

Interactive comment on “How reversible is sea ice loss?” by J. K. Ridley et al.

D. Bailey (Referee)

dbailey@ucar.edu

Received and published: 6 October 2011

I have read the manuscript submitted by Ridley, Lowe, and Hewitt: "How reversible is sea ice loss?" I believe it would be acceptable after some fairly minor revision and of interest to the readers of the Cryosphere. The authors perform reversibility experiments in which the levels of CO₂ are increased to a level where no Arctic sea ice remains and then two experiments where the CO₂ is stabilized and the other where the CO₂ is ramped down at the same rate as the increase to pre-industrial levels. Some specific comments follow:

1. I'm sure the authors are aware of the recently published manuscript in which Armour et al. 2011 perform a very similar set of reversibility experiments with the NCAR Community Climate System Model version 3. I believe the results are complimentary, and this manuscript was likely submitted before the Armour et al. paper was published.

C1079

However, some text should be added to compare the results between the two models. I believe it would only strengthen the conclusions to find a similar result in more than one climate model.

2. There is a discussion of the Southern Ocean playing a role in the asymmetric hemispheric response in sea ice. However, there is no discussion of the Arctic Atlantic Layer. How well is this ocean layer simulated in the model? My understanding has been that this layer is the wild card in the Arctic Ocean sea ice change and a possible source of irreversibility. What happens to the Arctic mixed-layer and halocline at 4xCO₂ in the model? Is it still too strong for the warm Atlantic layer waters to penetrate the mixed-layer? Some additional text and possibly a figure here would be very helpful.

Armour, K. C., I. Eisenman, E. Blanchard-Wrigglesworth, K. E. McCusker, and C. M. Bitz (2011), The reversibility of sea ice loss in a state-of-the-art climate model, *Geophys. Res. Lett.*, 38, L16705, doi:10.1029/2011GL048739.

Interactive comment on The Cryosphere Discuss., 5, 2349, 2011.

C1080