Geochemistry and isotope geochemistry of Upper Cretaceous chalk as equivalent for reservoir chalk of the North sea Basin for EOR

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Upper Cretaceous chalk from five exposures (Kansas, USA; Liège and Mons, Belgium; Aalborg and Stevns Klint, Denmark) have been sampled for comparison with reservoir chalk of the North Sea Basin (Tor and Hod Formations at Ekofisk, Brynhild, Enoch, Sleipnir and Jotun fields) of similar porosity in order to understand its reaction in flooding experiments for enhanced oil recovery (EOR). Chalks from Stevns Klint and Mons are very pure and contain like samples from Aalborg only few amounts of clastic material. The latter has abundant diagenetic chert. Liège and Kansas chalk contain the highest amount of clastics. Kansas chalk is particular, as it has reached the highest diagenetic grade, has higher concentrations in trace metals like Fe, Ni, Pb, Zn, Cu than all other chalk types and shows disturbed O-isotopes. This can be explained by abundant secondary micritic and sparitic cement in foraminifer shells. In contrast, C-O isotope values for all other on-shore chalk samples reflect primary seawater composition. This cannot be found in reservoir chalk. Here, O-isotopes are disturbed and similar to samples from Kansas. In some fields (Sleipnir and Jotun fields) trace metal compositions are also enriched and the chalk contains slightly higher amounts of clastic materials (Zr & Rb concentrations 2-5% of typical upper continental crust) and generally higher ΣREE concentrations with lower Y/Ho ratios (29-44) than in all on-shore samples. A post-depositional process affected the reservoir chalk, hence, in disturbing the O-isotope signature and affecting slightly the REE pattern, which is not related to clastic input. Chalk from Kansas shows a higher diagenetic overprint which explains the re-setting of the O-isotopes, but for the re-setting of the O-isotopes in reservoir chalk a reason have still to be found.

Provenance of Eolian Deposits in Desert-Loess Transition, North China by using Nd-Sr isotopic tracers

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The desert-loess transition of China is very sensititive to climate change. Many studies on desert evolution and loess formation have been carried out in recent years[1]. However, the provenance of late Quaternary deposits in the desert-loess transition is not yet known. Here, we present Nd-Sr isotopic data of coarse-grained sands in the Dishaogouwan (DSGW) profile in the transition between Ordos deserts and Chinese Loess Plateau to identify the source of eolian deposits during the past 20ka.

The DSGW profile mainly consists of Dishaogouwan (DSGW), Dagouwan (DGW), Chengchuan (CC), Salawusu (SW) and Lishi (LS) Formations. The Salawusu Formation was aqueous but other formations were predominantly of eolian origin. $\varepsilon_{Nd}(0)$ values and $^{87}Sr/^{86}Sr$ ratios of coarse-grained fractions vary from -8.4 to -12.5 and from 0.7169 to 0.7199 in DSGW and DGW, from -9.1 to -11.5 and from 0.7179 to 0.7192 in the CC, from -10 to -12 and from 0.7188 to 0.7206 in SW and from -10.5 to -12.7 and from 0.7183 to 0.7190 in LS, respectively.

80% ~ 90% of the eolian deposits developed in different periods were coarse-grained fractions. $\varepsilon_{Nd}(0)$ values and $^{87}Sr/^{86}Sr$ ratios of coarse-grained in the Formations which were dominated by eolian deposits vary within a narrow range, implicate for a similar source. Furthermore, the coarse-grained fractions merely sprang and rolled on the earth's surface by the wind[2]. So, eolian deposits in these Formations might be fed by sediment blowing of adjact highland or mechanical weathering of the sandstones in Ordos. Contrastly, the aqueous deposits of SW was dominated by fine-grained fractions, and water erosion of underlying depoists probably dominated coarse aqeous deposits of sw. $\varepsilon_{Nd}(0)$ values and $^{87}Sr/^{86}Sr$ ratios of coarse-grained in SW don't have a obvious difference with the values of eolian deposits. However, there are rarely coare-grained fractions in Loess plateau from where salawusu valley originated. So underlying eolian deposits with abundant coarse-grained fractions could supply the aqueous deposits with coarse-grained fractions.

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