Controls on biomarker and carbon isotope patterns during the Toarcian anoxic event  
(Dormettingen section; Swabian Alb)

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The Toarcian oceanic anoxic event (T-OAE) is associated with a prominent negative carbon isotope  
excursion (CIE; ~183 million years). About 10-m-thick organic matter-rich sediments accumulated during  
the T-OAE in the Southwest German Basin (SWGB). Rock–Eval, maceral and biomarker analysis were  
used to determine variations of environmental conditions across the CIE interval. Carbon isotope  
records were determined for various n-alkanes, pristane and phytane to contribute to the reconstruction  
of the paleo-environment and to study the factors controlling molecular δ¹³C values. Geochemical redox  
indicators provide evidence for photic zone anoxia during the Toarcian CIE, which reached its maximum  
after deposition of the “Unterer Stein” marker horizon. The 2α-methylhopane index suggests enhanced  
activity of diazotrophic cyanobacteria, which is also supported by nitrogen isotope data. This  
distinguishes the SWGB from other Toarcian basins with black shale deposition. Oxygen-depleted  
conditions, albeit with lower intensity continued after the CIE. All investigated organic compounds  
replicate the negative CIE, but the magnitudes vary considerably. The largest shift is observed for n-  
C27 (9 ‰) and reflects the combined effect of the global CIE and a major change in organic matter input  
termination of terrigenous organic matter input). The shift for short-chain n-alkanes, pristane, and  
phytane, interpreted to reflect marine biomass, varies between 4.5 and 5.0 ‰. This is the highest value  
observed so far for any Toarcian section. δ¹³C values of pristane and phytane reach a minimum near  
the base of the CIE interval and increase upsection. Thus, the maximum negative isotope shift predates  
the strongest basin restriction by about 450 thousand years.