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The Campine microcuesta: a relict of early Pleistocene facies transitions

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INTRODUCTION

Although the Belgian Quaternary lithostratigraphy in the north-eastern Campine region has been studied in much detail, there were still some aspects that were not fully understood. This changed recently, when the H3O-The Campine cross-boundary 3D (hydro)geological project started (Lanckacker et al., 2016) and insights from the Dutch lithostratigraphy helped to clarify the complex transitional relationships between several lithostratigraphic units in Belgium.

GEOLOGICAL BACKGROUND

The H3O-The Campine project area is situated on two structural entities, namely the Campine Block in the west and Roer Valley Rift System in the east. While the Campine Block was a relatively stable, gradually subsiding tectonic block, the Roer Valley Rift System experienced relatively strong subsidence from the late Oligocene up to recent times. From late Miocene onwards, fluvial conditions were installed in the Roer Valley Rift System that progressed through time from south-east towards the north-west as a result of high sediment input from the south-east (uplift of the Rhenish Massif; Schäfer et al., 2005).
During the early Pleistocene, the Campine region was characterized by an estuarine depositional environment, being on the edge between continental conditions in the south and shallow marine conditions of the Rhine embayment in the northwest. This palaeogeographical setting generated lateral facies transitions from south (Stramproy Fm) to north (Waalre Fm).
The Stramproy Formation consists of pale medium sands with some lignitic layers, while the Waalre Formation consists of locally thick (up to 15m) clays, micaceous fine grey clayey sand and coarse sand at the base (Westerhoff et al., 2009). In the Roer Valley Rift System, the Stramproy and Waalre Formations are covered by the fluvial gravel bearing sands of the Sterksel Formation.

GEOMORPHOLOGY

While the facies transition between the Stramproy and the Waalre Formation in the Netherlands is located essentially in the fast-subsiding Roer Valley Rift System, it is located on the slower subsiding Campine Block in Belgium. This causes the facies transition to be buried below more recent Quaternary units in most part of the Netherlands, while in Belgium the facies transition is at the surface, being severely contaminated and obscured by present-day erosion. The transition between the Stramproy and Waalre Formations is rather abrupt, making it possible to indicate a ‘facies transition line’ in map view – mainly based on the deeper lying Dutch observations. When extending this line towards the west, it coincides with the Campine microcuesta. This escarpment was traditionally explained by erosion of the Waalre Formation by the Nete river(s). This theory, however, did not explain fully why the Nete river had not eroded parts of the topographically inverted, gravelly Sterksel Formation too. The H3O-The Campine (hydro)geological model now provides an alternative explanation for this microcuesta, namely differential erosion between the clays of the Waalre Formation and the sands of the Stramproy Formation.

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