

WP5: First year achievements

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WP5 contributors

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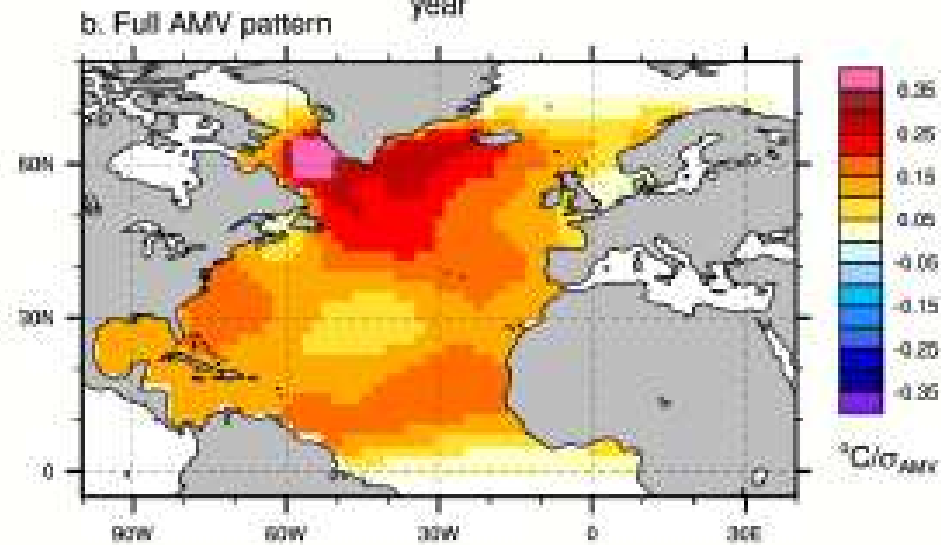
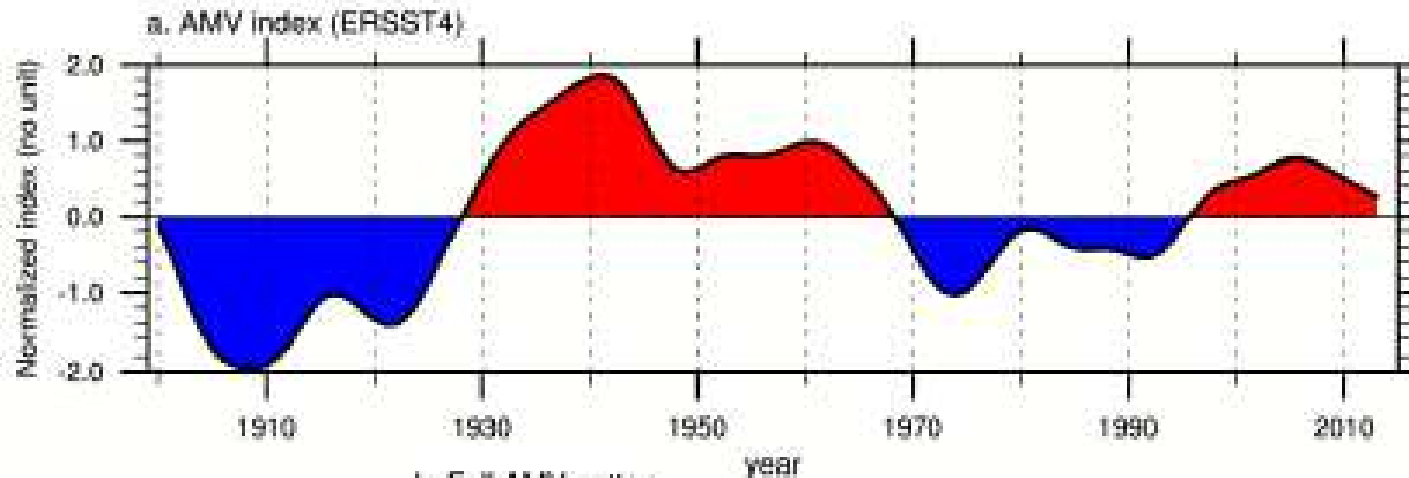
Completion of deliverable D5.1

- Defining the coordinated WP5 sensitivity experiments at both Std. and High resolution
- AMV/IPV experiments: influence of ocean basin SST interannual to decadal variability on European climate
- Arctic sea-ice experiments: influence of Arctic sea-ice loss on European climate
- *Snow melt experiments: influence of reduced Eurasian snow on European climate*

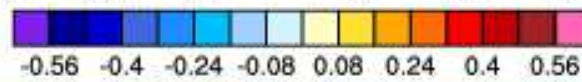
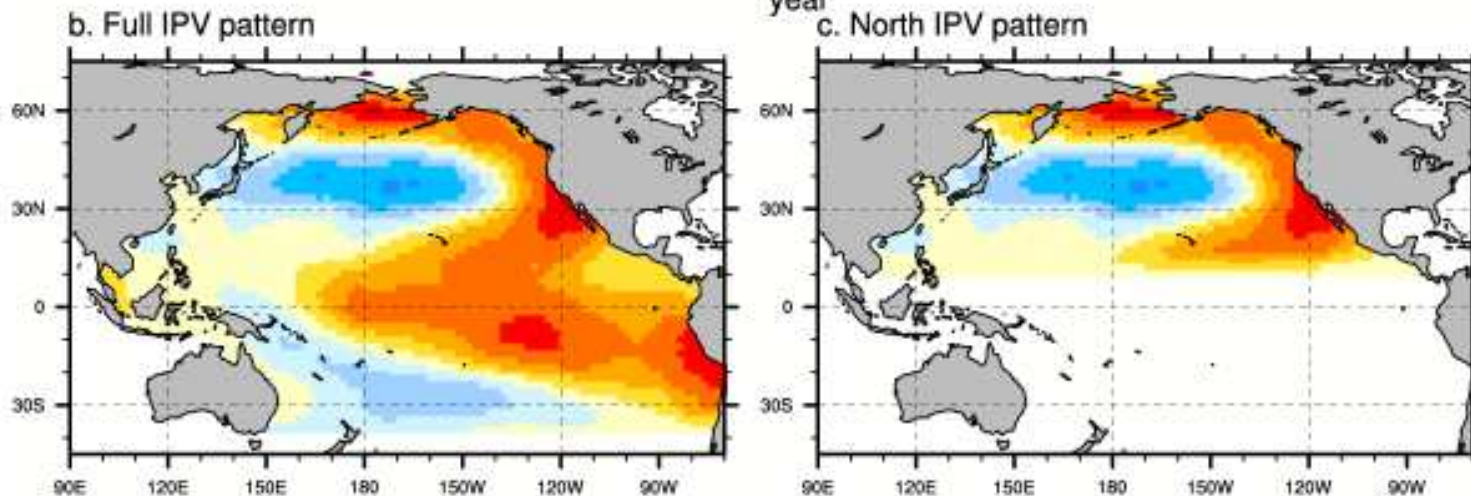
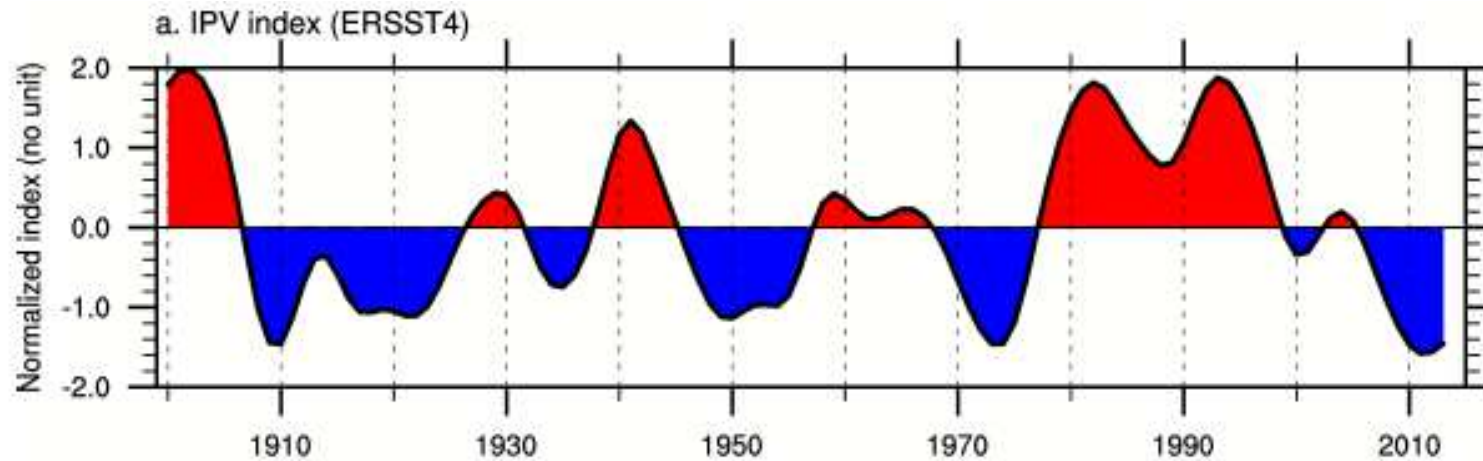
AMV/IPV experiments

- Protocol: ensemble coupled experiments with ocean basin SST restoring as planned in CMIP6 DCP-C
- Restoring towards the internal variability SST decadal pattern (forced signal removed through S/N EOFs)
- Patterns, notes and details on input4MIPs and on PRIMAVERA web site (see D5.1, updated recently)
- SSTs from ERSSTv4 (Huang et al. 2016)
- Positive and negative phases
- 10-year experiments and ensemble size ~25
- Compromise needed for high-resolution

AMV pattern



IPV pattern



σ_{IPV}

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Remaining questions

- Radiative forcing: pre-industrial in DCP-C or 1990's conditions as planned in PRIMAVERA?
- Flux restoring coefficient dQ/dT : $-40 \text{ W.m}^{-2}.\text{K}^{-1}$

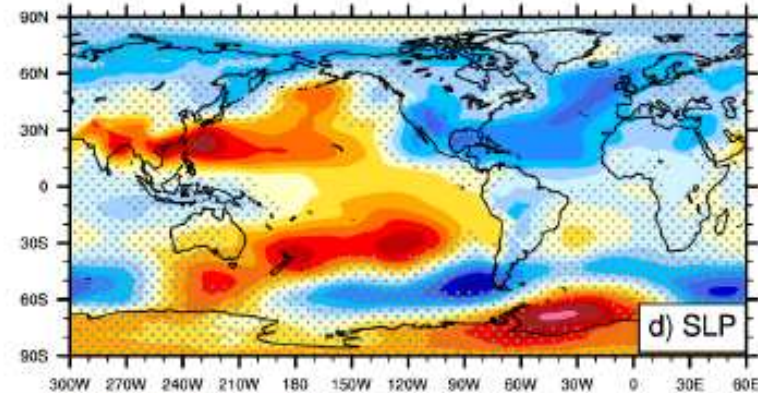
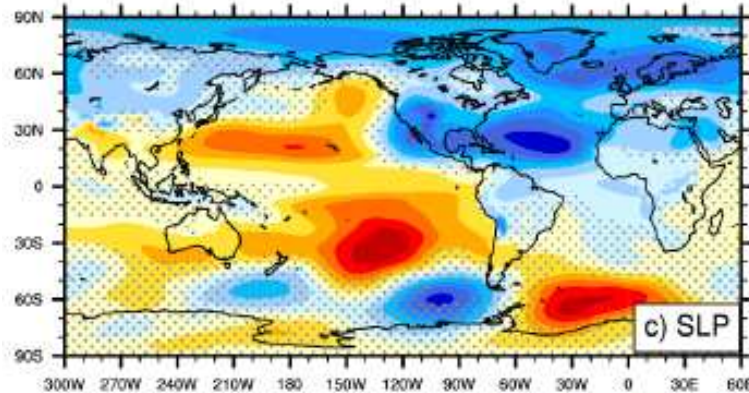
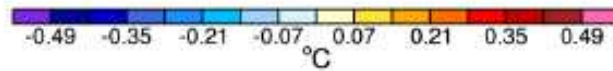
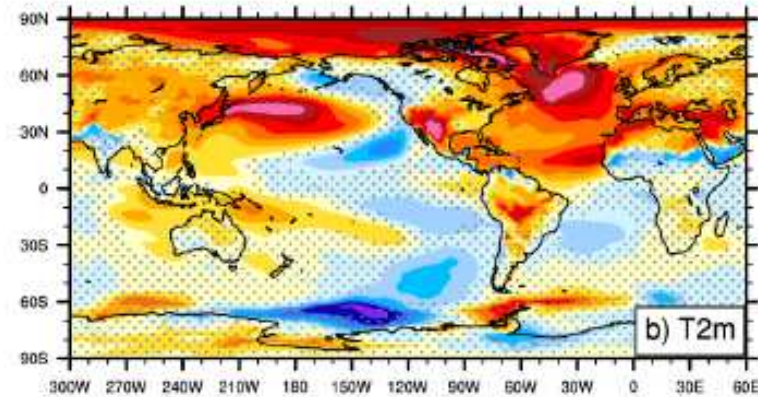
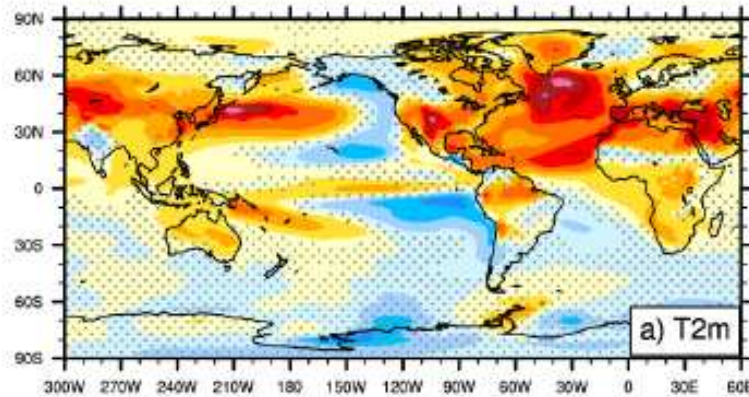
$$Q_{ns} = Q_{ns}^o + \frac{dQ}{dT} (SST_{MODEL} - SST_{TARGET})$$

- Or weight with mixed-layer depth ?
- SST_{TARGET} : DCP-C 1850 control climatology + AMV/IPV patterns. Use 1990 control instead ?
- Choose PDO or IPO ?

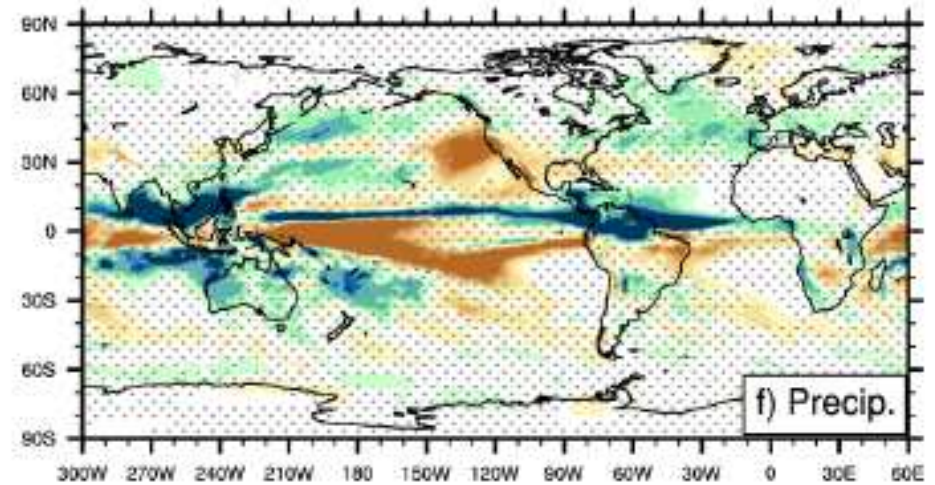
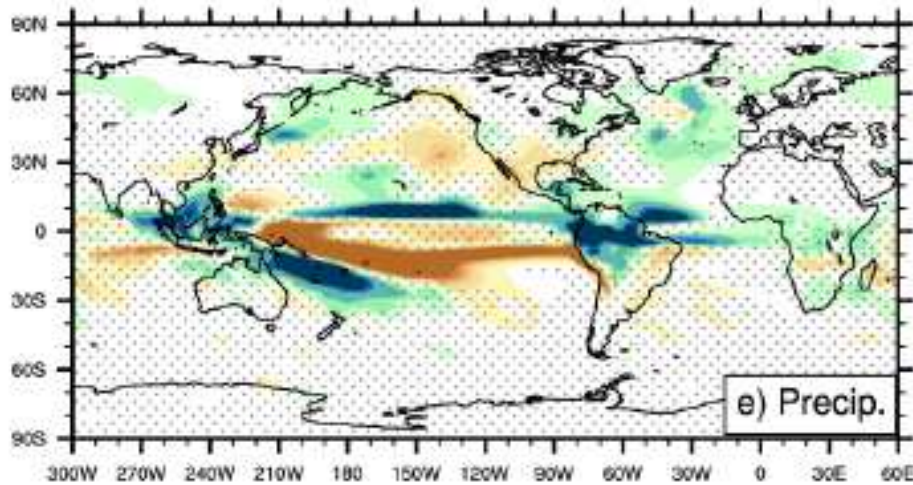
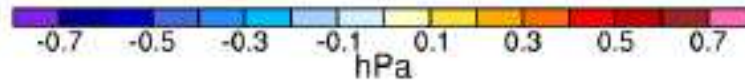
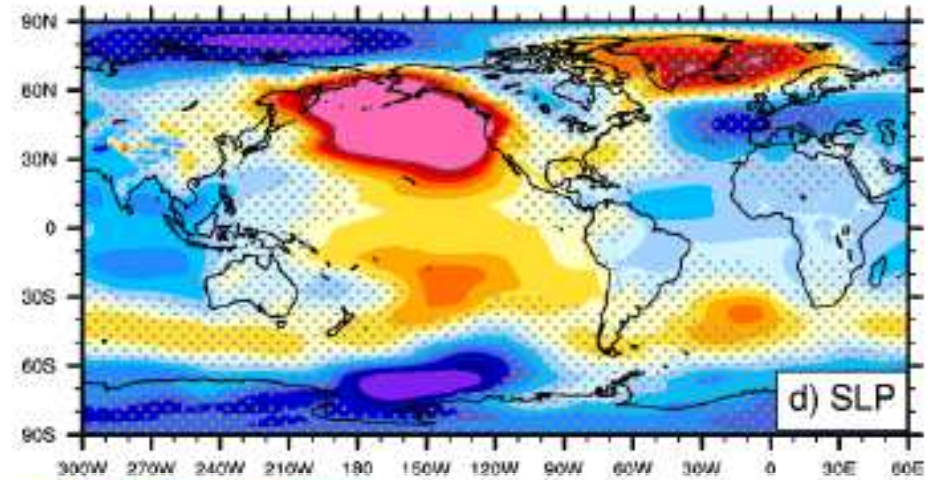
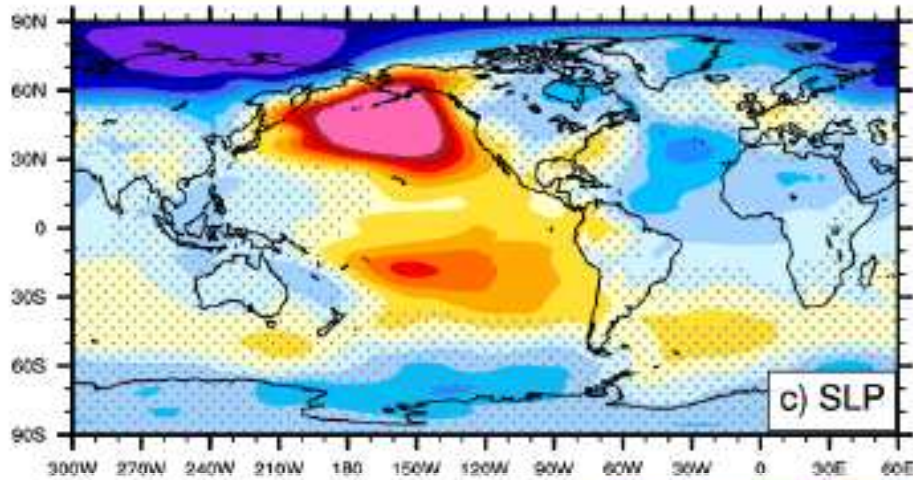
Results from US groups: summer

CM2.1 JJAS

CESM1 JJAS

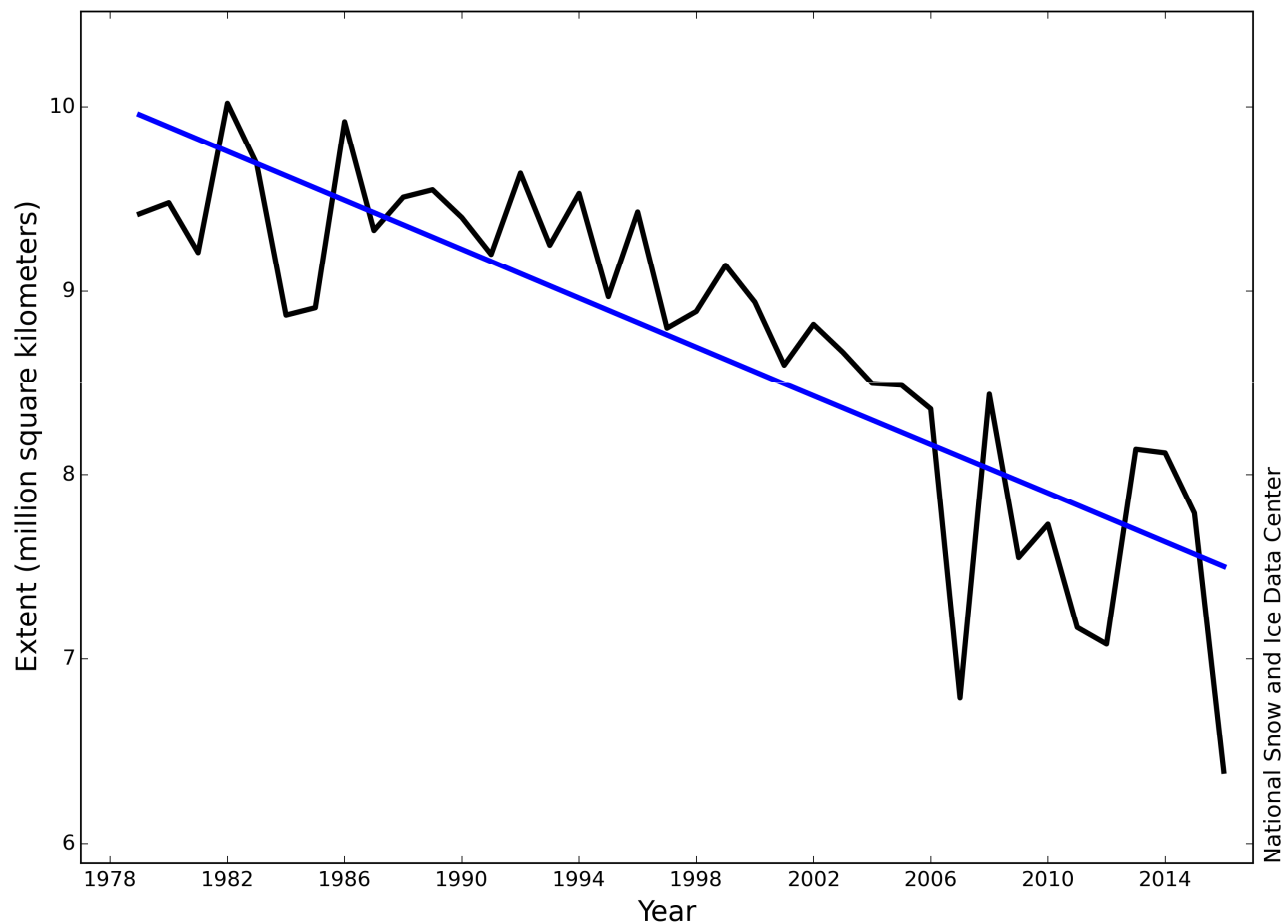


Winter



Arctic sea-ice

Average Monthly Arctic Sea Ice Extent
October 1979 - 2016



National Snow and Ice Data Center

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PRIMAVERA

Arctic sea-ice experiments

- Focus is recent period (1979-2016), not end of 21st century
- Both forced-atmosphere and coupled experiments
- Use HadISST2 SIE and SST data for the forced experiments
- Two options for forced and coupled experiments (final discussion and choice tomorrow !)

Arctic sea-ice: Forced Expts.

- AMIP-style: the control run is the WP6 AMIP simulation (1950-2015). The perturbed run (1991-2015) has observed SSTs and use sea-ice 1980's climatology (with SST adjustment in marginal points when sea-ice changes from observed). Ensemble size: 10, Nb years= 500
- Idealized-style: a 100-yr control experiment using SIC climatology (1979-1990, SIC_{clim}) and a 100-yr perturbed one with $SIC = SIC_{clim} + SIC_{diff}$ with SIC_{diff} being the 2005-2015 anomaly. SST climatology used in both experiments. Nb years= 400

Coupled experiments

- A la Deser et al. & Oudar et al.: use LW flux within sea-ice model or NS heat flux to restore sea-ice to values during two periods : e.g 2005-2015 and 1979-1990. Does not conserve energy and can induce AMOC adjustments
- a la Blackport and Kushner: modify all sea-ice code albedos instantaneously and run both control and perturbed experiments. Main effect in summer and autumn, small in winter.

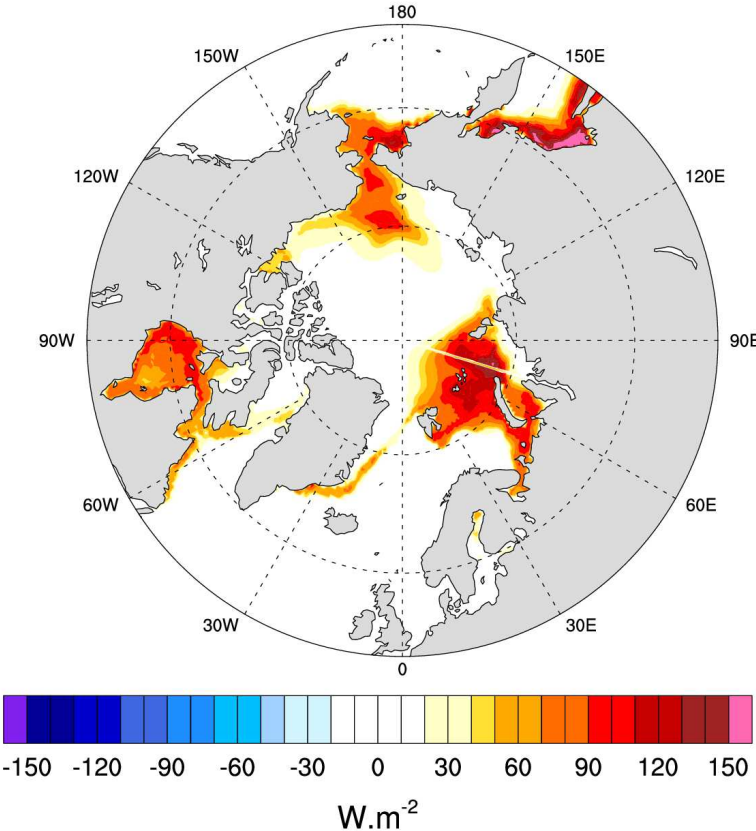
Flux correction

$$\beta \times (\text{FLUX TOTAL})$$

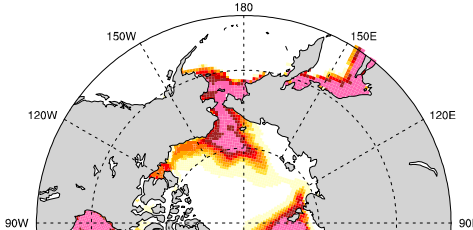
$$\beta = 0.6$$

Correction

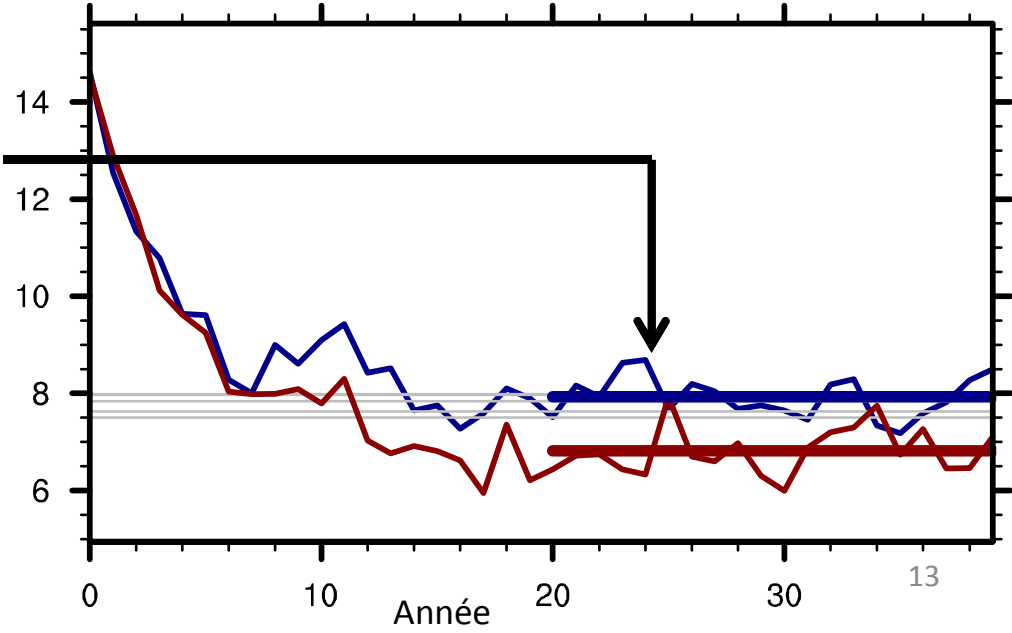
1.3



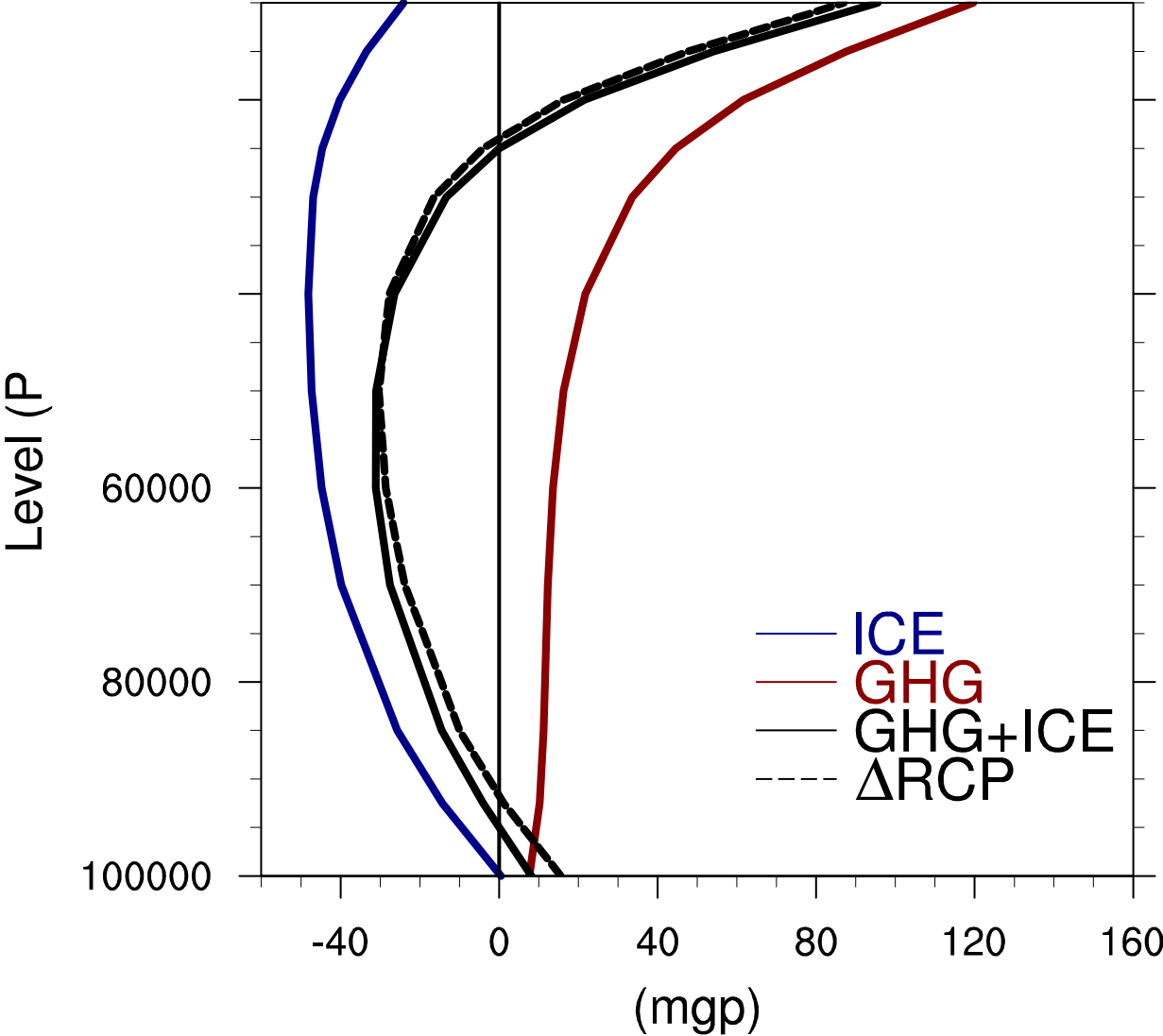
TOTAL FLUX

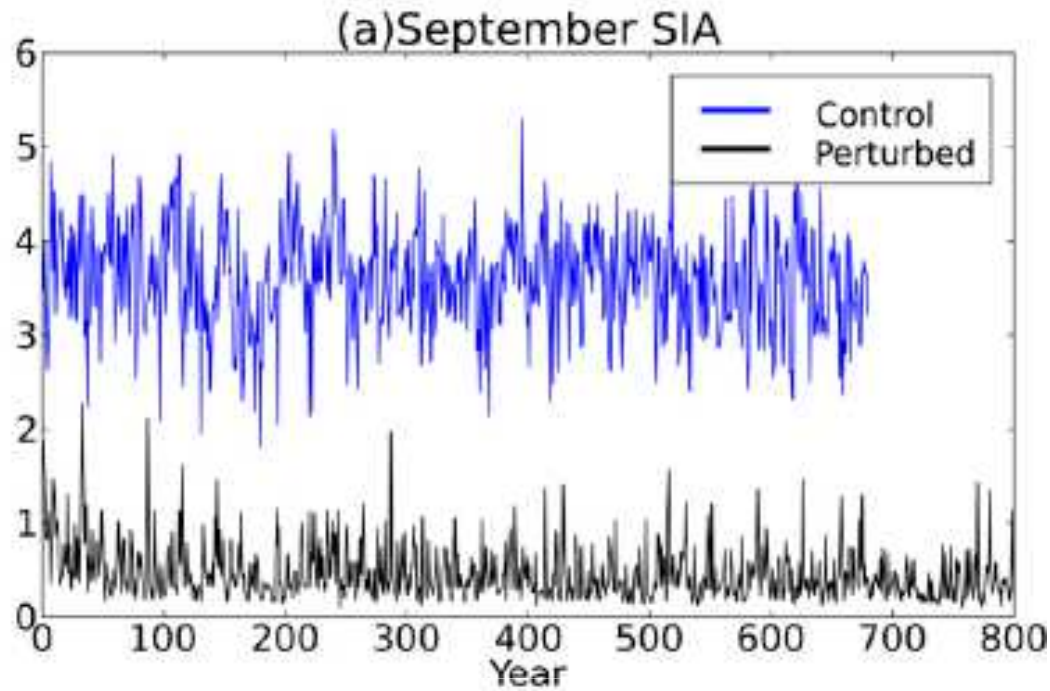


Sea-ice extent in january



NAM Response





Blackport & Kushner

