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Comment

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

**J. K. Ridley et al.**

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Thank you for your comments.

1. The paper by Armour et al (2011) only can out after submission of this manuscript. I have now included reference to this paper and comments to the fact that this work is complementary in the sense that it confirms that another model shows no irreversible behaviour in the sea ice cover. In addition the 1000 year stabilisation period employed in HadCM3 shows that prolonged exposure to warming provides a lag in sea ice response but still no irreversible behaviour.

2. We see no evidence of a breakdown in the Arctic halocline in HadCM3. Heat uptake in the shelf seas contributes to the warming of the intermediate waters, but there is no mixing of these waters with the mixed layer in the central Arctic. brief statements to this effect (no new diagram) have been included.

C1439

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"The Arctic Ocean structure is defined in HadCM3 by the strong halocline at about 120m depth. Throughout the simulations a freshening of the surface waters maintains the halocline, with no evidence that it will be breached through enhanced vertical mixing. The Arctic warms at the surface and through advection at 300-700m depth but the two water masses remain decoupled and the intermediate waters have no discernible impact on the sea ice cover."

It is rather interesting that this behaviour of the Arctic is also present in our AR5 model, HadGEM2, and the ocean heat content accrued during CO<sub>2</sub> ramp-up diminishes only with export through the Fram Strait with no thermal communication with the surface.

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

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5, C1439–C1440, 2011

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