## Hydrocarbon potential of Permo-Carboniferous rocks (Weiach, Switzerland)

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In order to quantify the source rock potential of the Permo-Carboniferous succession in the subsurface of the Molasse Basin, the organic matter of coaly and shaly rocks was characterized. In addition, the investigation provides information on the depositional environment. To meet this objective, elemental analysis, Rock-Eval pyrolysis, maceral and palynofacies analysis, biomarker and carbon isotope distributions were performed. 91 samples from the Weiach-1 well representing Carboniferous (Coal Series) and Permian (Lacustrine Series) sediments within the Constance-Frick-Trough were studied. The investigated Carboniferous Coal Series is about 200 m thick and thermally mature. Shaly sediments within the Coal Series contain on average 5.6 wt.-% TOC and gas-prone type III kerogen with an average HI of 130 mg HC/g TOC. Several coal seams occur within the Coal Series, including a main seam with a thickness of ~5 m. The coals have an average TOC of 65 wt.-%. The average HI of all coal samples is 213 mg HC/g TOC and classifies the organic matter as type III kerogen. Hence, the coal seams have a high gas potential. The Lacustrine Series of the Permian succession contains sandstones and shales and is 136 m thick. The average TOC of shale samples is 3.6 wt.-%. Strongly varying HI values (21–480 mg HC/g TOC) show that the organic matter in shales containing different kerogen types resulting from mixing of terrestrial organic matter and different amounts of autochthonous algal material. An approximately 12 m thick shale succession contains on average 4.5 wt.-% TOC. Its organic matter is predominantly oil-prone type II kerogen. Consequently, this interval has a very good petroleum potential. The maturity of the Lacustrine Series (Rr: 0.58–0.76) is within the (early) oil window. Biomarker and isotope data have been determined for the 12-m-thick shale interval. Biomarker indices indicate that oxygen availability decreased during deposition of this interval and that the sources of the organic matter changed. Changes in organic matter type are also supported by palynofacies data and maceral assemblages. $\delta^{13}C$ values of pristane and phytane decrease upwards (-30.33 to -28.47 ‰). This shows a change in the aquatic $CO_2$ reservoir. Plots of isotope ratios of n-alkanes versus their chain length reflect the different organic matter sources.