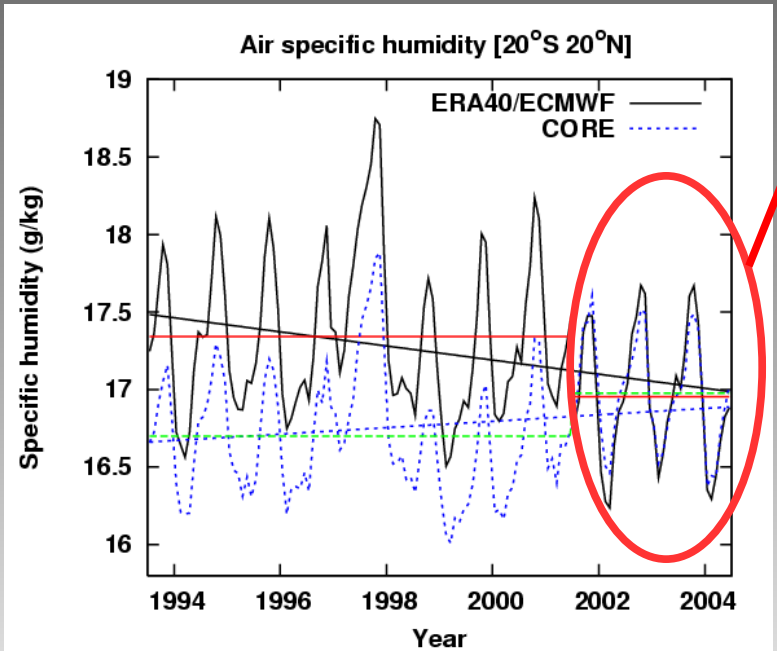


Weaker winds = weaker wind-driven circulation !
How can a decrease of precipitation on the northern ocean affect the ACC that much?
→ Changing the precipitation pattern can lead to really unexpected effects!

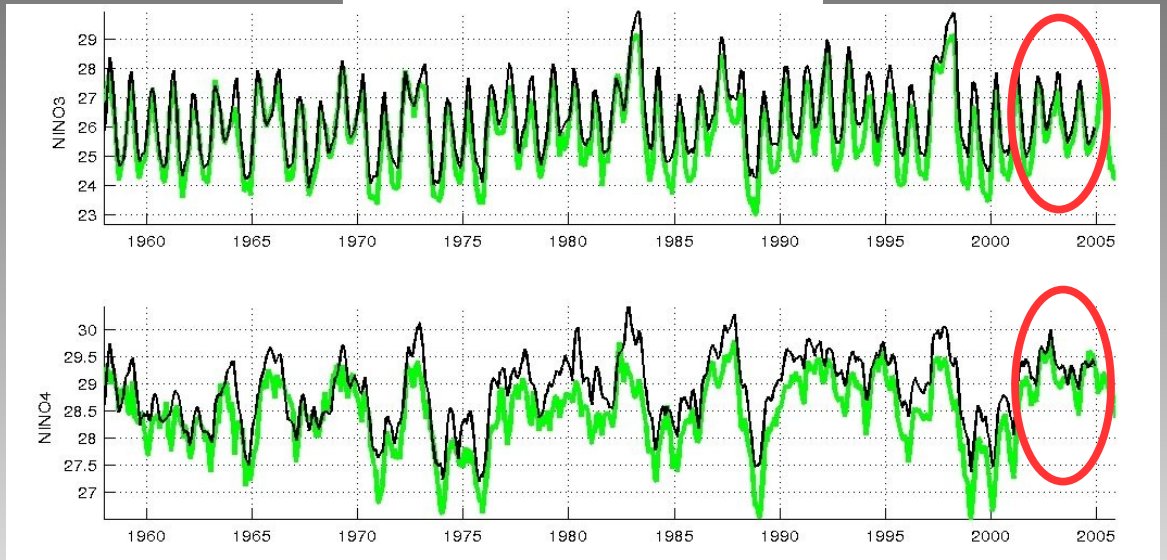
Prospect : Future improvement

Correction of the equatorial bias of q_{air} in ERA40, for the period 1958-2001.
This moist bias seems responsible for the excessive SST in this region.

ECMWF era



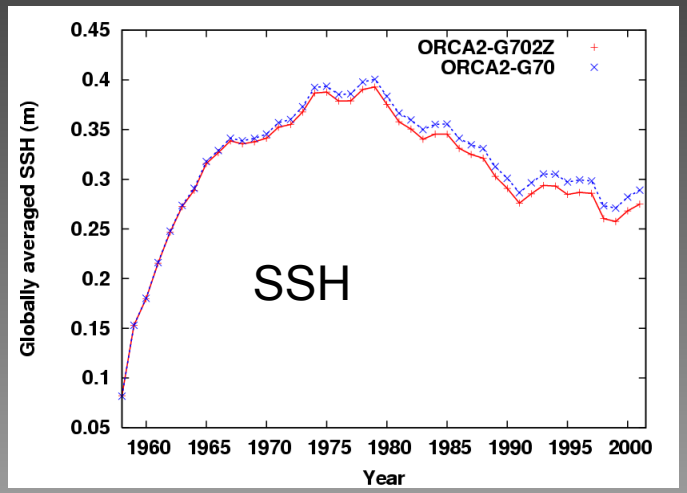
ORCA025-G70

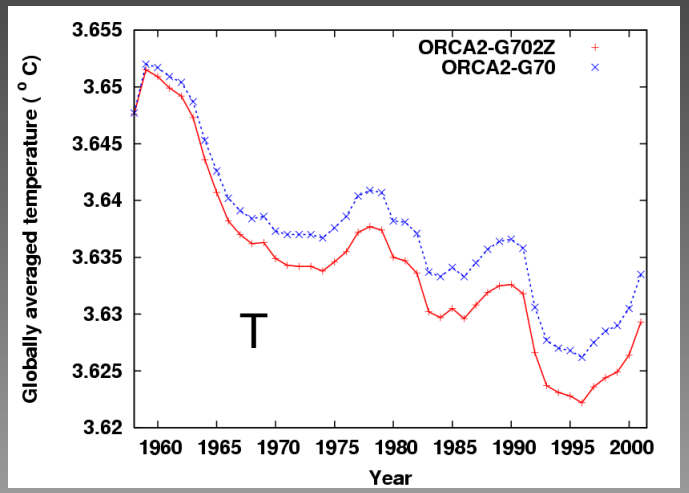


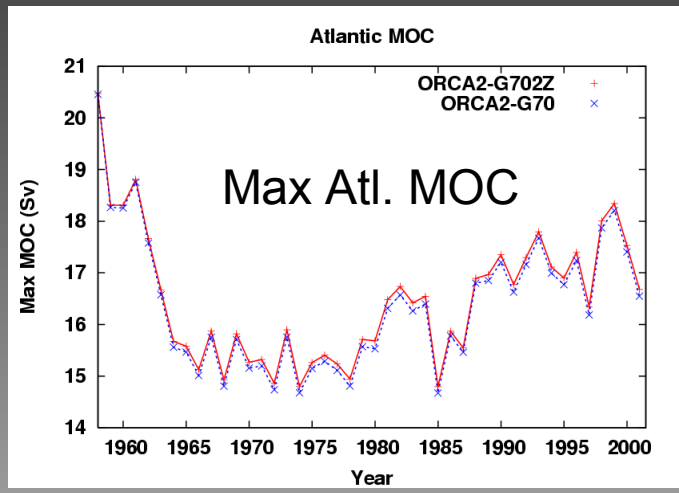
SST model vs *SST obs* on Nino boxes

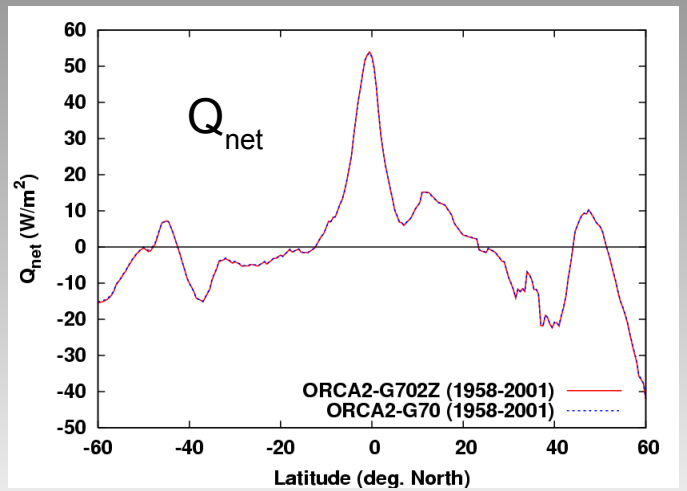
Tech : θ_{air} and q_{air} → 2m or 10m ?

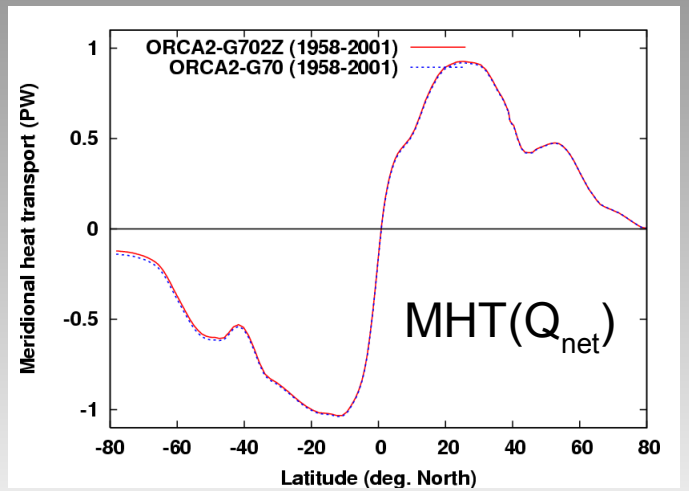
Run **ORCA2-G702Z** : clone of ORCA2-G70, θ_{air} and q_{air} are given at 2m (instead of 10m) and corrected online via the bulk procedure.







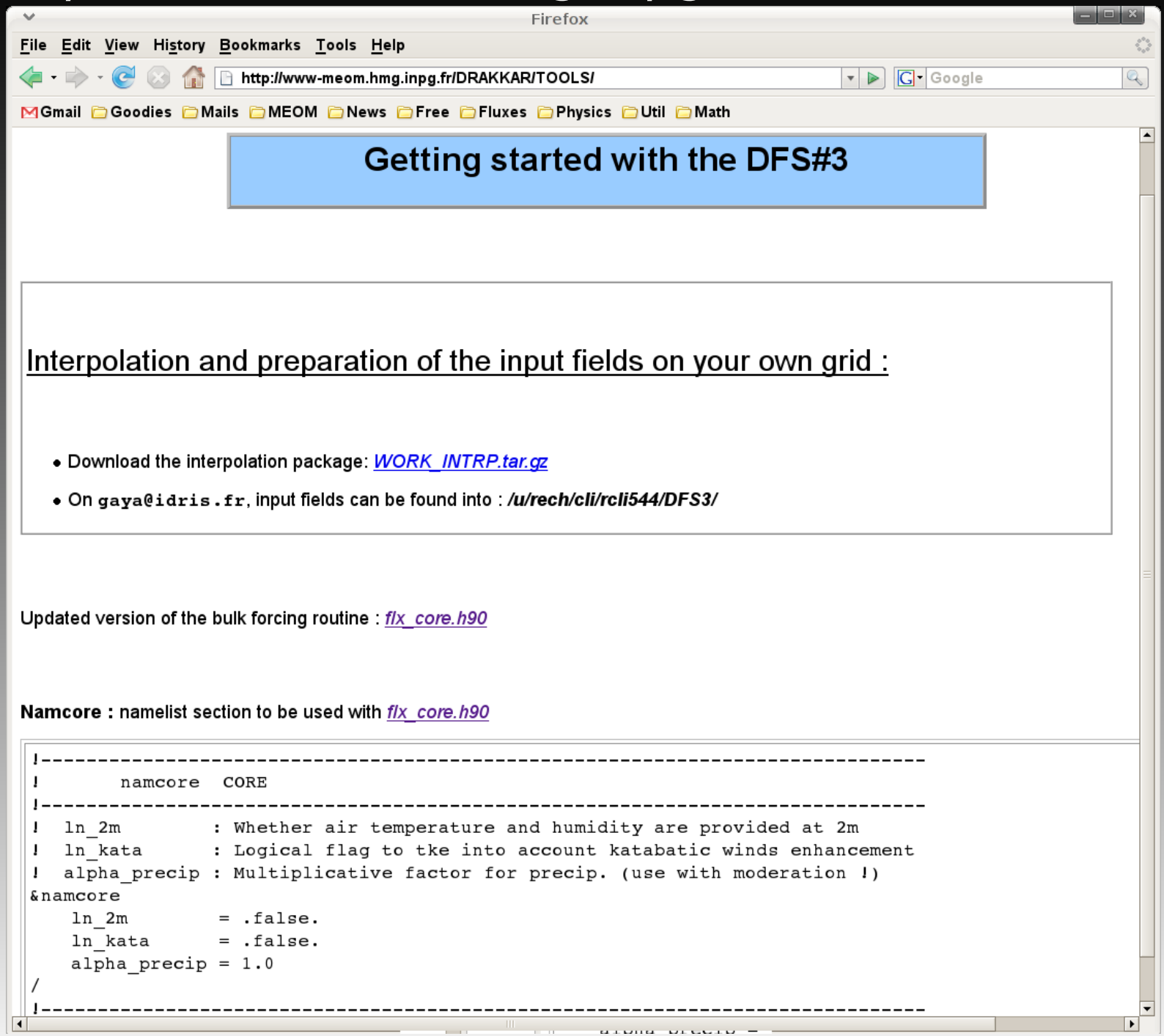




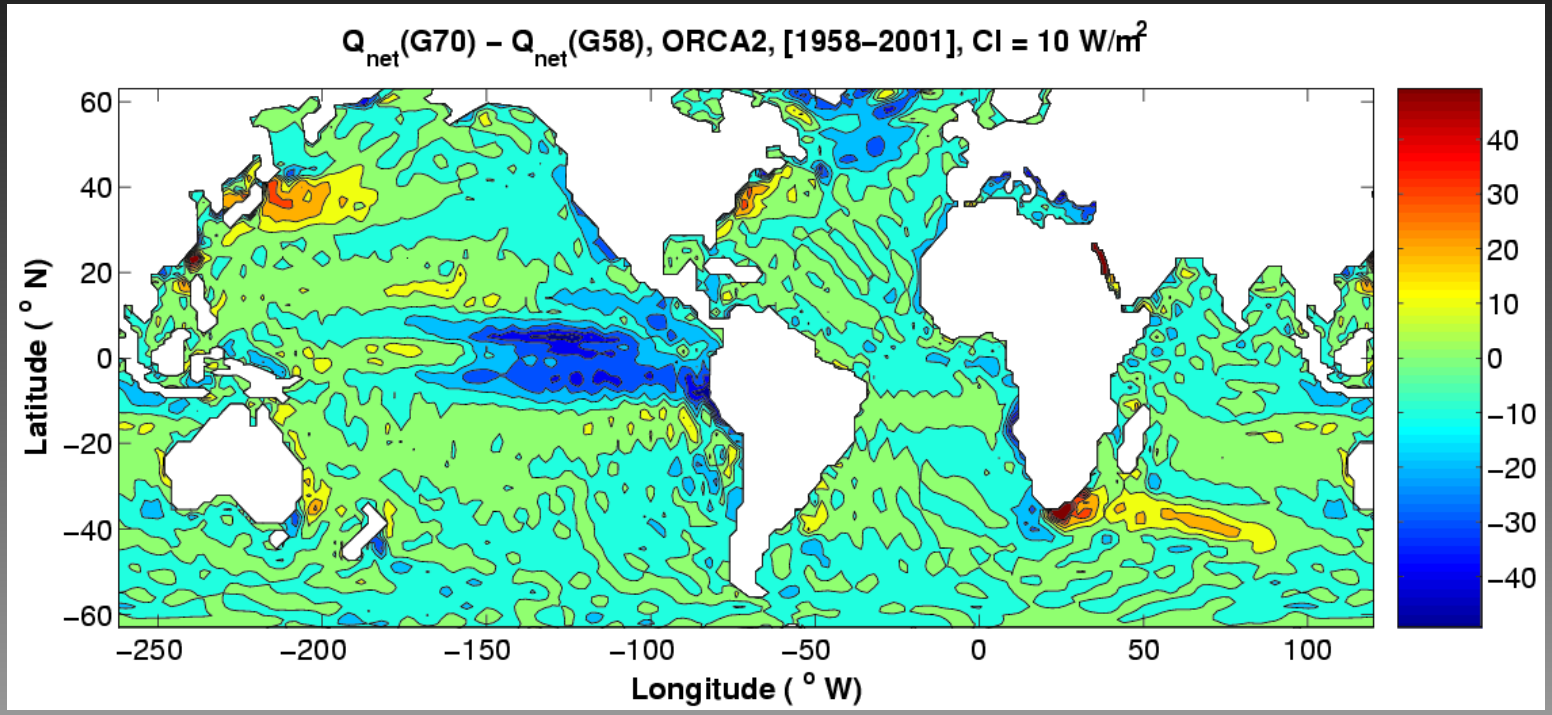
→ 2m !

Much less work and slightly better results!

http://www-meom.hmg.inpg.fr/DRAKKAR/TOOLS/

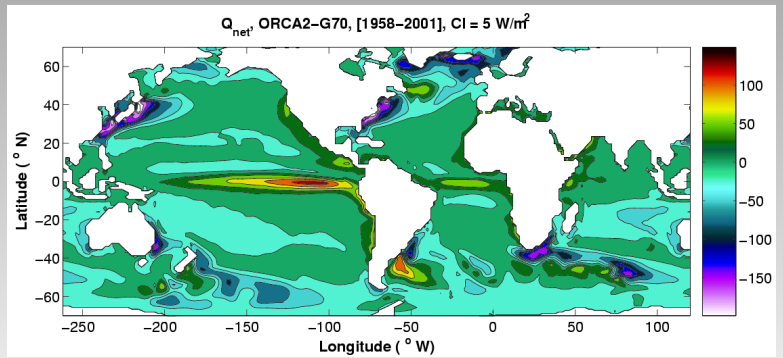


ORCA2 : Net heat flux, G70 vs G58



$Q_{net}(G70) - Q_{net}(G58) \equiv$ ERA40 vs CORE

ERA40



CORE