Towards the establishment of a complete lithostratigraphy of the Lower Triassic deep-sea chert gap

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Carboniferous to Jurassic pelagic deep-sea sediments that accumulated in the pelagic Panthalassa Ocean are mostly dominated by bedded chert, which contains abundant radiolarian tests (Matsuda and Isozaki, 1991). However, the Lower Triassic interval is characterised by grey and black siliceous claystone instead of bedded chert (the deep-sea chert gap) (Ishiga and Yamakita, 1993; Isozaki, 1997). Previously, it has been believed that siliceous claystone was deposited because of diminished radiolarian production during oceanic anoxia: black siliceous claystone of the uppermost Permian to Induan was assumed to reflect oceanic anoxia related to the end-Permian mass extinction, and grey siliceous claystone below and above it was assumed to represent a less prominent oxygen depletion (e.g. Isozaki, 1997). Contradictory to this hypothesis, the estimation of burial fluxes of clastic material and biogenic silica in the Spathian (upper Olenekian) siliceous claystone dominant lithofacies implies that the increase in the flux of clastic material, rather than decreased radiolarian production, was the origin of the deep-sea chert gap (Muto et al., JpGU meeting 2016). Furthermore, black siliceous claystone has recently been reported from the lower Spathian (Yamakita et al., Annual meeting of the Paleontological Society of Japan 2016) and the Lower-Middle Triassic boundary (Muto et al., JpGU meeting 2015), indicating that black siliceous claystone is not confined to the uppermost Permian to Induan interval of the deep-sea chert gap. Despite these recent advancements, compilation of lithostratigraphy covering the entire deep-sea chert gap has not been conducted to date. In this study, the lithostratigraphy of previously reported sections covering the deep-sea chert gap, along with new data from the Ryugadake section in Kyoto Prefecture are compiled. In the Ryugadake section, an approximately 2 m thick black siliceous claystone of unknown age is apparently overlain by an approximately 20 m thick grey siliceous claystone dominant lithofacies of upper Spathian age. The compiled sections are constrained by conodont biostratigraphy, which provides the biostratigraphic framework to correlate between distant sections.
The compilation of the lithostratigraphy of the deep-sea chert gap reveals three main features that were previously undernoted:
Firstly, black siliceous claystone occurs in multiple regions in the lower Spathian and probably across the Lower-Middle Triassic boundary. This implies that oxygen-poor depositional condition similar to that detected from the Induan black siliceous claystone is likely to have occurred in the early Spathian and at the Lower-Middle Triassic boundary.
Secondly, the thickness of the Griesbachian (lower Induan) to Smithian (lower Olenekian) interval also predicts a high sedimentation rate compared to bedded chert. The combined thickness of this interval seems to be at least over 15 m, which would mean a linear sedimentation rate greater than 6.7 m/Myr, higher than that of Middle Triassic to Lower Jurassic bedded chert (1.4 m/Myr; Ikeda and Tada, 2014). This implies that increased flux of clastic material to the pelagic realm was a phenomenon characteristic during the entire Early Triassic, not just the Spathian.
Thirdly, there is considerable lateral variation in the lithofacies of the deep-sea chert gap. The upper Spathian of the Ryugadake section is mostly composed of grey siliceous claystone dominant lithofacies with thin intercalations of black siliceous claystone and almost no chert. The contemporaneous interval in the Tsukumi composite section in Oita Prefecture is composed mainly of red and grey siliceous claystone dominant lithofacies with thin intercalations of grey chert and almost no black siliceous claystone. The

lateral variation in lithofacies must be taken into account when the sedimentary record of the pelagic deep-sea sections is used to investigate regional or global scale palaeo-environment.

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