



## **Carbon isotopic variation across the Livello Selli black shale: paleoenvironmental implications for the early Aptian anoxic event (OAE-1a)**

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We determined stable isotopic composition of carbonate and organic carbons across a sedimentary sequence in central Italy that includes Livello Selli black shale, deposited at the Western Tethys during the Early Aptian oceanic anoxic event (OAE-1a). The OAE-1a interval is subdivided into Selli black shale (1.3 m thick) and the underlying 50 cm-thick interval (termed Lower Critical Interval; Coccioni et al., 1992). They consist of an alternation of dark (organic-rich) and light (organic-poor) beds, which contrasts sharply with adjacent white chalk intervals. We observed a negative shift of organic carbon isotopic ratios from -23 to -28 per mil across the Lower Critical Interval, which is characterized by a stepwise pattern involving at least three sharp negative shifts. After the stepwise negative excursion, the organic carbon isotopic ratios indicate a fluctuation in the lower part of the Livello Selli, which is followed by a steep positive excursion up to -21 per mil in the upper part of the Livello Selli. The couplet of negative-positive excursions corresponds roughly to the globally recognized isotopic variation in other sites such as western Tethys (Menegatti et al., 1998) and central Pacific (Dumitrescu and Brassell, 2006). Therefore, the couplet of negative-positive excursions would reflect the global isotopic change of inorganic carbon dissolved in surface water. The positive isotopic excursion can be simply explained by a significant increase in relative accumulation rate of organic carbon which is depleted in  $^{13}\text{C}$ , resulting in a depletion of  $^{12}\text{C}$  in the ocean-atmosphere carbon budget. On the other hand, however, several scenarios are possible to explain the stepwise negative excursion as follows; 1) upwelling of isotopically light carbon dissolved in intermedi-

ate water, 2) dissociation of hydrate which resulted in a massive release of methane, and 3) release of huge amount of isotopically light CO<sub>2</sub> from mantle reservoir via flood basalt volcanism. Either of these events would have occurred repeatedly, at least three times, at the onset of the OAE-1a. In the presentation we also evaluate these possibilities on the basis of correlation between the carbon isotopic data and other geochemical records such as osmium (Tejada et al., 2006) and lead isotopic compositions determined in the same stratigraphic level.

#### References

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