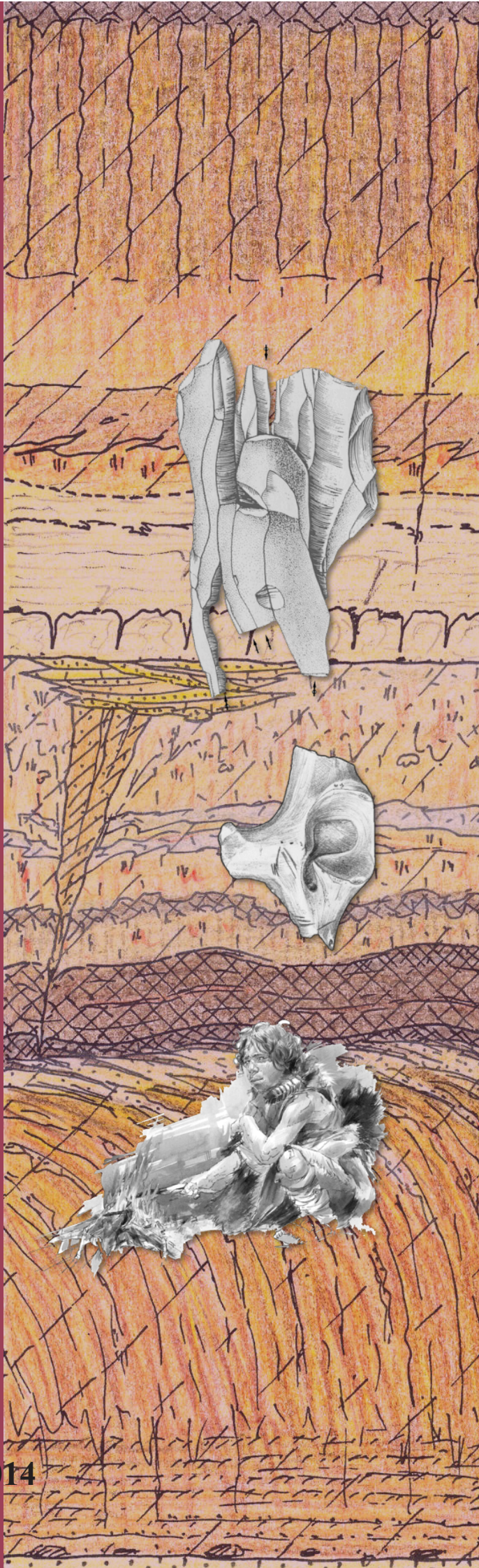
MIDDLE PALAEOLITHIC IN NORTH-WEST EUROPE

MULTIDISCIPLINARY APPROACHES



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LŒSS OF THE LOWER RHINELAND

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In the area of the Lower Middle Rhine and the Lower Rhine a stack of up to 55 m thick lœss deposits shows a distinct subdivision by solcomplexes and by sedimentological discordances (Fig. 1).

Lithological subdivision

Lithologically the lœss stack is subdivided by two formations. The Upper Lœss Formation encompasses five subformations ascribed to the Late Pleistocene (MIS 5–2), from young to old: the Brabant, Hesbaye, Ahrgau, Keldach and Rheingau Subformations (SF). The Lower Lœss Formation encompasses — as far as we know at present — seven subformations ascribed to the Middle Pleistocene (MIS 6 to at least 11), from young to old: the Wetterau, Gillgau, Limburg, Mülgau, Kützgau, Geldern and Jülich Subformations (SF).

While the Brabant SF has been preserved as blanket of the Rhine–Maas plateau up to 6 m thick, the older lœss deposits are preserved only locally in tectonical or morphological depressions or in lee slope positions.

Subdivision by solcomplexes

The lœss stack is subdivided by four solcomplexes that each represent an interglacial complex. The solcomplexes comprise each 2–5 Bt horizons, humus zones and sometimes gelic gleysols (Nassböden) each separated by thin lœss layers. In case of the Garzweiler Solcomplex (MIS 5) it can be demonstrated that this solcomplex embraces at least one interglacial (Eemian) represented by the Erbach Bt horizon. It is followed by Bt horizons representing very mature interstadials (Brørup and Odderade). In addition, each Bt horizon is followed by a separate humus zone which represents certain warming phases (Schirmer, 2000a, b).

From this follows: An interglacial solcomplex is a cluster of preferably terrestric and minor semiterrestric soils that comprises at least one interglacial period, sometimes two or more, and a range of interstadial periods. These warm periods are separated by thin lœss layers representing short cold periods with lœss deposition, called breviglacials *sensu* Schirmer 1999a. As a whole, the solcomplex with its soils and breviglacial lœsses forms a long period of quiescence of the landscape. During the long period of duration of a solcomplex there occur neither thick essential accumulation nor major erosion which transform the landscape basically (Schirmer, 1999a).

The Garzweiler Solcomplex is ascribed to MIS 5. The Erft Solcomplex should be assigned to MIS 7. The Rur and Niers Solcomplexes follow beneath. They may represent MIS 9 and 11 or they are older owing to possible erosional discordances.

The Ahr Interstadial Solcomplex representing the Middle Pleniglacial of the last Glacial (MIS 3) embraces a characteristic sequence of B and A horizons, the Remagen Soils 1-5 and Sinzig Soils 1-3 (Schirmer, 1990, 1995, 2012). These eight calcic cambisols are each separated by thin solifluctional lœss layers. However, two of these lœss layers are somewhat thicker thus forming three groups of soil clusters, two Lower Remagen Soils, three Upper Remagen Soils and three Sinzig Soils. This interstadial solcomplex can be considered being an initial climate stage of an interglacial solcomplex (Schirmer, 2002).

Subdivision by sedimentological discordances (event stratigraphy, discordance stratigraphy)

Normally a lœss stack encompasses an abundance of sedimentary pauses, those are times without deposition or minimal deposition, or times of soil formation or even times with erosional discordances. In any case lœss sedimentation is shorter than the sedimentary breaks in between. Most of the erosional discordances can be followed only over short distances and are of minor relevance. Moreover, each of the fossil soils ends with a sedimentary discordance visible by a certain truncation of the soil. However, there are major discordances that deeply and extensively truncate and revolutionize the lœss landscape (Schirmer, 2003a, 2003b, 2003c). They can be identified by tracing them over longer distances in large

outcrops or over several outcrops. Such are from old to young: the Mülgau Discordance in the lower Mülgau SF, the Wetterau Discordance in the lower Wetterau SF, the Keldach Discordance in the lower Keldach SF, the Hesbaye Discordance in the lower Hesbaye SF and the Eben Discordance in the upper Hesbaye SF. The Wetterau Discordance was observed being the strongest and deepest down-encroaching, sometimes eroding down to the Jülich SF. The Eben Discordance is smooth in plateau position, but in slope position it can also take off all the older formations as seen in the open cast mine Frimmersdorf West (Schirmer, 2003d). Discordances positioned close to the base of a løess subformation, following a quiet soil formation period, may be the event of a frequent freeze-thaw action. Major discordances (e.g. Wetterau or Eben Discordance) may be caused by permafrost decay (Schirmer, 2000, 2003b, 2003d).

Thus, major sedimentological discordances are climate-morphogenetical events that provide essential elements for subdivision of unconformity-bounded units and understanding the landscape evolution.

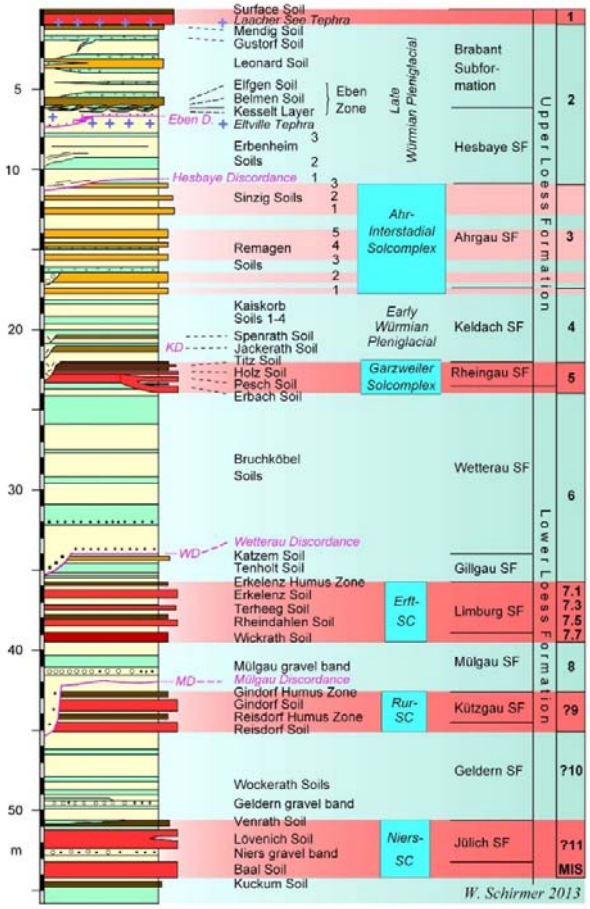

Figure 1
Rhine løss record. KD = Keldach Discordance.
Modified after SCHIRMER (2010).

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Fig. 1 with higher resolution