

AMOC Project

Observations

Data	Analysis
Merged SST (HadiSST 1870-1981; NCEP OI2 1981-2008)	EOFs

Fully-Coupled

1990, 20th Cent, 1850, Prediction

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
b40.1850.track1.1deg.006	CCSM4 1850 control	Case Info.	atm diag	ice diag	Ind dig	AMOC
b.e11.B1850C5CN.f09_g16.005	Large-Ensemble 1850 control, cesm1_1,CAM5 FV0.9, POP gx1v6	Case Info.	atm diag	ice diag	Ind dig	AMOC yrs 401-1000 AMOC yrs 401-1510 popdiagts
b.e11.B1850C5CN.f19_g16.008	Last Millennium 1850 control, cesm1_1,CAM5 FV1.9, POP gx1v6	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiagts

multi-case comparisons

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
Large Ensemble simulations	1 historical (1850-2005), 13 20thC (1920-2005), and 13 RCP8.5 simulations (2006-2080) cesm1_1,CAM5 0.9x1.25 (f09), POP gx1v6	Large Ensemble experiments information	atm diag	ice diag	Ind dig	AMOC
Last Millennium simulations	2 controls (one 1850, one 850), 9 all forcing, 2 Greenhouse Gas, 2 Land Use Land Cover, 2 Orbital, 3 Solar Variability, 4 Volcanic simulations cesm1_1,CAM5 1.9x2.5deg grid (f19), POP gx1v6	Case Info.	atm diag	ice diag	Ind dig	AMOC
amoc experiments	3 1-degree control runs (b.e11.B1850C5CN.f09_g16.005, amoc_lens_008, amoc_lens_009), 1 2-deg. atm, 1-deg. ocn. control run (b.e11.B1850C5CN.f19_g16.008) and 5 parameterization experiments (amoc_lens_001, amoc_lens_002, amoc_lens_003, amoc_lens_004, amoc_lens_006)	Case Info.	atm diag	ice diag	Ind dig	AMOC

parameterization experiments

[paper preparation html](#)

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
amoc_lens_001	reduced background vertical mixing from 0.17 x 10 ⁻⁴ to 0.10 x 10 ⁻⁴ m ² /s	Case Info.	atm diag	ice diag yrs 902-1001 (diff. from amoc_lens_005)	Ind dig	AMOC popdiagts popdiag (yrs 902-1001): N. Atlantic Global

amoc_lens_002	reduced submesoscale length scale from 5 km to 3.33 km	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiags popdiag (yrs 902-1001): N. Atlantic Global
amoc_lens_003	increased deep values of isopycnal and thickness diffusivities from 300 to 600 m ² /s	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiags popdiag (yrs 902-1001): N. Atlantic Global
amoc_lens_004	reduced horizontal viscosities from 600 to 300 m ² /s	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiags popdiag (yrs 902-1001): N. Atlantic Global
amoc_lens_005	new control	Case Info.	atm diag	ice diag yrs 902-1001	Ind dig	AMOC popdiags popdiag (yrs 1002-1101): N. Atlantic Global
amoc_lens_006	reduced isopycnal and thickness diffusivities from 3000 to 2000 m ² /s	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiags popdiag (yrs 904-1003): N. Atlantic Global
amoc_lens_008	control run ensemble member (different atm. initial conditions)	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiags popdiag (yrs 902-1001): N. Atlantic Global

amoc_lens_009	control run ensemble member (different atm. initial conditions)	Case Info.	atm diag	ice diag	Ind dig	AMOC popdiagts popdiag (yrs 902-1001): N. Atlantic Global
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Coupled Ocean-Ice

[Hindcast experiments](#) ([version history for JRA55-do](#))

Experiment	Description	Initialization	Diagnostics			
			Atm	Ice	Lnd	Ocean
g40.000	cesm1_1_beta01, G, CORE-II (1948-2007), (see Danabasoglu et al 2013)	Levitus/PHC	Atm	ice diag yrs 271-300	Lnd	popdiag yrs 271-300 popdiagts yrs 001-300 zonal mean pCFC year 287
g12b8.compo.5	cesm1_2_beta08, G, Compo (1948-2007)	Levitus/PHC	Atm	ice diag yrs 271-300	Lnd	popdiag yrs 271-300 popdiagts yrs 001-300 zonal mean pCFC year 287
g122.compo.7	cesm1_2_beta08, G, Compo (1948-2007)	Levitus/PHC	Atm	ice diag yrs 271-300	Lnd	popdiag yrs 271-300 popdiagts yrs 001-300
g14.20CRv2c.sp30	cesm1_4_beta06, G , 20CRv2c (1871-1900)	Levitus/PHC	Atm	ice diag yrs 121-150 ice diag yrs 271-300	Lnd	popdiag yrs 121-150 popdiag yrs 271-300 popdiagts yrs 001-150 popdiagts yrs 001-300

g14b6. 20CRv2c. 01	cesm1_4_beta06, G, 20CRv2c (1958-2009)	Levitus/PHC	Atm	ice diag yrs 236- 260	Lnd	popdiag yrs 236- 260 popdiagts yrs 001- 260
g14b6. 20CRv2c. 02	cesm1_4_beta06, G , 20CRv2c (1901-2009)	g14.20CRv2c. sp30 (yr 151) sfwf_weak_restore = 0.092	Atm	ice diag yrs 236- 259	Lnd	popdiag yrs 236- 259 popdiagts yrs 151- 259 popdiagts yrs 151- 368
g14b6. 20CRv2c. 03	cesm1_4_beta06, G , 20CRv2c (1901-2009)	g14.20CRv2c. sp30 (yr 151) sfwf_weak_restore = 0.0115	Atm	ice diag yrs 236- 259	Lnd	popdiag yrs 236- 259 popdiagts yrs 151- 259 popdiagts yrs 151- 368
g14b6. CORE2.01	cesm1_4_beta06, G, CORE-II (1958-2009)	Levitus/PHC	Atm	Ice	Lnd	popdiag yrs 236- 260 popdiagts yrs 001- 260
g14b6. JRA55.01	cesm1_4_beta06, G, JRA55v0.2 (1958-2009)	Levitus/PHC	Atm	ice diag yrs 001- 260	Lnd	popdiag yrs 236- 260 popdiagts yrs 001- 260
g14b6. JRA55.02	cesm1_4_beta06, G, JRA55v0.3 (1958-2009)	Levitus/PHC	Atm	ice diag yrs 001- 260	Lnd	popdiag yrs 236- 260 popdiagts yrs 001- 260
g14b6. JRA55.03	cesm1_4_beta06, G, JRA55v0.4 (1958-2009)	Levitus/PHC	Atm	ice diag yrs 001- 260	Lnd	popdiag yrs 236- 260 popdiagts yrs 001- 260
g14b6. JRA55.04	cesm1_4_beta06, G, JRA55v0.7 (1958-2009)	Levitus/PHC	Atm	ice diag yrs 001- 260	Lnd	popdiag yrs 236- 260 popdiag yrs 392- 416 popdiagts yrs 001- 416 additional diag

g14b6. JRA55.v11. C01	cesm1_4_beta06, G, JRA55v1.1 (1958-2009) with 4-yr salinity restoring	Levitus/PHC	Atm	Ice	Lnd	popdiagts yrs 001- 260
g14b6. JRA55.v11. C02	cesm1_4_beta06, G, JRA55v1.1 (1958-2009) with 1-yr salinity restoring	Levitus/PHC	Atm	ice diag yrs 001- 260	Lnd	popdiag yrs 288- 312 popdiagts yrs 001- 312 additional diag
g20b06. CORE2. C02	cesm2_0_beta06, G, CORE-II (1958-2009) with 4-yr salinity restoring	Levitus/PHC	Atm	ice diag yrs 001- 156	Lnd	popdiag yrs 137- 156 popdiagts yrs 001- 156
g20b06. CORE2. C03	cesm2_0_beta06, G, CORE-II (1958-2009) with 4-yr salinity restoring, no ocean current in flux computation	Levitus/PHC	Atm	ice diag yrs 001- 156	Lnd	popdiag yrs 137- 156 popdiagts yrs 001- 156
g20b06. JRA55.v13. T01	cesm2_0_beta06, G, JRA55v1.3 (1958-2009) with 4-yr salinity restoring	Levitus/PHC	Atm	Ice	Lnd	popdiagts yrs 001- 104
g20b06. JRA55.v13. T02	cesm2_0_beta06, G, JRA55v1.3 (1958-2009) with 4-yr salinity restoring, no ocean current in flux computation	Levitus/PHC	Atm	ice diag yrs 001- 156	Lnd	popdiag yrs 137- 156 popdiagts yrs 001- 208
g20b06. JRA55.v13. T04	cesm2_0_beta06, G, JRA55v1.3 (1958-2009) with 2-yr salinity restoring, 50% enhanced ice-ocean drag, & no ocean currents in flux computation for the open ocean	Levitus/PHC	Atm	ice diag yrs 001- 312	Lnd	popdiag (ts, vs obs, vs CORE2. C02)
g20b06. JRA55.v13. S07	cesm2_0_beta06, G, JRA55v1.3 (1958-2009) with 1-yr salinity restoring	Levitus/PHC	Atm	ice diag yrs 001- 312	Lnd	popdiag (ts, vs obs, vs CORE2. C02)
g20b06. CORE2. C04	cesm2_0_beta06, G, CORE-II (1958-2009) with 2-yr salinity restoring, 50% enhanced ice-ocean drag, & no ocean currents in flux computation for the open ocean	Levitus/PHC	Atm	ice diag yrs 001- 260	Lnd	popdiag yrs 137- 156 popdiagts yrs 001- 208

Semi-prognostic method experiments

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
g12b8.103		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 308-312	Lnd	popdiagts yrs 308-312 popdiag yrs 308-312
g12b8.103.1		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 308-312	Lnd	popdiag yrs 308-312
g12b8.103.2		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 308-312	Lnd	popdiag yrs 308-312
g12b8.103.3		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 308-312	Lnd	popdiag yrs 308-312
g12b8.103.4		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 308-312	Lnd	popdiag yrs 308-312
g12b8.103.5		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 308-312	Lnd	popdiag yrs 308-312
g12b8.103.6		branched from 0293-01-01 of g40.103	Atm	ice diag yrs 307-311	Lnd	popdiag yrs 308-311

AMV Experiments

AMV ensemble experiments (SST anomalies are imposed over the entire North Atlantic)

- [AMV pattern \(North Atlantic, Global\)](#)
- [Restoring mask \(map\)](#)

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
REF	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce
AMV+	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce
AMV-	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce

AMV ensemble experiments (SST anomalies are imposed over the northern North Atlantic only)

- [AMV pattern \(North Atlantic, Global\)](#)
- [Restoring mask \(map\)](#)

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
REF	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce
AMV+	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce
3xAMV+	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce

AMV ensemble experiments (SST anomalies are imposed over the tropical North Atlantic only)

- AMV pattern (North Atlantic, Global)
- Restoring mask (map)

Experiment	Description	Initialization	Diagnostics			
			Atmosphere	Ice	Land	Ocean
REF	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce
AMV+	Large-Ensemble 1850 control, cesm1_1_2,CAM5 FV0.9, POP gx1v6	LENS 1850 control	Atm	Ice	Lnd	Oce

Flow Field Correction Experiments

implements the semi-prognostic method for adjusting the hydrostatic equation to correct for systematic error

(see Greatbatch et al., 2004)

Experiment	Description	Initialization	Diagnostics				
			Atmosphere	Ice	Land	Ocean	
g12b8.103	cesm1_2_beta08, G case. CTR simulation	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce	
g12b8.103.3	cesm1_2_beta08, G case. identical to g12b8.103 but implements semi-prognostic correction (alpha = 0.5, applied full depth in NATL (>15N))	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce	
g12b8.103.5	cesm1_2_beta08, G case. identical to g12b8.103 but implements semi-prognostic correction (alpha = 0.8, applied in NATL (>15N), only above 830m and excluding points within 2 grid points of land)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce	
	NATL_FFC_alpha-1.0	cesm1_2_beta08, G case. identical to g12b8.103 but implements semi-prognostic correction (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 1 grid points of land)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce
NATL_FFC_alpha-1.0.2	cesm1_2_beta08, G case. identical to g12b8.103 but implements semi-prognostic correction (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce	

NATL_FFC_alpha-1.0.3	cesm1_2_beta08, G case. identical to g12b8.103 but implements semi-prognostic correction (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce
NATL_FFC_alpha-0.8	cesm1_2_beta08, G case. identical to g12b8.103 but implements semi-prognostic correction (alpha = 0.8, applied in NATL (between 15N and 65N), over full-depth and excluding points within 2 grid points of land)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce
NATL_FFC_NI_alpha-1.0	cesm1_2_beta08, G case. identical to g12b8.103 but implements non-interactive semi-prognostic correction Correction term was diagnose from experiment NATL_FFC_alpha-1.0.3 (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_REF	cesm1_2_beta08, G case. startup simulation	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_10	cesm1_2_beta08, G case. startup simulation with SSH correction (5-day timescale)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_11	cesm1_2_beta08, G case. startup simulation with SSH correction and semi-prognostic correction (5-day timescale and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_12	cesm1_2_beta08, G case. startup simulation with semi-prognostic correction (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_13	cesm1_2_beta08, G case. startup simulation with SSH correction and semi-prognostic correction (1-day timescale and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_14	cesm1_2_beta08, G case. startup simulation with SSH (filtered) correction and semi-prognostic correction (5-day timescale and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce

NATL_FFC+tropic_15	cesm1_2_beta08, G case. startup simulation with SSH (filtered) correction and semi-prognostic correction (5-day timescale excluding points within 2 grid points of land and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_16	cesm1_2_beta08, G case. startup simulation with SSH (filtered) correction and semi-prognostic correction (5-day timescale excluding points within 2 grid points of land and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_REF	cesm1_2_beta08, G case. REF startup simulation.	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC+tropic_17	cesm1_2_beta08, G case. startup simulation with SSH (filtered) correction and semi-prognostic correction (5-day timescale excluding points within 2 grid points of land and the GOM and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	startup simulation	Atm	Ice	Lnd	Oce
NATL_FFC_NI_4	cesm1_2_beta08, G case. startup simulation with non-interactive semi-prognostic correction to hydrostatic eqn (dp/dz) and SSH (filtered) correction Correction term was diagnose from experiment NATL_FFC+tropic_17 (5-day timescale (excluding points within 2 grid points of land and GOM) and alpha = 1, applied in N. Atlantic (between 15N and 65N), only above 830m and excluding points within 2 grid points of land)	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce
g12b8.103	cesm1_2_beta08, G case. CTR simulation	branched from 0293-01-01 of g40.103	Atm	Ice	Lnd	Oce
b.e11.B1850C5CN.f09_g16.005	cesm1_1_2_LENS, G case.	LENS PI control	Atm	Ice	Lnd	Oce
B1850C5CN_NATL_FFC_2	cesm1_1_2_LENS, B case. identical to b.e11.B1850C5CN.f09_g16.005 but implements semi-prognostic correction (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land and the GOM).	branched from 0402-01-01 of b.e11.B1850C5CN.f09_g16.005	Atm	Ice	Lnd	Oce

B1850C5CN_NATL_FFC_3	cesm1_1_2_LENS, B case. identical to b.e11.B1850C5CN.f09_g16.005 but implements semi-prognostic correction (alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land and the GOM). Sea ice change: dt_mlt_in = 1.5 (1.00), r_snw = 1.5 (1.75), rsnw_melt_in = 1500 (1000).	branched from 0402-01-01 of b.e11.B1850C5CN.f09_g16.005	Atm	Ice	Lnd	Oce
B1850C5CN_NATL_FFC_4	cesm1_1_2_LENS, B case. identical to b.e11.B1850C5CN.f09_g16.005 but implements SSH (filtered) correction and semi-prognostic correction (5-day timescale excluding points within 2 grid points of land and the GOM and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land) Sea ice change: dt_mlt_in = 1.5 (1.00), r_snw = 1.5 (1.75), rsnw_melt_in = 1500 (1000).	branched from 0402-01-01 of b.e11.B1850C5CN.f09_g16.005	Atm	Ice	Lnd	Oce
B1850C5CN_NATL_FFC_5	cesm1_1_2_LENS, B case. identical to b.e11.B1850C5CN.f09_g16.005 but with non-interactive semi-prognostic correction to hydrostatic eqn (dp/dz) correction Correction term was diagnose from experiment B1850C5CN_NATL_FFC_3 (5-day timescale excluding points within 2 grid points of land and the GOM and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land) Sea ice change: dt_mlt_in = 1.5 (1.00), r_snw = 1.5 (1.75), rsnw_melt_in = 1500 (1000).	branched from 0442-01-01 of B1850C5CN_NATL_FFC_3	Atm	Ice	Lnd	Oce
B1850C5CN_NATL_FFC_6	cesm1_1_2_LENS, B case. identical to b.e11.B1850C5CN.f09_g16.005 but with non-interactive semi-prognostic correction to hydrostatic eqn (dp/dz) correction Correction term was diagnose from experiment B1850C5CN_NATL_FFC_3 (5-day timescale excluding points within 2 grid points of land and the GOM and alpha = 1.0, applied in NATL (between 15N and 65N), only above 830m and excluding points within 2 grid points of land) Sea ice change: dt_mlt_in = 1.5 (1.00), r_snw = 1.0 (1.75), rsnw_melt_in = 2000 (1000), r_ice = -0.5 (0.0).	branched from 0482-01-01 of B1850C5CN_NATL_FFC_5	Atm	Ice	Lnd	Oce