Inden Formation

Unit name: Inden Formation

Hierarchical unit name :

Type: Formation

Code: In

Author(s):

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Alternative names : in older literature the Inden Formation sand was included in the 'Waubach sand and gravel unit'.

Origin of the name: -

Status: Formal

Date: 01/05/2022

How to refer: Vandenberghe, N., & Dusar, M., 2023. The Inden Formation, 01/09/2023. National Commission for Stratigraphy Belgium. http://ncs.naturalsciences.be/lithostratigraphy/Inden-Formation

Characterizing description

A pale grey to white coarse sand, which can be darker grey coloured due to mobile organic matter content, containing particularly in the coarsest horizons small wood fragments and clay clasts. Some thin clayey horizons occur near the base of the sand. The sand contains a pollen assemblage. No carbonates occur. Dinoflagellate cysts are absent except for the very base of the unit. The resistivity signal increases upwards.

Type section, type locality, type borehole, or type geophysical borehole

The reference for the Inden Formation in Belgium is the166-192,5 m interval in the Maaseik (049W0220/ Kb18d49w-B220) borehole; cores, SP, Res and GR geophysical logs of the interval are available in Vandenberghe et al. (2005).

Description upper boundary

A sudden increase in the spontaneous potential signal and a marked short drop in resistivity signal, are characterising the upper boundary. It probably corresponds to a thin level with lignite and clay fragments in otherwise coarse sand.

Description lower boundary

A marked sudden gamma ray signal increase characterises the transition to fine yellow and mica-rich sand (unit X in borehole Maaseik) or to greenish glauconite-bearing sand of the Diest Formation.

Thickness

In the Belgian part of the Roer Valley Graben (RVG), boreholes with the Inden Formation identified show a thickness of the formation in the same order of magnitude as the 26,5 m in the Maaseik reference well.

Occurrence

The Inden Formation as defined in the Maaseik reference borehole occurs in the Belgian part of the RVG east of the main bordering faults of Neeroeteren and Reppel as suggested by borehole correlations to Jagersborg (049W0236/ Kb18d49w-B235), Kinrooi (049W0230/ Kb18d49w-B230) and St.-Huibrechts-Lille (033W0139/Kb18d33w-B142) boreholes in fig.6 in Vandenberghe et al. (2020).

Regional correlations

In the Netherlands the Inden Formation was formally introduced in the nomenclature by Menkovic & Westerhoff (2010) and has been duly considered in the recent stratigraphic scheme of Munsterman et al. (2019, fig. 8 and TNO-GDN (2022)). Consequently the Kieseloolite Formation only starts at the base of the upper Waubach unit.

In Belgium, since the study of the Maaseik core stratigraphy by Dusar et al. (2012, p. 18), the lower part of the Waubach sand and gravel unit, the lower Waubach unit, is interpreted as the Inden Formation. The correlation with the Netherlands can easily be done through the Roosteren borehole (B60A0325) near the Belgian border (see Vandenberghe et al., 2020, fig.6). Also in the more recent geological-hydrological study of the Belgian-Dutch border area the lower part of the Waubach unit in the Maaseik borehole was interpreted as the Inden Formation (Vernes et al., 2018 , annex D fig. 7.3)

The reference for the Inden Formation is in the brown coal pits in Nordrhein-Westfalen and the unit has systematically been used in the stratigraphic studies of the German Lower Rhine area by e.g. Schäfer and Utescher (2014) and Utescher et al. (2021). In the Maaseik borehole only the very base of the Inden Formation is constrained biostratigraphically, namely an upper Tortonian dinoflagellate cyst assemblage. A correlation scheme of the Maaseik area in the RVG with the Lower Rhine stratigraphy in the east and the Campine area in the west is shown in Figure 0-1 below from Louwye and Vandenberghe (2020).

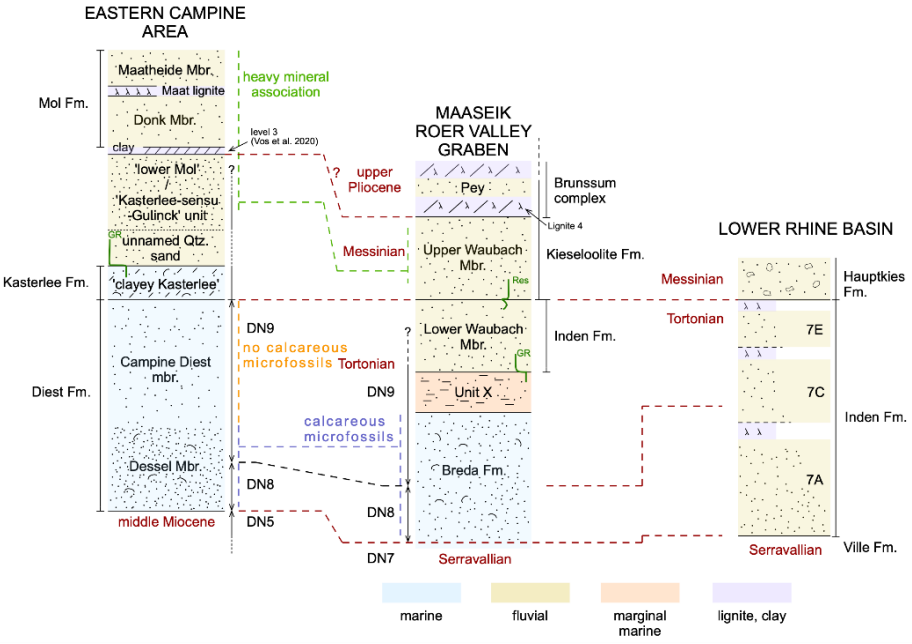

Figure 0-1 Correlation scheme of the Maaseik area in the RVG with the Lower Rhine stratigraphy in the east and the Campine area in the west; note that the Inden Formation as defined in the present LIS corresponds to the former and now disused lower Waubach unit (from Louwye and Vandenberghe, 2020).

Age

The Inden Formation identified in the Belgian RVG corresponds to the latest part of the Inden Formation in the Lower Rhine Basin Inden Formation. Based on dinoflagellate content it is considered end Tortonian as discussed in Louwye & Vandenberghe (2020).

Dataset

Data in the LIS are part of the DOV-Neogene data collection, including links to the GSB-collection data sheets

Name	GSB name	DOV name	GSB Collections URL	DOV URL
Maaseik borehole	049W0220	kb18d49w-B220	https://collections.naturalsciences.be/ssh-geology-archives/arch/049w/049w0220.txt	https://www.dov.vlaanderen.be/data/boring/1980-025921
Jagersborg borehole	049W0236	kb18d49w-B235	https://collections.naturalsciences.be/ssh-geology-archives/arch/059e/059e0140.txt	https://www.dov.vlaanderen.be/data/boring/1989-042715
Kinrooi borehole	049W0230	kb18d49w-B230	https://collections.naturalsciences.be/ssh-geology-archives/arch/049w/049w0230.txt	https://www.dov.vlaanderen.be/data/boring/1995-102445
St.-Huibrechts-Lille borehole	033W0139	kb18d33w-B142	https://collections.naturalsciences.be/ssh-geology-archives/arch/033w/033w0139.txt	https://www.dov.vlaanderen.be/data/boring/1984-082391
Roosteren borehole (DINOloket B60A0325)	-	B60A0325	-	https://www.dov.vlaanderen.be/data/boring/1977-165105

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