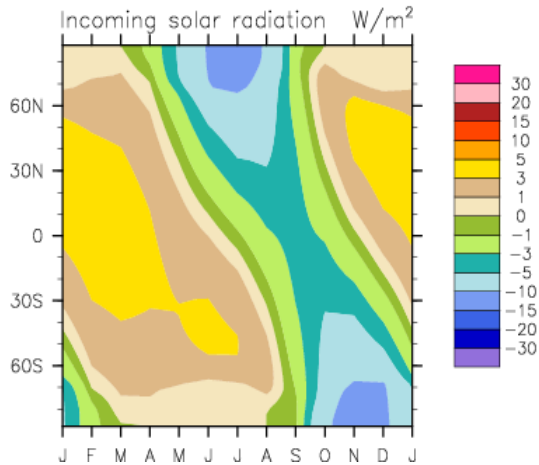


Sensitivity of the ocean to glacial conditions: PMIP2 climate model intercomparisons and data constraints

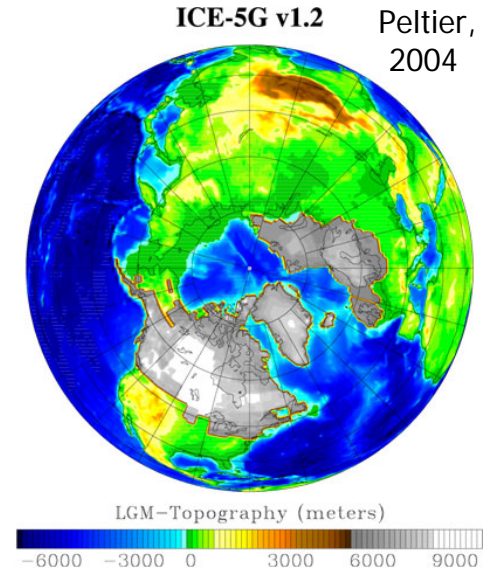
**Bette Otto-Bliesner and Esther Brady
PMIP2 Modeling and Data Communities**

PMIP2 Intercomparison Project

Last Glacial Maximum (LGM, ca. 21 ky ago)



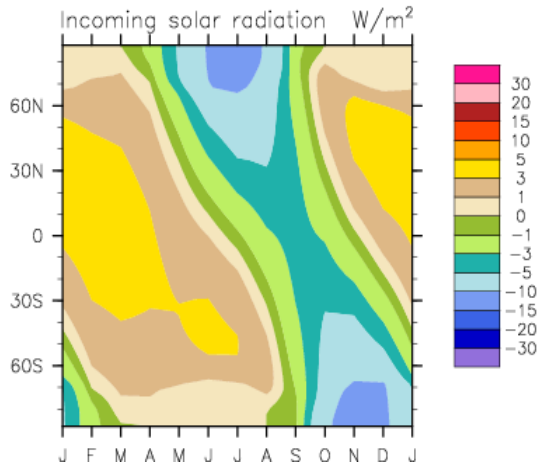
	R.F.
Orbital	+0.1
CO₂: 185 ppm	- 2.8
CH₄: 350 ppb	
N₂O: 200 ppb	
Continental Ice + sea level	~ - 3
Vegetation	~ -1
Dust	~ -1



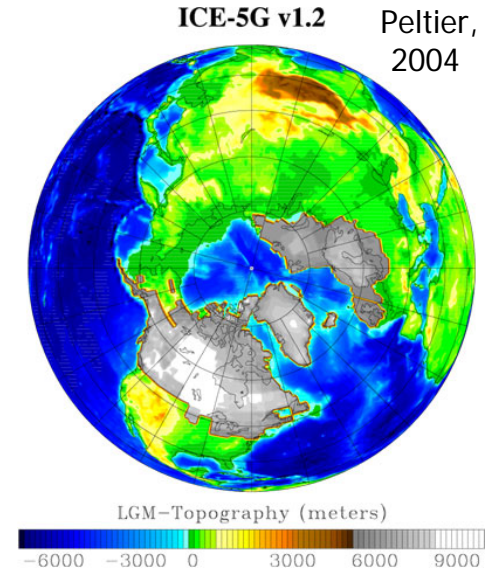
Model	Atmosphere	Ocean
CCSM	T42(2.8°×2.8°)	0.3-1°×1°
HadCM3	2.5°×3.8°	1.5°×1.5°
MIROC-medres	T42(2.8°×2.8°)	0.5-1.4°×1.4°
IPSL*	2.5°×3.75°	1-2°×2°
FGOALS	T42(2.8°×2.8°)	1°×1°
ECBILT-CLIO	T21(5.6°×5.6°) quasigeostrophic	3°×3°

PMIP2 Intercomparison Project

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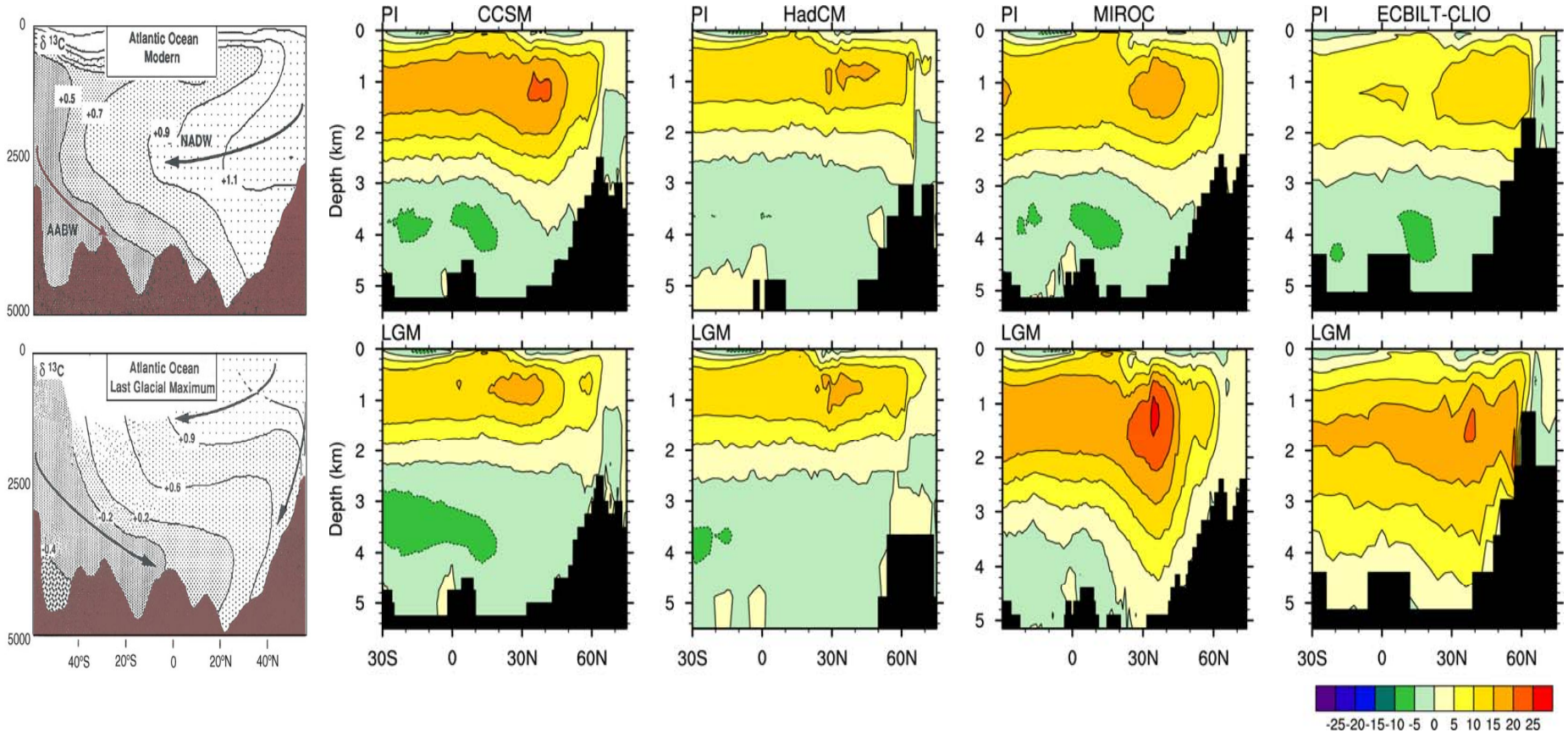


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Data-Model / Model-Model Comparisons

Atlantic Ocean MOC



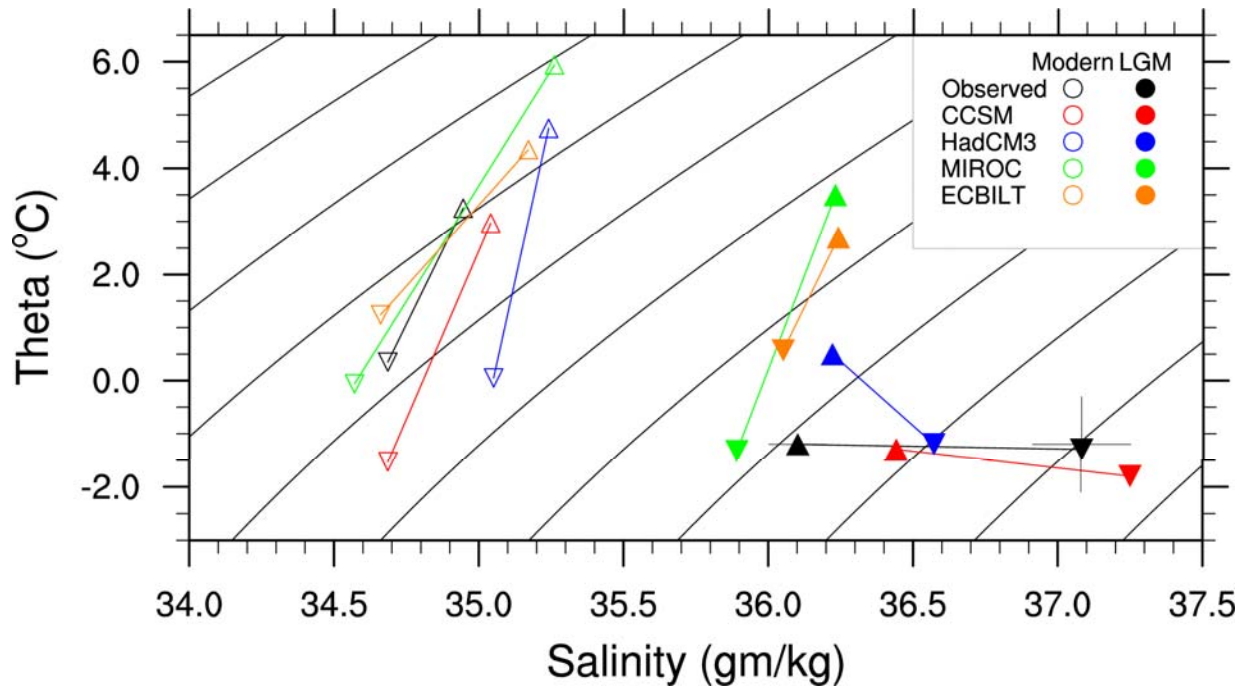
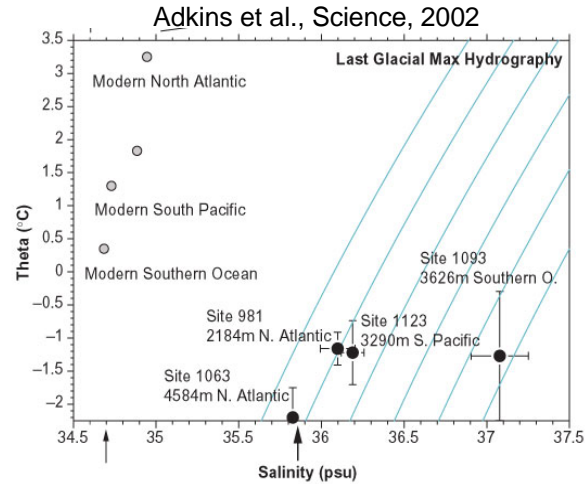
- What other proxy data can we use to evaluate these much different responses at LGM?

Last Glacial Maximum ocean thermohaline circulation: PMIP2 model intercomparisons and data constraints, *Geophysical Research Letters*, 2007

B. L. Otto-Bliesner, C. D. Hewitt, T. M. Marchitto, E. Brady, A. Abe-Ouchi, M. Crucifix, S. Murakami, and S. L. Weber

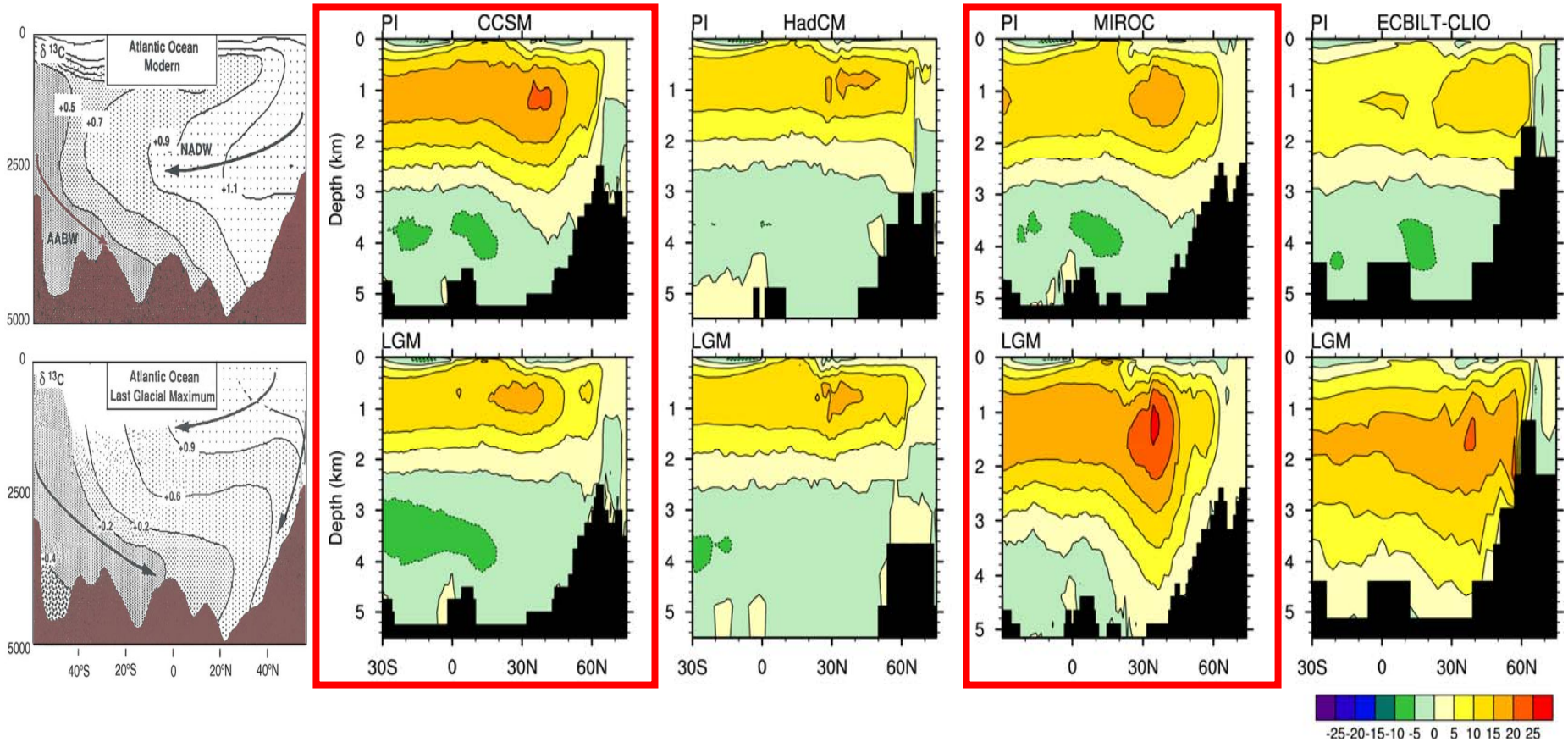
Data-Model / Model-Model Comparisons

Deep Ocean Temperature - Salinity



Data-Model / Model-Model Comparisons

Atlantic MOC

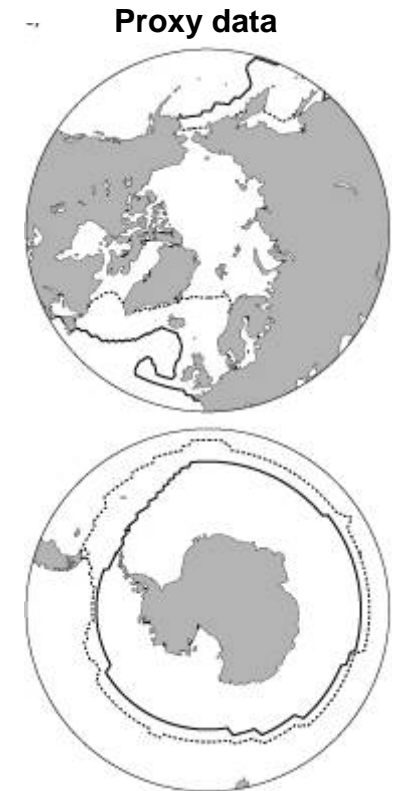
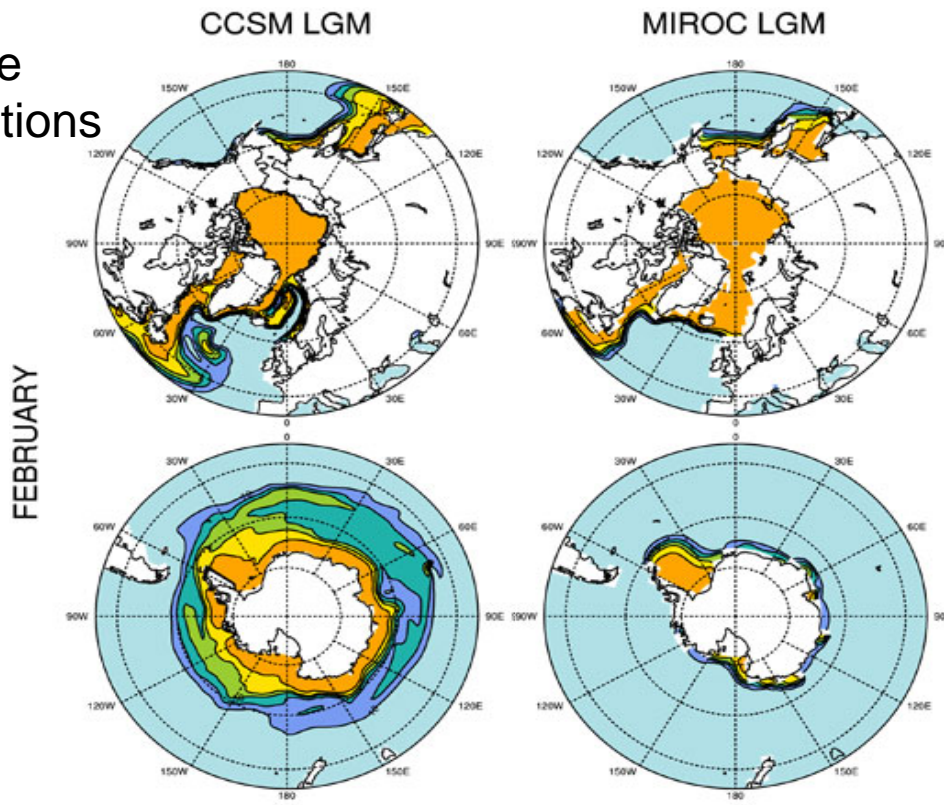


- Why do CCSM and MIROC give much different responses at LGM?

Water Mass Formation Rates

	CCSM		MIROC	
	Modern	LGM	Modern	LGM
Southern Ocean				
Haline contribution	11.1	39.6	-5.3	4.6
Thermal contribution	5.1	0.4	10.3	7.5
Total change	16.2	40.0	6.3	12.2
North Atlantic				
Haline contribution	-5.9	-2.7	-5.7	-1.5
Thermal contribution	24.4	16.6	21.5	34.8
Total change	18.6	13.9	15.8	33.2

Sea Ice Concentrations



Water Mass Formation Rates

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- PMIP2 models give very different glacial Atlantic THC even with comparable circulations for present
- Model-data synthesis suggests shoaling of boundary between NADW and AABW, with N. Atl overturning neither much stronger or weaker than modern
- Simulation of sea ice changes can be important

Sea Ice Concentrations

