

Clayey-top-facies (Diest Formation)

Unit name: clayey-top-facies

Hierarchical unit name: Diest Formation

Type: Facies

Code: DiCl

Author(s):

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Alternative names: Diest D4 facies in Adriaens (2015)

Origin of the name: The origin of the name of the unit is discussed in Wouters and Schiltz (2011), Adriaens & Vandenberghe (2020)

Status: Informal

Date: 01/05/2022

How to refer: Adriaens, R. & Houthuys, R., 2023. The clayey-top-facies, 01/09/2023. National Commission for Stratigraphy Belgium. <http://ncs.naturalsciences.be/lithostratigraphy/clayey-top-facies>

Characterizing description

The clayey-top-facies consist of a glauconite-rich, poorly-sorted clayey sand with a characteristic higher clay content compared to the coarse Kempen Diest Member below. The size distribution mode typically ranges between 170 μm and 250 μm . The clay content (dispersed, $<2\mu\text{m}$) typically ranges between 1% and 10%. The pelletal glauconite content ranges between 26% and 67% and is on average 32.9% (Adriaens, 2015).

The mineralogical and clay mineralogical composition of the clayey-top-facies is very specific and differs from the rest of the Diest Formation. The clay mineralogy consists of a significant amount of expandable clay minerals: dioctahedral smectite but also, and more distinctly, trioctahedral Fe-rich vermiculite (see Adriaens & Vandenberghe, 2020 for details). This type of vermiculite is rare in the stratigraphic column, and is assumed to be related to a glauconitic soil environment. Most likely, it was not formed in-situ but originates from a remote source area where a soil developed on glauconitic sediment in very specific, yet poorly understood, conditions.

Apart from the distinct vermiculite, the clayey-top-facies is also relatively enriched in siderite, apatite and sporadically vivianite and chlorite but the relatively high clay content and the presence of Fe-vermiculite are the distinctive criteria for the clayey-top-facies.

This facies needs better descriptions of extent, correlations and depositional structures. Therefore, it is defined as a facies and not as a formal member inside the Diest Formation.

Type section, type locality, type borehole, type CPT and/or type geophysical borehole

The name clayey-top-facies was first proposed by Wouters and Schiltz (2011) in their description of the ONDRAF/NIRAS boreholes in the central Campine in region Kasterlee - Mol - Dessel. For now, the occurrence of the facies is also confined to this area. The type localities are the ON-Dessel-2 and ON-

Dessel-3 boreholes. At present, the facies has not been recognized in outcrops. The facies was recognized in following boreholes:

ON-Dessel-2 (031W0338/ kb17d31w-B299)

ON-Dessel-3 (031W0354/ ON Dessel-3)

Mol (031E0435/ B/1-96196)

Rees (017E0399/kb8d17e-B495)

Description upper boundary

The Diest clayey-top-facies is overlain by the Kasterlee Formation, more specific the Hallaar and Heist-op-den-Berg members. The boundary is defined in the type area based on the appearance of a fraction $>500\mu\text{m}$ in the top of the Diest Formation often accompanied by a decrease in the gamma ray signal. In the first 2m above the contact, Fe-vermiculite still occurs in lower quantities as the sediment above the contact is reworked. Above the contact, the dispersed clay content ($<2\mu\text{m}$) increases to 10-20%. Clay lenses are rare in the clayey-top-facies whereas cm-thick brown to purple clay occurs frequently above the contact.

Description lower boundary

The base of the clayey-top-facies covers the Kempen Diest Member which is clearly coarser-sized and does not contain the distinct Fe-vermiculite tracer of the clayey-top-facies. The clay content ($<2\mu\text{m}$) of the clayey-top-facies typically is 1% to 10%, whereas the Kempen Diest Member has a clay content $<0.5\%$ and a loose appearance.

Thickness

The clayey-top-facies reaches its largest thickness of about 12 m in the ON-Dessel-2 and ON-Dessel-3 boreholes.

Occurrence

The occurrence of the clayey-top-facies is confined to the central Campine area in and around the villages Mol and Dessel. The unit is not recognized in the outcrops more to the western (Kasterlee) and southern (Olen, Heist-op-den-berg) part of the Campine and is also absent in the Hageland area. The extension of the facies in the eastern part of the Campine is not investigated although the occurrence of organic-rich clay lenses at the top of the Diest Formation reported at several locations in Limburg (Helchteren kb25d62e-B272/ 62E261, Peer, Wijshagen kb18d48w-B181/ 48W 180) by Gulinck suggests a possible relation with the clayey-top-facies in the central Campine.

Regional correlations

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Age

Dinoflagellate cyst biozone DN9 was identified in the clayey top facies attributing a late Tortonian to Messinian Miocene age to this facies (Louwye et al., 2007). Additional data are required.

Dataset

Data in the LIS are part of the [DOV-Neogene data collection](#), including links to the GSB-collection data sheets.

Subset of the Diest Formation: <https://www.dov.vlaanderen.be/data/opdracht/2020-021774>

References

Adriaens, R., 2015. Neogene and Quaternary clay minerals in the southern North Sea. Unpublished Ph.D. Thesis, KU Leuven, Leuven, 272 p.

Adriaens, R. & Vandenberghe, N., 2020. Quantitative clay mineralogy as a tool for lithostratigraphy of Neogene Formations in Belgium: a reconnaissance study. *Geologica Belgica* 23/3-4, 365-378. <https://doi.org/10.20341/gb.2020.018>

Louwye, S., De Schepper, S., Laga, P., & Vandenberghe, N., 2007. The Upper Miocene of the southern North Sea Basin (northern Belgium): a palaeoenvironmental and stratigraphical reconstruction using dinoflagellate cysts. *Geological Magazine*, 144/1, 33–52. <https://doi.org/10.1017/S0016756806002627>

Wouters, L. & Schiltz, M., 2012. Overview of the field investigations in and around the nuclear site of Mol Dessel. ONDRAF/NIRAS NIROND-TR report 2011–42 E, 100 p.
