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Katian (Upper Ordovician) – Aeronian (Lower Silurian) carbon isotope excursions in South China

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The Upper Ordovician Wufeng Formation and the lower Silurian Lungmachi Formation are widely distributed on the Yangtze Platform in South China [1], and have been recognized as two major hydrocarbon source rocks in the shale gas investigation recently [2]. Both the Wufeng and Lungmachi formations are mostly composed of black carbonaceous shale intercalated with siliceous shale and silty shale. About 20 layers of bentonites have been identified from the Wufeng Formation and six from the basal Lungmachi Formation [3]. The black shale yields abundant and diverse graptolite fauna, based on which an internationally correlated biozonation has been recognized. The Wufeng Formation ranges from the graptolite *Dicellograptus complanatus* Biozone of the upper Katian Stage to the *Metabolograptus extraordinarius* Biozone of the lower Hirnantian Stage, spanning a stratigraphical interval of four biozones [4]. The Lungmachi Formation ranges from the *Metabolograptus persculptus* Biozone of the upper Hirnantian Stage to the *Spirograptus guerichi* Biozone of the basal Telychian Stage, spanning a stratigraphical interval of nine biozones [1].

Samples of two drill cores of the Wufeng and Lungmachi formations were collected and analysed for geochemical data. The graptolite biozonation has been well recognized based on the graptolite specimens collected. The $\delta^{13}\text{C}_{\text{org}}$ values increase from -30.16‰ at the *Paraorthograptus pacificus* Biozone to -29.45‰ at the *Metabolograptus extraordinarius* Biozone, which represents the positive Hirnantian isotope carbon excursion (HICE) recorded in South China [5] and elsewhere [6]. The $\delta^{13}\text{C}_{\text{org}}$ values decline rapidly to -30.00‰ in the lower part of the *Metabolograptus persculptus* Biozone and then fluctuate gently between -30.53‰ and -30.01‰ through the *Akidograptus ascensus* Biozone to the middle *Cystograptus vesiculosus* Biozone. A small positive shift of ca. 0.7‰ was recorded in the middle and upper parts of the *Cystograptus vesiculosus* Biozone, which is followed by another small positive excursion of ca. 0.76‰ in the lower *Coronograptus cyphus* Biozone. Then the $\delta^{13}\text{C}_{\text{org}}$ values show minor fluctuation between -29.13‰ to -28.61‰ till the basal *Stimulograptus sedgwickii* Biozone. In the lower *Stimulograptus sedgwickii* Biozone, a significant positive excursion of $\delta^{13}\text{C}_{\text{org}}$ can be readily recognized, with which the $\delta^{13}\text{C}_{\text{org}}$ reaches its highest value (-28.01‰).

The organic carbon excursions preserved in the black shales in South China can be correlated globally and used as standards for stratigraphic correlation of upper Katian – uppermost Aeronian.

References:

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