ICAM8 Abstracts

Lower Mesozoic paleogeography of circum-Arctic basins

Correlation of the Triassic deposits of Chukotka, Wrangel Island and Mendeleev's Rise.

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Mineral-petrographic, geochemical, geochronological data of sandstones of Mendeleev Rise, Wrangel Island and continental Chukotka have been studied. The composition of sandstones and geochronological age of detrital zircons are similar for these three objects. At the same time, there are certain differences in the depositional environments. The sandstones of the Mendeleev's Rise are characterized by a high content of detrital quartz with microfractures, which indicates the genesis from continental land. The number of quartz grains with microfractures decreases from Mendeleev Rise to Wrangel Island and Chukotka. Geochemical and petrographic parameters of sandstones indicate the gradual maturation of sandstones from continental Chukotka to Mendeleev Rise. In the samples from Mendeleev Rise, there is no geochemical evidence of redeposition of clastic material, and weathering of sources rocks, which indirectly indicates the absence of significant tectonic rearrangements in the feeding province and its prolonged exposure.The sandstones of the Mendeleev Rise were deposited in the coastal-marine, near-continental environment. The paleogeographic setting were more marine in the south, from Wrangel Island to Chukotka region. Geochronological data show that all analyzed samples are characterized by practically identical populations of zircons. The young population of zircons is 234-282 Ma, and there is also a population of old zircons, of which the most significant is the peak of 1800 Ma.

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Large scale tectonics as controlling factor of the Upper Triassic to Middle Jurassic basin fills in Svalbard and nearby pan-Arctic Basins

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In Svalbard, we have subdivided the shallow marine to paralic Norian to Bathonian succession into five main sequences. The sequences are separated by well-defined key sequence stratigraphic bounding surfaces, which are correlated throughout the archipelago. The sequences are clearly linked to pan-Arctic or nearby regional tectonism. In ascending order the five bounding lower surfaces are; i) Pan Arctic Early Norian flooding; ii) subaerial unconformity near base Rhaetian related to the onset of the Novaya Zemlya Fold and Thrust Belt; iii) shoreline ravinement surface near the Pliensbachian-Toarcian transition due to uplift caused by tectonic reorganisation; iv) subaerial unconformity in Bajocian due to onset of the early phase of the North Atlantic and Amerasian rift systems in basins to the west and north, respectively, and v) sudden subsidence of the basin followed by "mid" Bathonian flooding. We correlate these five key sequence stratigraphic bounding surfaces in Svalbard with similar surfaces in the southwestern Barents Sea as well as in the Sverdrup Basin and in basins at the northernmost part of the North Atlantic conjugate margins. The sequences are not necessarily chronostratigraphic correlative or related to the same tectonism, but closely follow the near time-equivalent key sequence stratigraphic surfaces and facies stacking and shift in drainage patterns. We demonstrate the importance of tectonic events for controlling the sequence stratigraphy, facies development and source to sink trends in Svalbard and the nearby Arctic basins.

POSTER session

Provenance of the Upper Triassic on the Barents Shelf; a multi-technique approach

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A correct interpretation of provenance of the Late Triassic Snadd and De Geerdalen formations on the Barents Shelf plays a key role in paleogeographical reconstructions of northern Pangea. The provenance of Arctic Late Triassic sediments has been tied to the Uralide orogenic belt, the Siberian Traps and to the hypothetical Crockerland landmass. Here, we combine several techniques in order to investigate the provenance of Late Triassic deposits in an N–S transect from Svalbard to the Nordkapp basin; including detrital zircon U–Pb and Lu–Hf analysis, petrographic analysis, and chemical analysis of lithic fragments and the heavy minerals chromium spinel and rutile. This multi-technique approach, working with minerals and lithic fragments, will provide provenance-sensitive information on rocks in addition to felsic source rocks favored in detrital zircon studies. Preliminary petrographic observations have identified lithic fragments of volcanic, metasedimentary and sedimentary origin with plagioclase dominating over K-feldspar. Detrital zircon age spectra resemble published spectra of the larger Arctic region with three recognizable age peaks: a Permian to Carboniferous age peak compatible with an inferred Uralide provenance, a significant Silurian age component possibly tied to a Caledonian source, and a Triassic peak of unknown origin. The results increase our understanding of the complex provenance of the Late Triassic deposits on the Barents Shelf, which includes mafic, ultramafic, (meta)sedimentary, as well as felsic source rocks.

Major drainage reorganization at the Triassic – Jurassic transition and the implications for reservoir development on the Western Barents Shelf

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At the Triassic – Jurassic transition on the Barents Shelf, thick, mud-dominated intervals containing sands with variable reservoir properties gave way to thin sand-dominated intervals with favourable reservoir qualities. Consensus has yet to be reached regarding the mechanisms causing these sedimentological and mineralogical changes. Climatic and tectonic forcing, leading to depositional environment and provenance shifts have been suggested, but resultant models are conflicting. A multi-proxy sedimentary provenance study has aimed to refine and improve these models.

The analyses reveal that a distinct and rapid provenance change followed an early Norian maximum flooding surface. This is seen by an increase in grain size, compositional maturity and proportion of stable heavy minerals.

These data are interpreted to reflect an episode of major drainage reorganisation prompted by tectonism on Novaya Zemlya. Uplift of the Finnmark Platform and Central Barents Arch choked incoming sediment from the Uralian Orogen whilst hinterland rejuvenation resulted in extensive recycling of pre-Norian units and an influx of material originating from crystalline basement.

Following the transition, detrital zircon age spectra are dominated by Proterozoic ages that are difficult to interpret. However, through complementary heavy mineral analysis and chemical/age data from rutile and K feldspar in particular, west and east Caledonian sand types have been delineated. These can be used to help predict the location and quality of reservoir intervals within the Realgrunnen Subgroup.

The outcropping strata in the Kong Karls Land archipelago, Arctic Norway; a key reference point for the Upper Triassic to Lower Cretaceous succession in the northern Barents Sea

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Kong Karls Land in the eastern Svalbard archipelago, northern Barents Sea, displays a 300 m thick Upper Triassic to Lower Cretaceous succession. The unique exposures provide essential data for evaluation of the Mesozoic basin fill on the nearby platforms and in the more remote Arctic areas of the Barents Sea. The Norian to Aptian succession in Kong Karls Land, coupled with immediately nearby offshore regional 2D seismic lines, reveals eight key sequence stratigraphic surfaces. Six of them define the lower boundary of larger tectonic mega sequences (TMS) linked to larger scale plate tectonic reorganisations in the Barents Sea or nearby landmasses. The TMS reflect; i) denudation of Fennoscandia and Uralian mountain chain and probably landmass in north east; ii) the evolving Novaya Zemlya Fold and Thrust Belt, iii) uplift and shear movements of the Barents Platform; iv) incipient North Atlantic and Amerasian rifting in the west and north; v) upper Jurassic folding; vi) Lower Cretaceous rejuvenation of folding, and finally vii) magmatism. While the Triassic and Lower Jurassic succession is fairly complete in Kong Karls Land, the Middle Jurassic to Lower Cretaceous strata are only remnants reflecting a major shift in tectonism.