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Title: Spor etter Mjølnirnedslaget i Janusfjellprofilet på Svalbard

The Mjølnir Impact and the Janusfjellet Section

The 40 km diameter Mjølnir Crater was formed 142 ± 2.6 Ma (Volgian-Ryazanian boundary) by the impact of a 1.6 km diameter asteroid into the 350-400 m deep paleo-Barents Sea. The structure is buried and well preserved in sediments on the Bjarmeland Platform, which has been tectonically stable since late Paleozoic.

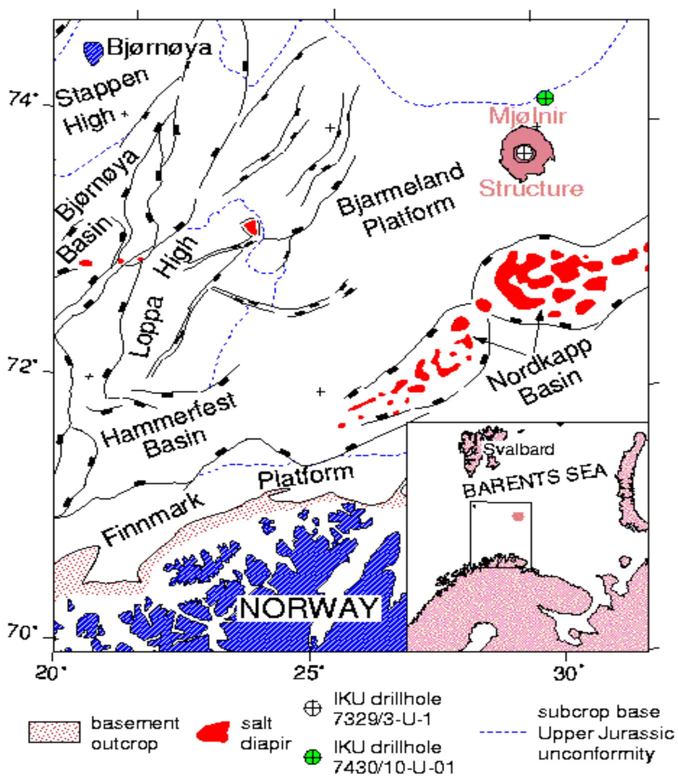

Figure 1: Location map of the Mjølnir structure. Also marked is the IKU well 7430/10-U-01 positioned 30 km north-northeast of the crater, and the core recovered from inside the crater (7329/03-U-01).

The studied Janusfjellet Section (level 0-49.1 m) on Svalbard (450 km northwest of the crater) includes the upper part of the Agardhfjellet Formation, represented by the Slottsmøya Member (level 0-38 m), and lower part of the Rurikfjellet Formation, represented by the Myklegardfjellet Bed (level 38-39.5 m) and the Wimanfjellet Member (level 39.5-49.1 m).

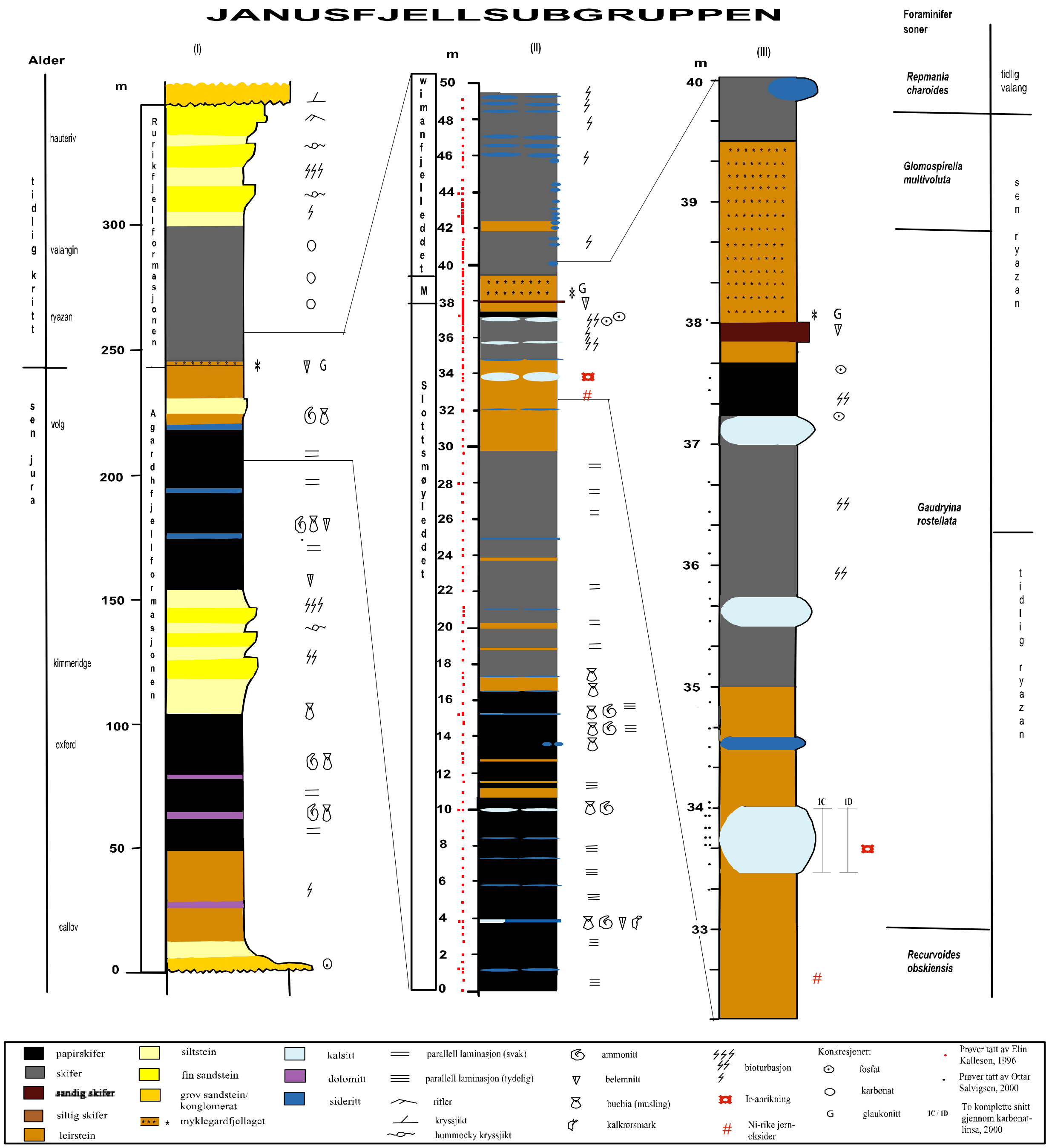

Figure 2: The stratigraphy of the Janusfjellet Subgroup (column I), compared to the stratigraphy of the detailed Svalbard sections (column II and III).

This study indicates that geological parameters may carry information indicating possible environmental impact influence. Redox-parameters (the geochemical ratios Cr/V, Th/U, Ni/(Ni+V), MnO/Fe_2O_3) in the Slottsmøya Member indicate dominating anoxic/hypoxic depositional conditions in level 0-32 m. In level 32-38 m, redox-parameters, degree of bioturbation and TOC-values show dominating oxic depositional conditions. This could be related to tsunami effects caused by the Mjølnir impact, especially in Ir-enrichment level (33.6-34.0 m). High TOC-values in the same level could be related to soot-concentration in sediments after impact. Phosphate-rich levels are found in 37.25 m and 37.60 m, and may be related to transgressive events.

Redox-parameters (Cr/V, Th/U, Ni/(Ni+V), MnO/Fe_2O_3) in the Myklegardfjellet Bed indicate dominating anoxic/hypoxic depositional conditions. The Myklegardfjellet Bed is glauconite-rich, and contains some belemnites in its lower part, indicating oxic/dysoxic depositional conditions.

Redox-parameters (Cr/V, Th/U, Ni/(Ni+V), MnO/Fe_2O_3) and degree of bioturbation in the Wimanfjellet Member, show dominating oxic depositional condition.

Grain size-parameters ((quartz + feldspar)/(sum clay minerals) and SiO_2/Al_2O_3) in the Slottsmøya Member indicate shallowing upwards developments in the 0-32 m interval,. There are large variations in grain-size-parameters in level 32-38 m, with several low values in level 33.3-34.0 m (Ir-enrichment level). This could be explained by shifting sedimentary provenances, caused by turbidite/density currents, avalanches and slides after the impact.

Grain size-parameters ((quartz + feldspar/(sum clay minerals)) and SiO_2/Al_2O_3) in the Myklegardfjellet Bed and the Wimanfjellet Member indicate coarsening upwards developments.

The maturity-parameter (quartz/feldspar) variations are on average higher in the Slottsmøya Member than in both the Myklegardfjellet Bed and the Wimanfjellet Member. There are many high values in interval 33.3-38.0 m.

The upper part of the Slottsmøya Member represents a regression followed by a transgression. The base of the Myklegardfjellet Bed represents a transgressive surfase.

The Ir-anomaly in the Janusfjellet Section (2.1 ppb at level 33.7 m) occurs in carbonate sediments. Ir-enrichments with possible Mjølnir ejecta have also been discovered in The Barents Sea and in Siberia, 2500 km away fram the impact site. The ejecta distribution in the area was probably highly assymetrical. The geological, geochemical and paleontological signals in the sediments show that the environmental consequences of the impact (the results of impact generated waves, currents, changing redox-conditions) were more symmetrically distributed. Influences of the asteroid impact have been discovered in cores of marine sediments from 30 to 500 km away from the impact site.