Comparative study of sea ice response from NEMO-LIM3 to two different atmospheric forcings

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Summary

A set of two hindcast simulations are run using the NEMO-LIM3 oceanic general circulation model (OGCM). The mean seasonal cycle amplitude of sea ice area is overestimated in both hemispheres, while the ice concentration in winter fits observations well.

Experimental setup

Two simulations, respectively denoted « DFS4 » and « NCEP » hereafter, are run according to the following procedure:

Model and parameters (both experiments)
We use the NEMO-LIM3 oceanic general circulation model. LIM3 (the sea ice component of the model) includes different ice thickness categories, brine entrapment and explicit drainage modeling.

Melting ice albedo has been set to 0.5; ice strength (P*) to 40 000 N/m.

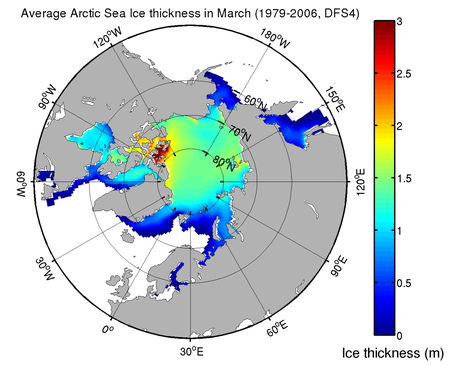
Spatial and temporal coverage (both experiments)
A tripolar ORCA1 grid is used (1° resolution). The simulations start in 1958 and run up to 2006 (DFS4) and 1986(NCEP).

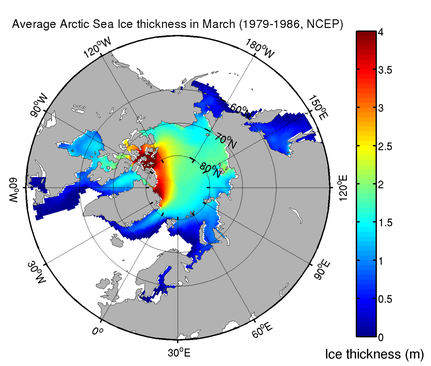
Initial conditions (both experiments)
Initial temperature and salinity fields for the ocean are used from Levitus climatologies (1998).

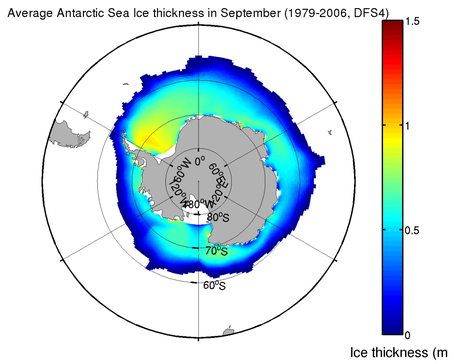
Atmospheric forcing
DFS4: We use the DFS4 data set developed by Brodeau et al. (2009).

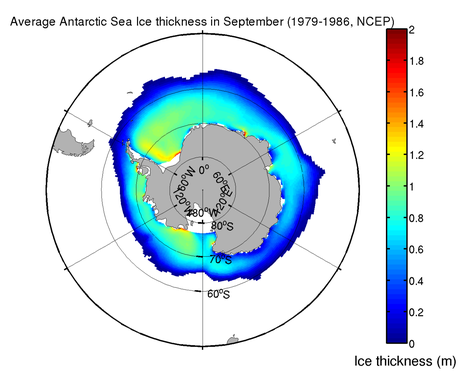
NCEP: Here data from the NCEP/NCAR reanalysis project are used (Kalnay et al., 1996), along with CLIO bulk formulation for precipitation, total cloudiness and specific humidity (see Vancoppenolle et al., 2009)

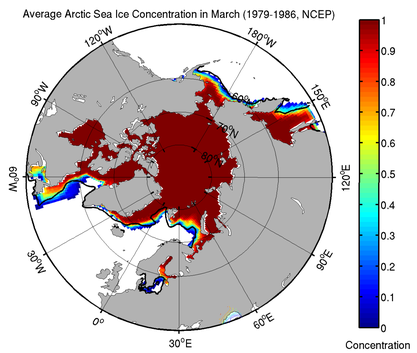
Results

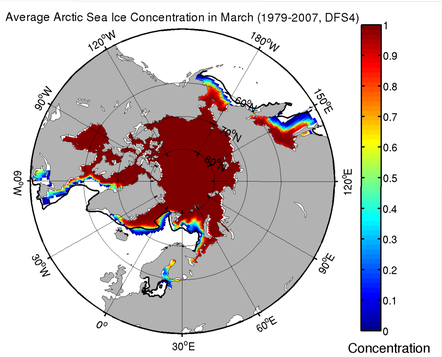


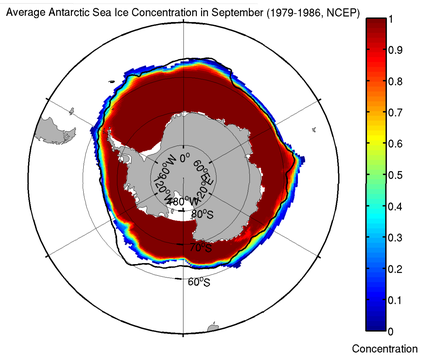


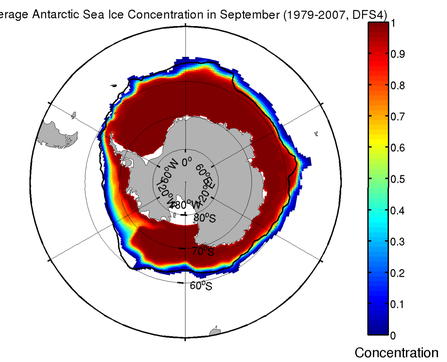




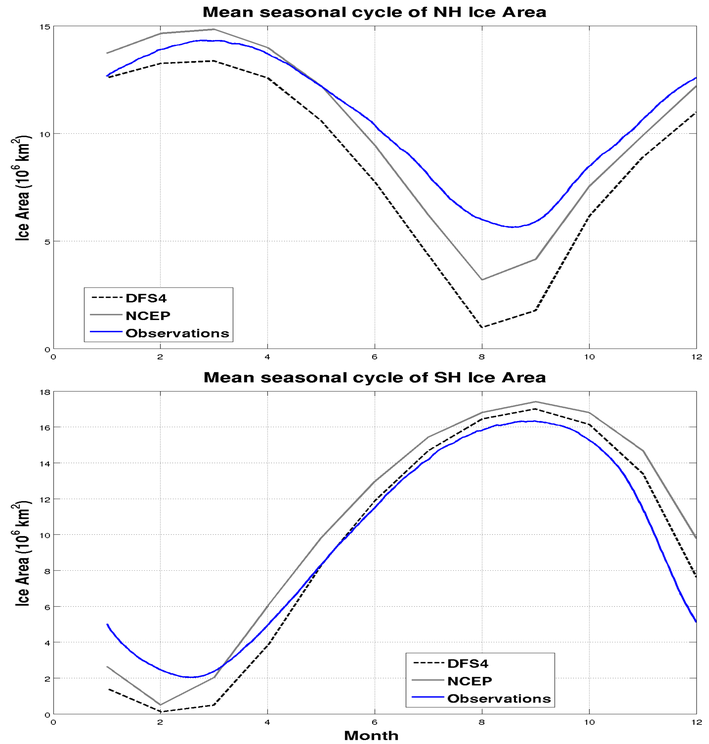








The black solid lines represent the observed mean ice edge (Comiso, 2007)



Remarks and perspectives

-Using a higher value for ice melting albedo could help maintain more ice during summer (both experiments)
-Sea ice cover shrinks drastically from 1986 onwards (for NCEP only). Particular attention will be paid to the salinity feedback term in the model.
-Re-runs of both experiments are currently being processed in order to (i) get rid of the model spinup effects and (ii) improve the model outputs through better parameter choices.

References

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