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Impact of the degradation of organic matter on the Hg/TOC ratio in the Bonarelli Level (Cenomanian-Turonian boundary interval): implications for deep-time investigations

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Mercury (Hg) enrichments in sediments are more and more used as a tracer for distal volcanism. Changes in organic-matter deposition affect changes in Hg sequestration in sediments. In this study we evaluate the potential role of organic-matter degradation on the sequestration of Hg in sediments. For this we investigate uppermost Cenomanian-lowermost Turonian sediments, which include the organic-rich Bonarelli Level, and which are exposed at Furlo (Umbria Marche Basin), Manilva (Subbetic Basin), Monte Velo (Trento Platform), and El Chorro (Betic Cordillera). In all sections, the Bonarelli Level is marked by significant increases in Hg contents of up to 860.7 ppb. The lower Hg/total organic carbon (TOC) ratio at Furlo and Manilva suggests important Hg drawdown during organic-matter (OM) deposition. Pyrolysis data indicate that preserved OM mainly corresponds to type-II OM, i.e. of marine origin. On the opposite, three significant positive Hg/TOC excursions persist at El Chorro and Monte Velo. There, the samples from the Bonarelli Level with moderate TOC contents (from 0.14 to 2.73 wt. %) exhibit low HI values in the field of type-III OM. This resulted from the weathering of marine OM type II to type III. The degradation of OM affected the TOC contents and related HI values but not the Hg content, which adsorbed onto OM during sediment deposition. Consequently, the high Hg/TOC ratios observed at El Chorro and Monte Velo do not correspond to realistic values and general care is needed in relating Hg to TOC contents, especially in analysing samples from outcrops exposed to weathering.