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Climate of the Past Discussions

Interactive comment on "South Atlantic island record reveals a South Atlantic response tothe 8.2 kyr event" *by* K. Ljung et al.

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Response to SC S450 : 'Sea ice-albedo feedback around 8.2 ka.'

1) I agreed that a freshwater induced THC reduction could cause a sea surface temperature (SST) increase in South Atlantic. To related the seesaw effect with this SST warming in South Atlantic, readers may wonder how much cooling in North Atlantic SST was caused by such a strong freshwater discharge (0.75 Sv over 20 years).

The maximum decrease in surface temperature over the North Atlantic amounts to more than -10°C over the main convection site South of Svalbard, which becomes covered by sea-ice after the local deep convection shuts down there. This has been discussed in detail elsewhere (Renssen et al. 2001; 2002; Wiersma Renssen, 2006), so we only briefly mention it in the present manuscript.

2) It was also shown in Wang and Mysak (2005) that the sea ice-albedo feedback, similar to ice-albedo feedback, could further contribute to an additional cooling of SST in North Atlantic. Both the freshwater caused initial SST cooling and sea ice-albedo feedback induced additional cooling of the North Atlantic SST should be considered and illustrated to support an annual SST warming of 0.2 to 0.5 degree C in South Atlantic. Since the sea ice-albedo feedback plays an important role in this bi-polar seesaw mechanism, I wish that authors could analysis the sea ice concentration in both North and South Atlantic regions in their model simulations.

The sea-ice area in the NH increases by 2.0x1012 km2 from 10.3x1012 km2 before the perturbation to 12.3x1012 km2 during the coldest century of the event. This is now briefly discussed in the revised manuscript. In the Southern Hemisphere the response in sea ice area is much smaller, as it decreases only slightly from 5.3x1012km2 to 5.0x1012km2 in the same period, which is consistent with the small warming in the Southern Ocean due to the bi-polar seesaw mechanism. The latter decrease is not statistically significant, and therefore we would argue that it is unlikely that the sea-ice albedo feedback in the Southern Ocean made a large contribution to the climate change around 8.2 ka at Nightingale Island. However, the enhanced sea-ice cover in the Arctic clearly contributed to the cooling in the Northern Hemisphere.

Interactive comment on Clim. Past Discuss., 3, 729, 2007.