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The primary goal of the Comment by Carlson and Clark (2008) appears to be to draw attention to the Carlson et al. (2007) paper, which disputes the findings of de Vernal et al. (1996). A joint reply focusing on significant issues with the) Carlson and Clark (2008) paper therefore appears appropriate.

De Vernal et al. (1996) applied the modern analogue technique to dinocysts to estimate sea-surface salinity (SSS) at the mouth of the St. Lawrence River at the onset of and during the Younger-Dryas (YD) event. Their data did not support the idea of enhanced freshening during the YD. Subsequently, Lowell et al. (2005) reported on an unsuccessful search for a viable route that could have been the spillway via which Lake Agassiz water made its way through the Great Lakes–St. Lawrence River system into the North Atlantic. This is consistent with de Vernal and others' conclusions.

Carlson et al. (2007) write "We corrected the Mg/Ca record in Globigerina bulloides [Gb] for sea surface temperature (SST) and salinity effects using an existing SST record (from de Vernal et al., 1996)." The idea that one may employ the results of one proxy to correct another is naïve. Dinocysts represent conditions in the photic zone where August SSS ranged from 30 psu to 31 psu (de Vernal et al., 1996). Planktic foraminifera such as G. bulloides could not have developed with such a low salinity. G. bulloides shells were either carried into the area by a saltier subsurface layer, as in the modern Gulf of St. Lawrence, or developed sporadically when suitable conditions prevailed.

Carlson et al. (2007) apply a dinocyst-inferred summer SST shift from ~8 °C to ~16 °C to the isotopic paleotemperature equation using an ^{18}O-record from Neogloboquadrina pachyderma, thus artificially producing a 2.75‰ drop in surface-water ^{18}O content and a salinity drop of more than 3 psu. Firstly, N. pachyderma requirements are incompatible with a 8–16 °C temperature range (they develop with T <<8 °C and S >34 or 34.5 psu; e.g., Kucera, 2007; Spindler, 1996). At high latitudes, N. pachyderma represents conditions toward the deeper portion of the pycnocline between the surface layer and the underlying water mass (the Labrador Sea Water in the modern North Atlantic, the North Atlantic Water Mass in the modern Arctic) (Hillaire-Marcel and Bilodeau, 2000; Hillaire-Marcel et al., 2004). It follows that the reconstruction of a salinity drop during the YD advocated by Carlson et al. (2007) is an artifact of (mis)interpretation.

The use by Carlson et al. (2007) of U/Ca ratios to label "a signal from the western Canadian plains" is odd. The data depicts a single brief excursion in the middle of the YD, not at its inception, inconsistent with the notion of a trigger from the west. Moreover, the modern St. Lawrence River system carries a U/Ca molar ratio of ~2×10^{-6} (Durand, 2000), compared with ~1.3×10^{-6} in seawater. There is no reason to believe that carbonate erosion was inactive in the St. Lawrence River area during the YD. It thus seems a stretch to argue that significant freshwater was being flushed through the system from the west based on this argument. The use of Sr isotope data in Carlson et al. (2007) is similarly questionable in view of the large array of Sr sources in regional rocks.

Carlson et al. (2007) conclude "the dinoflagellate-cyst salinity reconstruction for the St. Lawrence River is in error during the YD." If this were true, one would have thought that they might have been more cautious in using temperatures reconstructed with the same dinocyst transfer function, as assumed in their paper.

Carlson et al. (2007) contest the assumption that the meltwater flux through the McKenzie River outlet to the Arctic Ocean computed in Tarasov and Peltier (2005) could have caused the YD event, based upon the reference to Peltier et al. (2006). However, modern coupled atmosphere-ocean global climate models such as the NCAR (National Center for Atmospheric Research) CSM1.4 model used in Peltier et al. (2006) are heavily damped. Thus the magnitude of the freshwater forcing needed to cause a significant slowdown of the Atlantic meridional overturning circulation may be an overestimate. Their concerns regarding the carbon dating of freshening events in the Arctic also fails to recognize the issue of reservoir age for this interval of time.

Further support for Peltier (2007) and Tarasov and Peltier (2005) is provided by Darby et al. (2002), Moore (2005), Stokes et al. (2005), and Hillaire-Marcel and de Vernal (2008).

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