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The Tremadocian through Darriwilian conodont succession of NE Spitsbergen: faunal affinities and intercontinental correlation

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The strata of the Cambro–Ordovician Oslobreen Group, composed of the Tokammane (Cambrian), Kirtonryggen (Lower Ordovician) and Valhallfonna (Middle Ordovician) Formations are exposed along the coast of Ny Friesland in NE Spitsbergen. The Lower to Middle Ordovician conodont faunas of this region are very well preserved displayed also by the CAI 1 of the material in the collections.
A low yield is typical for the lower part of the Kirtonryggen Formation. The oldest Ordovician conodont faunas span the *Rossodus manitouensis* through *Macerodus dianae* zones (Tremadocian, Spora and Basisletta Member) followed by the Floian *Oepikodus communis* Zone recovered from the richer upper part of the formation (Nordporten Member). All the taxa are typical of the tropical North American Midcontinent faunal province (e.g., species of *Eucharodus*, *Ulrichodina*, *Aloxoconus, Colaptoconus, Macerodus, Oneotodus*) and can well be correlated to the North American Standard Zonation (Ross *et al*. 1997). The different facies display deposition under warm conditions and large stromatolithes are recognized within the sub- to intertidal dolostones of the Basisletta Member (FORTEY & BRUTON 1973). Carbonates of the overlaying Nordporten Member reflect more open marine conditions (mud- to wackestones with grainstone interbeds, water depth between FWB and SWB; BRANDL 2009).
The tropical Midcontinent-type assemblages dominated the region until open marine associations invaded the shallow shelf (i.e. *Evae* transgression). The pandemic *Oepikodus evae* becomes frequent and is succeeded by *O*. *intermedius* in abundance in the Olenidsletta Member, i.e. the lower member of the Valhallfonna Formation. In this part of the succession, the most common associated species are *Bergstroemognathus, Protoprioniodus, Protopanderodus, Oistodus, Wandelia, Phragmodus,* and *Semiacontiodus*. These faunas of mixed affinities display more open marine conditions which is supported by oxygen isotope data. The $\delta^{18}O$ values indicate that relatively cooler sea-water temperatures prevailed from the *O. evae* Zone and upwards. The Olenidsletta Member formed in deeper water environments and is dominated by dark platy, graptolite-bearing mudstones with thin marly intercalations (e.g., FORTEY & BRUTON 1973, FORTEY & COCKS 2003, BRANDL 2009). The upper strata (Profilbekken Member) are characterized by the *Periodon-Paroistodus* assemblage characteristic for outer shelf, shelf margin, and upper slope settings around Laurentia and may especially well be compared with the faunal succession of Newfoundland (e.g., STOUGE 1984, JOHNSTON & BARNES 1999).
The Valhallfonna Formation comprises the Floian and Dapingian stages and ends in the early Darriwilian *Lenodus variabilis* Zone. Palaeobiogeographically, the Ny Friesland faunas show close affinities to coeval assemblages from North-East Greenland and West Newfoundland. The occurrence of early Darriwilian *Phragmodus spicatus* and *Juanognathus leptosomatus* known from Australo-Asian peri-Gondwana allows us also to correlate precisely to these areas.
Our conodont zonation is closely tied to a recently established $\delta^{13}C$ isotope curve from Ny Friesland (BRANDL 2009) and a correlation to $\delta^{13}C$ curves from North East Greenland, Newfoundland (AZMY *et al.*, unpublished, pers comm. 2009) and Argentine Precordillera (BUGGISCH *et al*. 2004) is presented. Observed sea-level changes are compared with the detailed Ordovician sea-level curve established by NIELSEN (2004). Finally, the

palaeogeographical implications of characteristic gaps in the sedimentary successions of the different terranes along the northern Laurentian margin (e.g., HARLAND 1997, SMITH 2000, STOUGE *et al*. 2001, KNIGHT *et al*. 2001) are discussed.

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