

A complete profile of the Upper Buntsandstein in Northern Hesse – an approach in linking stratigraphy and facies by using geochemical data

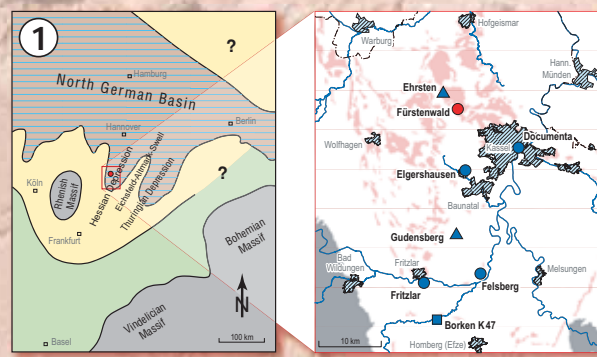


MICHAELA DERSCH-HANSMANN & NICOLA HUG

Hessisches Landesamt für Umwelt und Geologie, Rheingastr. 186, D-65203 Wiesbaden; contact: m.dersch@hlug.de

In 2003, Site Fürstenwald has been drilled near Kassel (Northern Hesse) down to 275 m, revealing layers of the lowermost Muschelkalk, a complete section of the clay-dominated so-called “Röt-Folge” (representing the Upper Buntsandstein entirely) down to the uppermost sandy units of the Middle Buntsandstein.

Our investigations focused on the clay-rich sediments of the Upper Buntsandstein, which have been deposited in a widespread sabkha environment between the shallow marine North German Basin (extending southwards down to Lower Saxony) and fluvially fed depositions beginning in the Southern part of Hesse. The results allow comparisons with wells nearby (Fig. 1), especially with well Borken K47 as shown in Fig. 2.

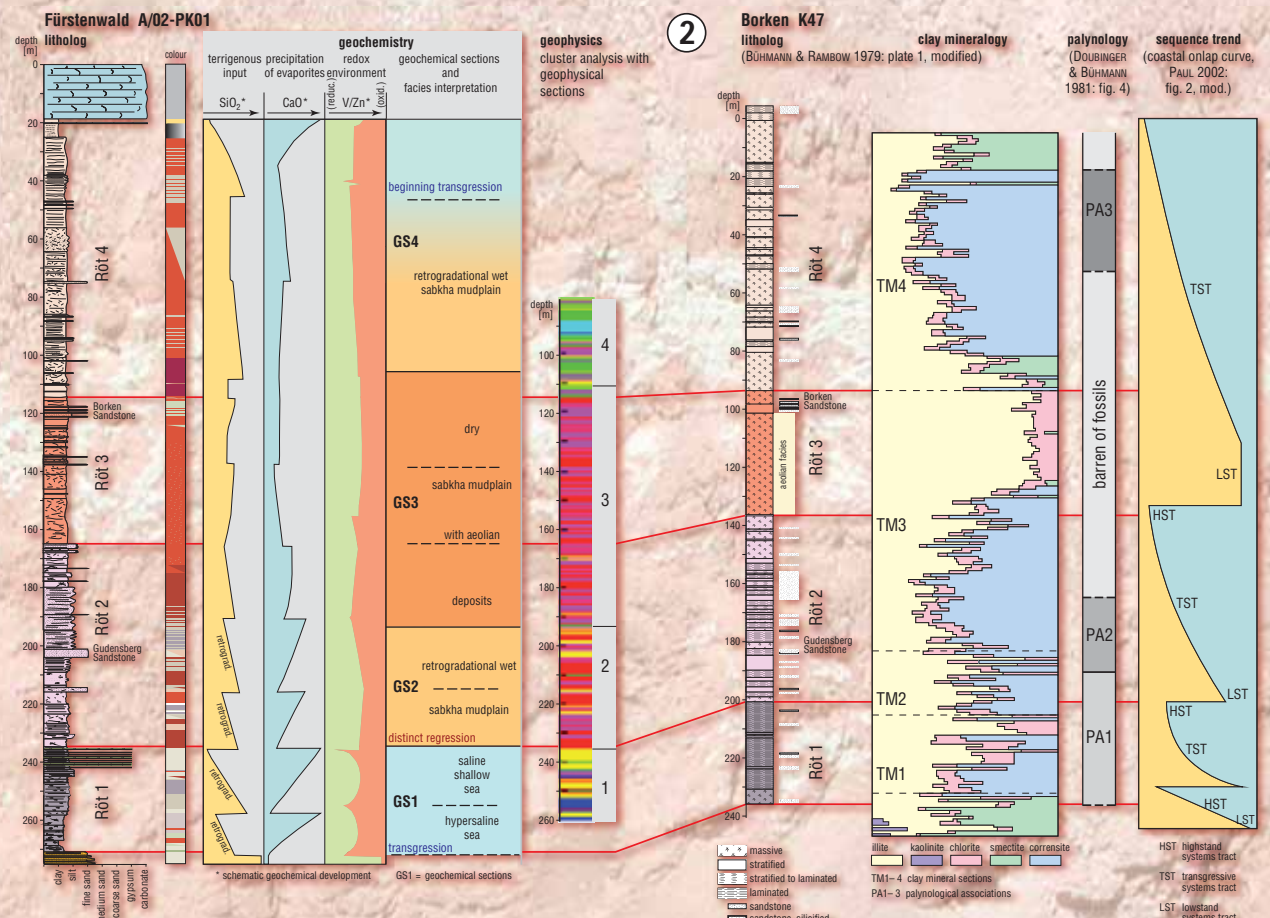


North German Basin and its southern margin: Facies and Palaeogeography during the Upper Buntsandstein (after PAUL, 2006, modified).

Position of Site Fürstenwald and adjacent wells containing Upper Buntsandstein sediments, all located in the central part of the Hessian Depression.

Detailed geochemical investigations have been performed on the 253 m clay-rich sediment section of the “Röt-Folge”. Our purpose was to find out if it is possible to confirm and further subdivide the lithologically based internal Röt stratigraphy by means of geochemical data. Four main geochemical sections (GS1–GS4) could be defined, which are not (all) identical to the stratigraphic subformations, but mirror geochemical changes in the sabkha environment. These may be due to climatic, tectonic and/or sea level changes.

BÜHMANN, D. & RAMBOW, D. (1979): Der Obere Buntsandstein (Röt) bei Borken/Hessen, Stratigraphie und Tonmineralogie. – Geol. Jb. Hessen, 107: 125–138; Wiesbaden.
 DERSCH-HANSMANN, M., HUG, N. & WONIK, T. (in press): Ein vollständiges Röt-Profil (Oberer Buntsandstein) in Nordhessen - Lithostratigraphie, Sedimentfazies, Geochemie und Geophysik der Kernbohrung Fürstenwald – Geol. Jb. Hessen: Wiesbaden.
 DOUBINGER, J. & BÜHMANN, D. (1981): Röt bei Borken und bei Schlüchtern (Hessen, Deutschland): Palynologie und Tonmineralogie. – Z. dt. geol. Ges., 132 (1): 421–449, 5 Abb., 1 Tab., 3 Taf.; Hannover.
 PAUL, J. (2002): Der Röt (Oberer Buntsandstein) in der nördlichen Hessischen Senke. – Geol. Jb. Hessen, 129: 55–78; Wiesbaden.
 PAUL, J. (2006): Facies analysis and sequence stratigraphy of an evaporitic-fluviatile unit: The Röt (Lower Triassic, Germany). – N. Jb. Geol. Paläont., Abh., 242 (1): 103–132, 12 fig.; Stuttgart.



Lithology with geochemical and geophysical interpretation of Site Fürstenwald sediment composition (geochemical proxies are shown schematically).

For comparison: Lithology, clay mineralogy (BÜHMANN & RAMBOW 1979) and palynology (DOUBINGER & BÜHMANN 1981) at well Borken K47 as well as sequence stratigraphical clues after PAUL (2002, modified).

Geochemical section 1 (GS 1)

- transgressive development throughout the Röt 1
- two-step transgressive development
- clearly dominated by the evaporative fraction (halite and gypsum)
- hypersaline environment
- conditions change towards a more marine environment

Geochemical section 2 (GS 2)

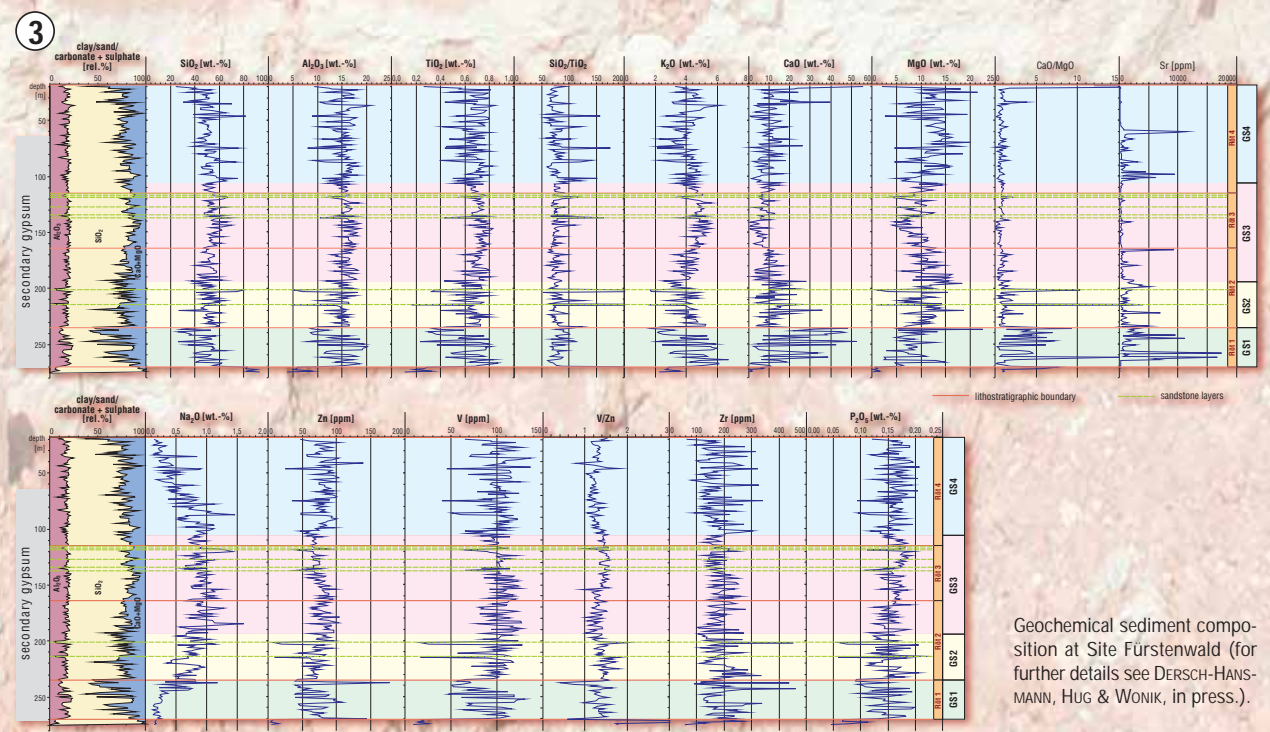
- regression at the beginning of the Röt 2
- sudden increase in siliciclastic input, tentatively increasing towards the upper part of GS 2
- subdivided into two evolutionary parts
- retrogradational, rather wet sabkha mudplain

Geochemical section 3 (GS 3)

- the sabkha plain reaches its driest phase
- culminating in predominantly aeolian accumulation due to the blowout of the dry sabkha mudplain during sea level lowstand
- transitions towards and off this aeolian phase are gradational

Geochemical section 4 (GS 4)

- subdivided into two parts
- distinctly decreasing siliciclastic input, increase in carbonate
- lower part: returned influence of water in the sabkha plain, successively reinstalling rather wet conditions
- upper part: beginning of a new transgression, leading to the marine environment of the Lower Muschelkalk



Geochemical sediment composition at Site Fürstenwald (for further details see DERSCH-HANSMANN, HUG & WONIK, in press.).