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A LITHOFACIES CLASSIFICATION AS A TOOL
IN THE RECONSTRUCTION OF THE
PLEISTOCENE DEPOSITIONAL ENVIRONMENTS
IN THE WESTERN COASTAL PLAIN (BELGIUM)

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in the Western Coastal Plain (Belgium)**

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Synthesis of a Geological Survey project
'Updating the Quaternary database of the Geological Survey of Belgium'

34 pages, 8 figures, 8 tables, 23 photoplates

Cover illustration: Core Nieuwpoort 2 (36W145): basal part of the Pleistocene sequence showing the rapid vertical changes in lithology and sedimentary characteristics. The photograph covers the sediments at a depth between 25 – 26m (left part on the photograph); 23 - 24m; 22 - 23m and 20 - 21m below surface.

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Abstract. This paper is the outcome of the project “Updating the Quaternary database of the Belgian Geological Survey”(November 2010 – March 2013). The objective of the project was to provide a useful and relatively quick method for borehole description and for the reconstruction of the depositional environment, applicable on the whole of the Quaternary deposits. The western coastal plain of Belgium has been selected as pilot area because of the existence of about 100 high-quality undisturbed mechanically-drilled cores recovering the whole Quaternary sediment succession until the Tertiary substratum. The investigation focuses on the Pleistocene deposits that hitherto have not been studied in detail; this in contrast to the Holocene deposits. Moreover, their existence is even hardly known. This study is made as a model study.

The first part of the paper illustrates step by step the procedure followed in order to reconstruct the depositional palaeo-environments. Much attention is paid to the definition of lithofacies as they are the basic tool in the reconstructural procedure. Because these lithofacies are so fundamental in particular for further use, most of them are illustrated with photographs. In a next step the lithofacies are combined into facies associations and sedimentary subenvironments are defined. The goal of the study, viz. the reconstruction of the environment, is obtained by combining the facies associations. These environments are then part of a larger entity namely the depositional system.

In the second part of the paper the application of the classification on the Pleistocene deposits in the Western Coastal Plain of Belgium is described and discussed.

Keywords: sequence architecture, shore-shelf, tidal flats, estuary, fluvial, Pleistocene, Belgium

1. Introduction

1.1. *The need of geological knowledge*

Environmental management and a well-balanced land-use planning must be considered with respect to the geological setting and the properties of the deposits in order to avoid environmental, technical and financial problems. The purpose of a land-use planning is to reduce to a minimum the negative impact on the natural environment at the occasion of the selection of sites or areas for e.g. extraction of raw material, agricultural activities, creation of dumping sites. This explains the increased use of subsurface data. Engineers are interested in the properties of the deposits for practical purposes such as subsurface constructions, large infrastructural works, development of building sites, and compaction of unconsolidated deposits. More recently, archaeologists need to interpret their findings within a context of palaeo-environmental change since the Convention of Malta requires a geo-archaeological survey before construction works. Such a survey is frequently carried out by archaeologists, geographers and engineers from consulting agencies who are not familiar with the (detailed) Quaternary setting of a particular area. Therefore, they have to rely on the existing database of borehole descriptions available in DOV (website

<https://dov.vlaanderen.be/dovweb/html/index.html>) (see comments below).

However, borehole descriptions of Quaternary deposits are only useful when the data is organized into a clear and unambiguous stratigraphy. Quaternary deposits in particular show rapid vertical changes in lithology that, moreover, have restricted spatial distribution. The heterogeneity is the result of the responses of the natural systems to the complex relationship between the successive climate changes (with short-term episodicity), base-level changes, sedimentation and erosion processes, and not at the least, human activity for the more recent period.

The organization of the Quaternary deposits can only be performed with the understanding of the depositional history of an area. Therefore, knowledge of successive depositional palaeo-environments within a timeframe is required. The primary and basic elements to reconstruct the palaeo-environment are lithofacies based on texture, sedimentary structures and bedding characteristics, reflecting depositional processes on a regional scale. Once defined, the lithofacies are

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