# CYCLICITY OF SHALLOW-MARINE, WARM-WATER CARBONATE PLATFORM DEPOSITS: FACIES ARCHITECTURE AND SEQUENCE STRATIGRAPHY OF THE LATE CARBONIFEROUS NY FRIESLAND PLATFORM (SPITSBERGEN)

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During the Late Carboniferous (late Moscovian to Kasimovian), a spacious, warm-water carbonate shelf, the Ny Friesland Platform, developed at around 25°-30° N along the northern margin of the supercontinent Pangaea. The fossiliferous platform strata are characterized by a pronounced cyclicity, consisting of stacked parasequences, which are separated by subtle discontinuity surfaces and show specific facies successions consisting of up to 4 facies sets:

Locally occurring *Transgressive Facies Sets* at the base of the parasequences consist of intraformational, coarser-grained resediments (peloidal, litho- to bioclastic rudstones) or nodular mudstones interbedding with thin, fine-laminated claystones to marls. While the coarser resediments comprise a considerable part of reworked material from the underlying strata, the fine-grained deposits accumulated in areas marked by sediment-starved conditions. Both types of transgressive facies formed under a general rising sea level after the initial flooding of the platform surface.

*Mid-platform Facies Sets* conformably overlie the transgressive sediments and consist of thick- to medium-bedded, fossiliferous wackestones dominated mainly by echinoderms, brachiopods, bryozoans and/or fusulinid foraminifers, locally embedding lateral restricted enrichments of horn-shaped, solitary, rugose corals. These sediments formed under quiet-water, open-marine, oxygenated conditions on submarine, muddy flats below the fair-weather wave base, when water depth was highest during maximum transgression.

*Inner-platform Facies Sets* consist of very thick- to medium-bedded dolomite and carbonate beds marked by the common occurrence of stylolites. The limestones comprise associations of various microfacies types, representing different shallow-submarine to peritidal platform environments. High-diverse, fossiliferous packstones to wackestones marked by changing component compositions of echinoderms, small foraminifers, coralline red algae, dasycladalean green algae, phylloid algae, chaetitides, colonial rugose and tabulate corals and *Palaeoaplysina*, represent open-water, sandy to muddy flats. Within these sediments, scattered and isolated, smaller calcareous algal and coral knobs and larger, partly amalgamated *Palaeoaplysina* mounds occur. The deposits grade into ooidal-, peloidal- and skeletal grainstones to packstones, reflecting wave-or tide-agitated nearshore areas and sandy shoals or bars, which protected semi-restricted, low-energy lagoons or tidal flats. The latter are represented by mudstones and peloidal, low-diverse, fossiliferous wackestones comprisong mainly echinoderms and mollusks.

*Sabkha Facies Sets* occur locally at the top of individual parasequences and consist of laterally discontinuous, thin horizons comprising *Microcodium* or caliche facies (mainly peloidal, litho- to bioclastic pack- to rudstones). These capping beds reflect a terrestrial, low-relief sabkha, which prevailed under arid to semi-arid climatic conditions during the emersion of the platform top. Within these areas, the emerged limestone strata were affected in varying degrees by iron-staining, desiccation, meteoric alteration, dolomitisation, erosion, reworking and pedogenesis within weakly developed palaeosols.

The stacked parasequences are interpreted as successive shallowing-upwards cycles, separated by subaerial exposure surfaces. They reflect glacio-eustatic, high-frequent and high-amplitude sea-level fluctuations due to volume changes of the ice caps of southern Gondwana Land.

According to biostratigraphic data, the parasequences represent 4$^{th}$ order cyclothems (duration of 200–400ky), which superimpose a 3$^{rd}$ order, late-highstand sea-level curve. The latter is reflected by an overall thinning-upwards trend of the individual parasequences and an internal shift of the proportions and composition of the different facies sets due to an overall shallowing-upwards trend and decreasing accommodation space of the depositional area.