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A changing $\delta^{44/40}$Ca temperature sensitivity of *N. pachyderma* (sin.) in the Nordic Seas reveals new insights in Mg/Ca temperature overestimations

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The high temperature sensitivity of the $\delta^{44/40}$Ca signature in the polar to subpolar planktonic foraminifer *N. pachyderma* (sin.) (change of 0.2 per mill $\delta^{44/40}$Ca per degree Celsius) found in previous studies has turned out to be robust and reproducible in the North Atlantic and Norwegian Sea. However, in the western part of the Nordic Seas which is characterized by cold and low saline polar waters, $\delta^{44/40}$Ca ratios of *N. pachyderma* (sin.) are fairly insensitive to temperature variations, reflecting the weak $\delta^{44/40}$Ca temperature dependency found in other planktonic foraminifer species. The comparison of two independent carbonate proxies, $\delta^{44/40}$Ca and Mg/Ca, reveals that this shift back to the weak $\delta^{44/40}$Ca temperature sensitivity in polar waters is accompanied by an increase of Mg/Ca ratios by a factor of about 2 relative to the 'expected' values. Hence, Mg/Ca ratios tend to overestimate sea surface temperatures of polar waters by up to 10˚C. The turnover between the two $\delta^{44/40}$Ca temperature sensitivities of *N. pachyderma* (sin.) is precisely described by the boundary between the Arctic Domain in the central Nordic Seas and the Atlantic inflow into the Norwegian Sea. A threshold is described by salinities of approx. 34 psu and water temperatures of about 3˚C. We suggest that both, the incorporation of "excess" Mg into the shell and the switch between the two $\delta^{44/40}$Ca temperature sensitivities, are linked by a common control mechanism of the foraminiferal metabolism.