A DOC reservoir in the Furongian Series

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Numerical modelling of paired carbon-sulphur isotope data indicates that the Steptoean Positive Carbon Isotope Excursion (SPICE) in the Paibian Stage of the Furongian Series may record transient increases of primary productivity and preservation of organic carbon (Gill, et al 2011). However, organic-rich black shales associated with SPICE were sparsely found. There is no denying that high primary productivity and removal of ^{13}C-depleted CO_2 are still the driving mechanism of the positive excursions. When the positive $\delta^{13}C$ excursion was associated with falling sea-level and an expansion of carbonate platform, massive organic carbon should be restricted to deep basins or deep oceans. Thus, a possible interpretation for the lack of organic-rich black shales during SPICE could be that, a large dissolved organic carbon (DOC) reservoir was developed in the deep ocean during the Furongian, similar to what has been documented in the Late Cryogenian, Ediacaran and Early Cambrian (Swanson-Hysell et al., 2010; McFadden et al., 2008; Ishikawa et al., 2013).

Paired $\delta^{13}C_{carb}$-$\delta^{13}C_{org}$ from the Furongian strata in the Tarim Basin, together with many other published data from time-equivalent strata globally (Buggisch et al., 2003; Saltzman et al., 2011), suggest that the decoupled or weak co-varying $\delta^{13}C_{carb}$-$\delta^{13}C_{org}$ may record a resurgence of a large oceanic DOC reservoir during the Furongian Series, within a period of 10~12 Ma. The shift from coupled to decoupled $\delta^{13}C_{carb}$-$\delta^{13}C_{org}$ at the base of the Furongian Series may indicate the onset of an increasing DOC reservoir, while the shift from decoupled to coupled $\delta^{13}C_{carb}$-$\delta^{13}C_{org}$ may suggest the terminal of the Furongian DOC reservoir in the Early Ordovician.

[1] Buggisch et al. (2003) *Palaeogr, Palaeoclimatol, Palaeoecol* **195**,357-373. [2] Gill et al. (2011) *Nature* **469**, 80-83. [3] Ishikawa et al. (2013) *Precambrian Res* **225**, 190-208. [4] McFadden et al. (2008) *PNAS* **105**, 3197-3202. [5] Saltzman et al. (2011) *PNAS* **108**, 3876-388. [6] Swanson-Hysell et al. (2010) *Science* **328**, 608-611.