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Glaciations of the terminal Ediacaran in northern and northwestern China: implications of the diamictites for palaeogeography and tectonics

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The consensus is that there were three major glaciations in the Neoproterozoic, namely the 715 Ma (Sturtian: early Cryogenian), 635 Ma (Marinoan: late Cryogenian) and 580 Ma (Gaskiers: Ediacaran) events. In spite of this threefold subdivision, no terminal Ediacaran glacial deposits (i.e. younger than the Gaskiers glaciation) have been thus far reported, although there is a negative shift of δ13Ccarb (the Shuram event) to account for. Diamictites of Ediacaran age crop out in a 2500 km long range fringing the southern, southwestern and northwestern flanks of the North China craton (NCC), as well as in the Qaidam and Tarim basins of Northwest China. Diamictites and siltstones bearing ice-rafted debris (IRD), striated pebbles, and sitting on striated pavements measure tens of metres thick. They are characteristically gray-white or purple-red. These rocks are interpreted as continental glacier sediments and marine ice-rafted deposits. They rest upon underlying Mesoproterozoic rocks of 1.6-1.5Ga age, indicating a paraconformity and a hiatus of >1.0 Ga hiatus. The Ediacaran glacial deposits are directly overlain by phosphorus-bearing sandstone deposits of the earliest Cambrian in an apparently conformable sequence. There is no hiatus between the diamictites or IRD-bearing silt and overlying phosphorus deposits of the earliest Cambrian. δ13Ccarb data from the diamictites and interbedded siltstones show a remarkable negative shift. Previous researchers suggested that these diamictites should be correlated to the Gaskiers glacial deposits and in particular the 551 Ma Shuram negative δ13C shift. On the basis of stratigraphy, sedimentology, paleontology and geochemistry (δ13Ccarb), however, we propose that the widespread diamictites in the NCC and possibly in NW China are of terminal Ediacaran age. This raises the prospect of a common, terminal, Ediacaran glaciation across the NCC, the Qaidam block and Tarim Craton. If this is the case, it could be hypothesized that in terms of palaeoclimate, palaeogeography, and tectonic setting they may have been more closely connected than previously thought.