Integrating the lower Carboniferous and older stratigraphy of the Netherlands with that of Belgium and Germany

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Abstract

In spite of the fundamental changes occurring during the middle Paleozoic, the expression of this period in the subsurface of the Netherlands is difficult to disentangle. No sedimentary rocks older than Serpukhovian (Namurian) are exposed in the Netherlands, although many good outcrops are known from Belgium and Germany. In the Netherlands, pre-Serpukhovian sedimentary rocks are only known from 74 boreholes and inferred from seismic data. In the ultimate southwest and southeast of the country, this Paleozoic succession is found at relatively shallow depth (< 500 m). Going northwards, the depth rapidly increases, reducing the number of boreholes and seismic surveys reaching it.

During the last decades, both the amount of publicly available data and the interest in the lower Carboniferous and older succession have grown considerably. The Mississippian (Dinantian) succession is a target for geothermal energy exploration and energy storage. The Upper Devonian (Famennian) sandstone in the southeast of the Netherlands and bordering Belgium has gained interest for the construction of the subsurface gravitational wave observatory Einstein Telescope.

The renewed interest has resulted in new studies and boreholes, shedding new light on the sedimentology and stratigraphy. Both new and legacy data have been integrated into a new lithostratigraphic framework allowing for straightforward correlation to Belgium and Germany. The informal Frasnian-Famennian Bollen Claystone formation has been emended, while the Famennian Evieux Formation from Belgium, is adopted for equivalent deposits in the Netherlands. The Belgian Hastière Formation holds the Devonian-Carboniferous transition and has been identified in the Netherlands as well. Finally, the well-known Belgian Tournaisian Pont d'Arcole Formation can be traced over great distances in boreholes in the Netherlands and is introduced into the lithostratigraphic nomenclature. Apart from these successions straddling the Devonian-Carboniferous boundary, a new formation is introduced for the oldest known strata encountered in the Netherlands. These concern sediments deposited by turbidites during the late Silurian to earliest Devonian. The resulting updated lithostratigraphy embeds this part of earth history in the regional framework, allowing for better future integrated studies.

Keywords: Devonian, Tournaisian, Famennian, Frasnian, Silurian

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