

ADDITIONAL AMS ¹⁴C-DATES FROM THE REINBERG BASIN
(VORPOMMERN, NE GERMANY)

Supplemental report to DFG project Bi 560/1-5 “Präzisierung der
frühesten Vegetationsentwicklung anhand der Lokalität Reinberg”

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1. Introduction

The Reinberg basin in Vorpommern (NE Germany) was subject of integrated geomorphological-palynological studies between 01.05.1999 and 31.10.2000, financed by the Deutsche Forschungsgemeinschaft (DFG) (cf. De Klerk, 2001; De Klerk & Helbig, 2001; De Klerk et al., 2001). One of the research priorities was the palaeobotanical investigations of the so-called “Reinberg horizon”, a humus-rich fossil Ah horizon on top of Pleniglacial basin sands which palynologically date at the transition from Pleniglacial to Lateglacial. It appeared impossible at that time to obtain absolute dates from the Reinberg basin due to contamination of the AMS-¹⁴C samples with recent ¹⁴C, originating from previous tracer experiments in the rooms where the samples were prepared. It was arranged with the “Leibnitz Labor für Altersbestimmung und Isotopenforschung” (Christian-Albrechts-Universität Kiel) that 5 further dates were already paid for before the termination of the project, which would be carried out after new samples could be obtained from the study area. It was decided only to try to date the Reinberg horizon, since this horizon formed the main study subject, and samples could be easily selected without time-consuming additional palynological analyses. New cores were taken in September 2001 and screened for datable material in September 2002. The results of the dates were communicated by Prof. Dr. P.M. Grootes in March 2003.

2. Methods

New cores were taken with a Hiller sampler: REC², R23², R29², R35², and R36², located immediately next to the original cores REC, R23, R29, R35 and R36 (cf. Fig. 1). As the original core-markers still were present in the basin, the position of these cores immediately next to the original cores is without doubt. Depth ranges and sediment description are presented in Table 1. Differences in the depth below surface of the sand compared to the previous cores (cf. Tab. 1, Fig. 1 and De Klerk et al., 2001) are due to micro-relief differences in the top of the Pleniglacial sand, and/or due to differences in the elevation of the top of the covering peat caused by differences in water content between the various years.

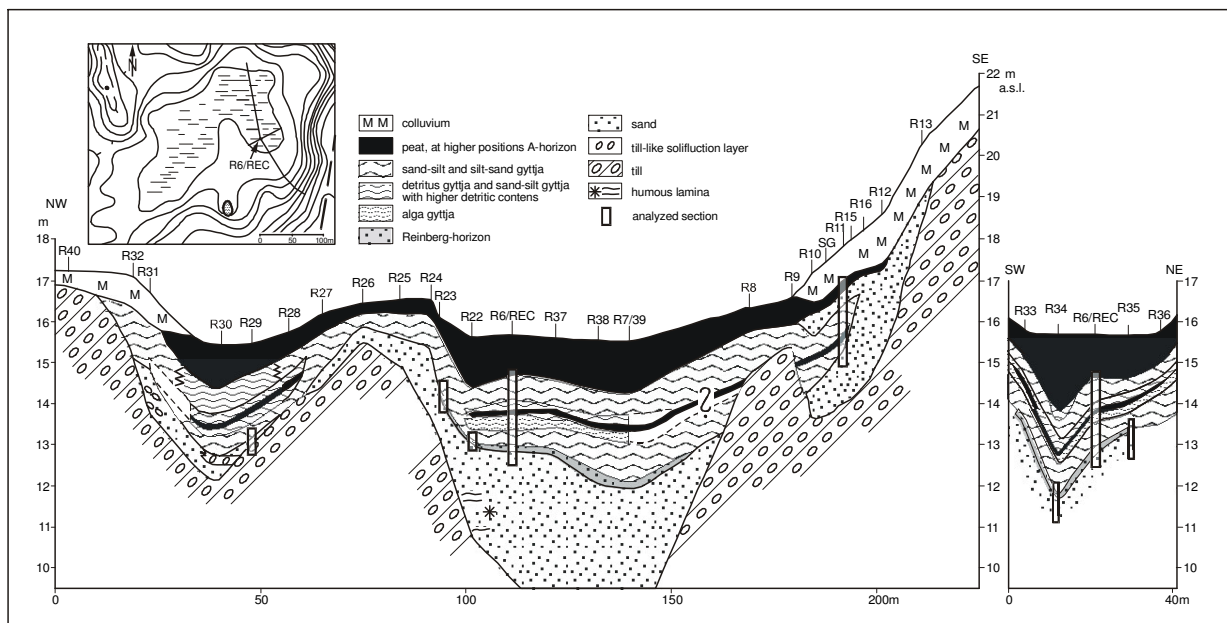


Fig. 1: Cross-sections of the Reinberg basin (from: De Klerk, 2001; De Klerk & Helbig, 2001; De Klerk et al., 2001).

All samples were prepared in the Geographical Institute of the Greifswald University: there has been no direct contact with the Botanical Institute which hosts the source of contamination with recent ^{14}C -isotopes.

The obtained cores were divided into different depth trajectories, subsequently washed with H_2O , sieved ($0.50\ \mu\text{m}$), and screened for AMS-datable macrofossils. The observed macrofossils are presented in Tab. 1. As the amount of observed seeds, fruits and nuts attributable to upland plants was insufficient even for one AMS-date if these all were added together, it was decided to prepare samples from the numerous wood fragments and charcoal particles from selected depth ranges (Tab. 2). Weight of the samples (cf. Tab. 2) was determined after heating the samples at 85°C .

TABLE 1: Description of the sampled sections

Core	Sampled depth ranges (cm below surface)	Sediment description	Observed macrofossils
REC ²	300-311	Humous sand	Tissue fragments indet.; wood fragments indet.; root fragments indet.; charcoal particles
R23 ²	214-235	214-219: gyttja 219-235: humous sand	cf. Cyperaceae bicapellate nut; beetle remains indet.; wood fragments indet.; root fragments indet.; charcoal particles
R29 ²	266-272; 272-278	266-272: gyttja 272-278: humous sand	266-272: <i>Amblyodon dealbatus</i> remains; tissue fragments indet.; 266-278: wood fragments indet.; root fragments indet.; charcoal particles
R35 ²	220-242	220-230: humous sand 230-242: slightly humous sand >242: sand	Cyperaceae bicapellate nut; Chitine remains (leg of insect or spider); tissue fragments indet.; wood fragments indet.; root fragments indet.; charcoal particles
R36 ²	190-210; 210-230; 230-241	190-192: gyttja 192-230: sand 230-241: humous sand	190-210: 2 <i>Potamogeton</i> spec. fruits; 190-241: wood fragments indet.; root fragments indet.; charcoal particles

3. Results

3.1. Macrofossils

The previous research already demonstrated that the Reinberg horizon is poor in macrofossils. The new samples contained even less macrofossils as the previous analysed samples. They mainly confirm the previous vegetation reconstruction. Previously not found were remains of the moss *Amblyodon dealbatus*. In this way some new information is provided about the local moss vegetation within the Reinberg basin.

3.2. AMS-dates

The results of the AMS-dates (Tab. 2), unfortunately, do not range around the age of approximately 12900 ^{14}C years B.P., which was the expected age for the Reinberg horizon.

One of them (REC² 300-311) is much younger than expected. This is probably the result of the presence of younger wood or root material within the selected wood fragments transported downwards by the core, in spite of careful sampling and removal of dubious material.

The other samples are much older than expected and range (within their \pm -values) between ca. 20000 and 30000 ¹⁴C years B.P. The dated material, thus, dates from a period prior to the Brandenburgian glacial advance, i.e. prior to the glaciation of the northern German area. The possibility of redeposition of charcoal and wood was taken into consideration during sampling: since wood fragments and charcoal particles are very vulnerable to mechanical damage - even during sampling several particles did not 'survive' the careful handling with a pincet -, it was assumed that these fragments could not endure the pressure of a glacier and, thus, were contemporaneous with the pollen signal of the Reinberg horizon. This assumption, obviously, was wrong.

TABLE 2: Results of the AMS-¹⁴C-dates of the new cores from the Reinberg basin

Sample	Lab. Nr.	Dated material	Sample weight (mg)	Carbon content (mg)	Result (¹⁴ C years B.P.)
REC ² 300-311	KIA 19274	Wood fragments; charcoal particles	4.1	0.7	3615 \pm 45
R23 ² 214-235	KIA 19275	Wood fragments; charcoal particles	3.5	0.6	23460 + 380 / -360
R29 ² 266-272	KIA 19276	Wood fragments; charcoal particles	13.9	5.9	29510 \pm 190
R35 ² 220-242	KIA 19277	Wood fragments; Charcoal particles	4.3	0.3	26560 + 1140 / - 1000
R36 ² 230-241	KIA 19278	Wood fragments; Charcoal particles	6.2	2.1	28860 + 270 / -260

4. Concluding remarks: dating of the Reinberg horizon

The ¹⁴C-age of the Reinberg horizon, currently, has to remain unknown. Still available material is stored in the Botanical Institute of the Greifswald University in a refrigerator that is one of the prime suspects in containing contaminating recent ¹⁴C-isotopes. In order to obtain new dates, new samples should be cored. As the current research shows it is very uncertain if sufficient AMS-datable macrofossils can be found in one core: only if a great number of samples are cored there is a change to find the necessary amount of fruits, nuts, seeds or leaves.

The large amount of exotic redeposited pollen demonstrated in the Reinberg horizon makes it impossible to date pollen concentrates from the Reinberg horizon, unless a method can be developed that allow the dating of selected pollen (e.g. the pollen types that occur in such high amounts in the diagrams of the Reinberg horizon that they are interpreted to originate from the local vegetation).

Thus, without new time-consuming research including coring, macrofossil analysis and pollen analysis, the actual age of the Reinberg horizon remains unknown and correlation with other palaeoecological/palaeoclimatic data from other areas remains mere hypothetical.

Current available literature including the Reinberg basin (state: May 2003)

- De Klerk, P. (1998): Late Glacial and Early Holocene vegetation history in northern Vorpommern: a preliminary review of available pollen diagrams. Project Report, EMAU Greifswald, 34 p.
- De Klerk, P. (2001): Vegetation history and palaeoenvironmental development of the Endinger Bruch area and the Reinberg basin (Vorpommern, NE Germany) during the late Pleniglacial, Lateglacial and Early Holocene (with special emphasis on a widespread stratigraphic confusion). PhD-thesis, EMAU Greifswald, 103 p. + appendices
- De Klerk, P. & Helbig, H. (2001): Präzisierung der frühesten Vegetationsentwicklung anhand der Lokalität Reinberg. Project Report, EMAU Greifswald, 16 p. + appendices.
- De Klerk, P., Helbig, H., Helms, S., Janke, W., Krügel, K., Kühn, P., Michaelis, D. & Stolze, S. (2001): The Reinberg researches: palaeoecological and geomorphological studies of a kettle hole in Vorpommern (NE Germany), with special emphasis on a local vegetation during the Weichselian Pleniglacial/Lateglacial transition. Greifswalder Geographische Arbeiten 23: 43-131.
- Helbig, H. (1999): Die spätglaziale und holozäne Überprägung der Grundmoränenplatten in Vorpommern. Greifswalder Geographische Arbeiten 17: 1-110.
- Helbig, H. (1999): Die periglaziäre Überprägung der Grundmoränenplatten in Vorpommern. Petermanns Geographische Mitteilungen 143: 373-386.
- Helbig, H. & De Klerk, P. (2002): Geoökologische Prozesse des Pleni- und Spätglazials in der Hohlform „Reinberg“, Nordvorpommern. Greifswalder Geographische Arbeiten 26: 31-34.
- Helbig, H., De Klerk, P., Kühn, P. & Kwasniowski, J. (2002): Colluvial sequences on till plains in Vorpommern (NE Germany). Zeitschrift für Geomorphologie N.F., Supplementbände 128: 81-100.
- Theuerkauf, M.: Die Laacher Seetephra in Nordost-Deutschland. MSc-thesis, EMAU Greifswald, 76 pp. + appendices.
- Theuerkauf, M. (in press): Die Laacher See-Tephra in Nordostdeutschland: Paläoökologische Untersuchungen mit hoher zeitlicher und räumlicher Auflösung. Greifswalder Geographische Arbeiten.

Planned future publications on the Reinberg basin (state: May 2003)

- De Klerk, P., Helbig, H. & Janke, W.: Vegetation and environment in and around the Reinberg basin (Vorpommern, NE Germany) since the Weichselian late Pleniglacial. In preparation for: Palaeogeography, Palaeoclimatology, Palaeoecology.
- De Klerk, P., Janke, W., Kühn, P. & Theuerkauf, M.: Palaeoecological processes around the deposition of the Laacher See tephra in the distal area of its northeastern fan: an example from the Reinberg basin (Vorpommern, NE Germany). In preparation for: Boreas.
- De Klerk, P., Helbig, H., Michaelis, D. & Stolze, S.: A local vegetation from the transition from Pleniglacial to Lateglacial in the Reinberg basin (Vorpommern, NE Germany). In preparation for: Review of Palaeobotany and Palynology.