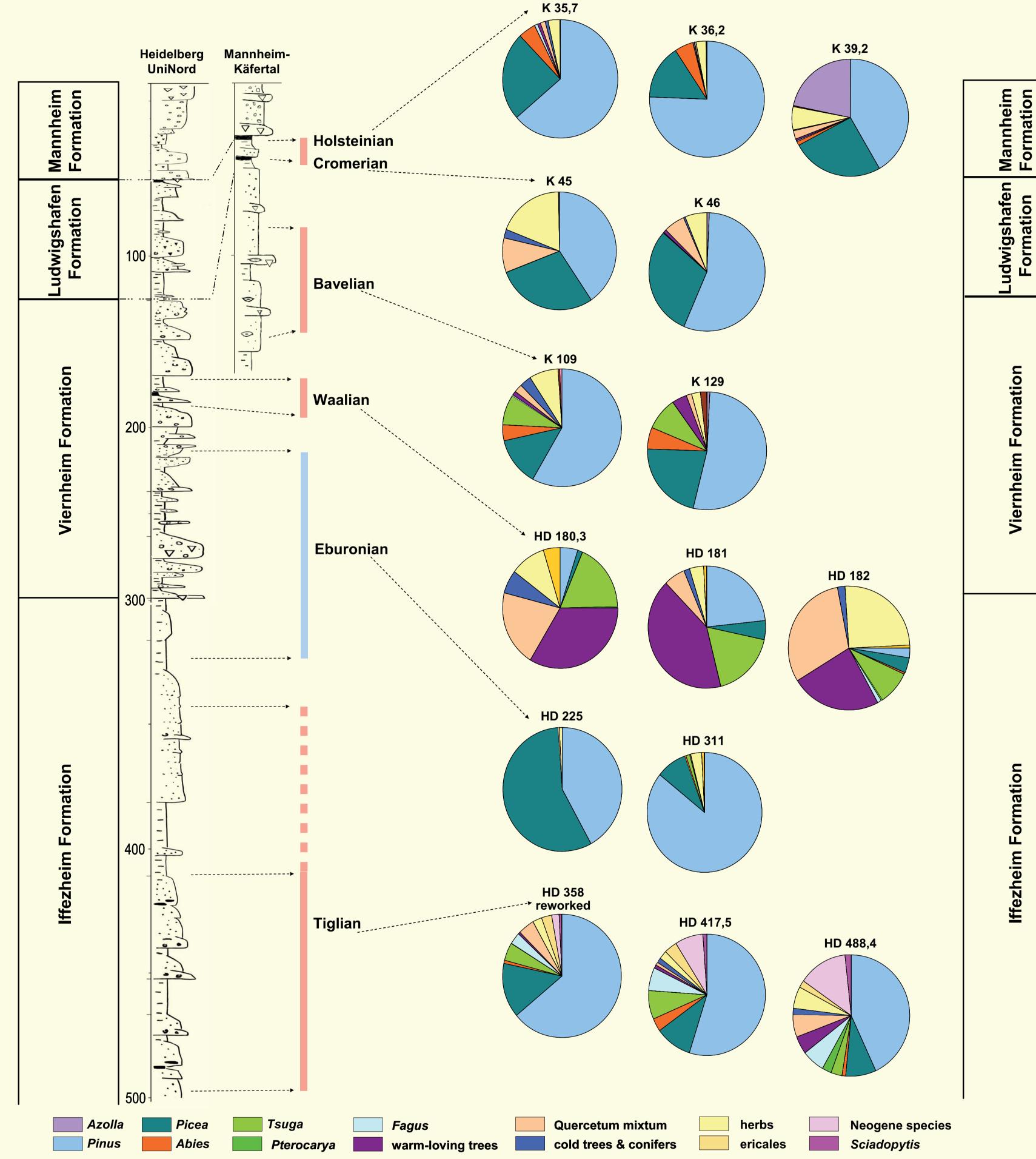
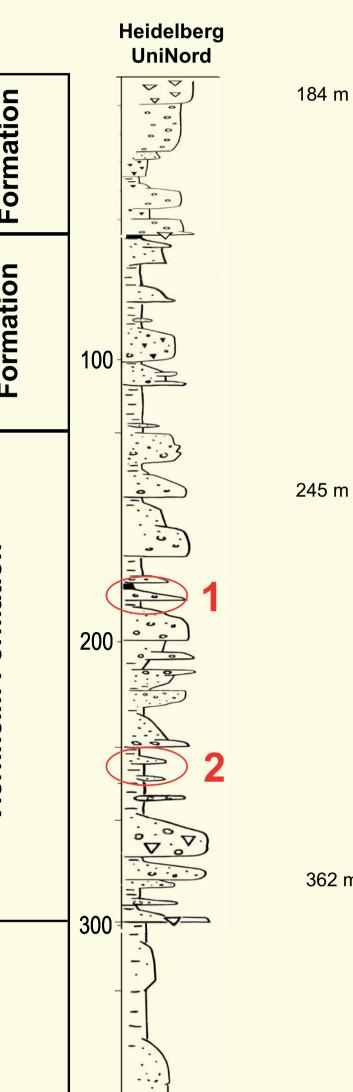


LANDESAMT FÜR GEOLOGIE, ROHSTOFFE UND BERGBAU

The Heidelberg Basin Drilling Project Sedimentology and Stratigraphy of the Quaternary succession -

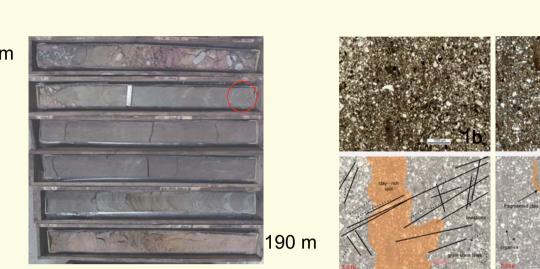
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400

500-

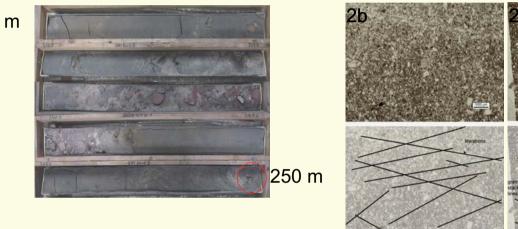


185,9 – 186 m

(1b) Many clasts embedded in light brown silt and clay (diamicton), in places stacking of clay and fine sand domains giving evidence of freeze-thaw activity.

(1k) Clay band disruption, bending and fragmentation.

The sediment is possibly been deposited close to an open ground surface in shallow water. It may be a small mass movement of avulsion sediment coming off a point bar within a floodplain environment or simply flood-plain sediments that have been deposited rapidly and suffered slight mass movement.

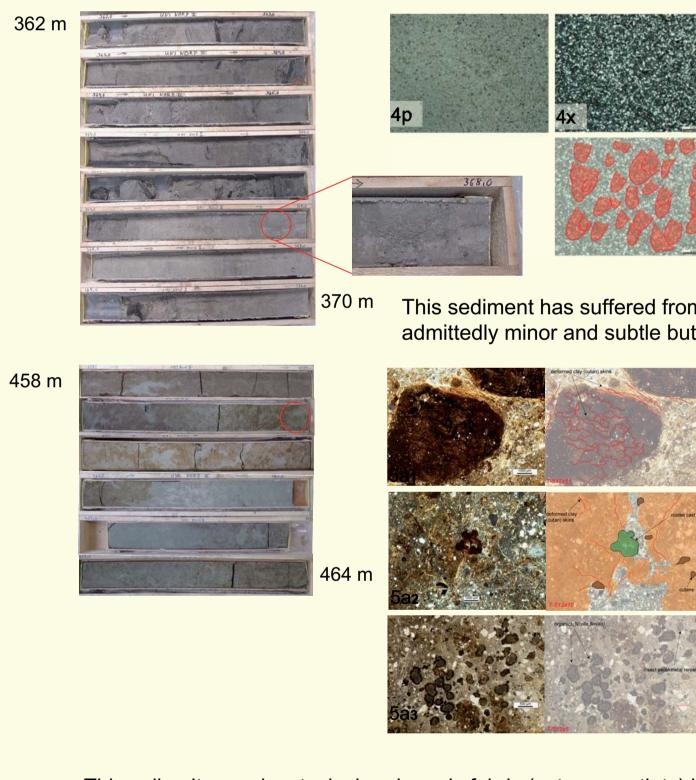


249,9 – 250 m

(2b & 2f) Light brown diamicton with a high concentration of small and few larger clasts. Two generations of shear zones in both sections.

(2f) Small clay accumulations in the lee of larger clasts and a rotation structure around the large clast in the centre.

The sediment is an internally deformed diamicton that has been overrun by a much higher stress bearing process such as a large mass movement (land slide?, see overlying fining upward cycle). The clay lee-side deposits and the large rotation structure indicate clast movements relative to the matrix material.



367,8 – 367,9 m

(4p) Light grey sand with grains slightly patterned.

(4x) The same pattern better seen in polarized light. There is subtle evidence of repeated grain loaded casts i.e. the 'lobes' are quite numerous. This may be silt droplets indicating periglacial movements.

This sediment has suffered from freeze/thaw processes. Evidence is admittedly minor and subtle but there nevertheless.

460,9 – 461 m

A reddish to orange, fine grained diamicton with many clay skins (cutans or argillans) resulting from clay translocation during soil formation. (5a1) Tow large clay 'clots' contain (probably older) clay cutans which exhibited deformation. (5a2) Deformed clay skins, cutans and clay infilled rootlet casts. (5a3) Specimens of Nittela flexilis, a

floating microalgal species, and insect fragments.

This soil unit reveals a typical pedogenic fabric (cutans, rootlets) but shows also some disturbance by short distance transport possibly by water (microalgae, marginal fragmentation of clay 'clots'). This is consistent with a flood effect moving soils around an occasional flooded river floodplain, and in the process picking up organics etc. The sediment is a diamicton possibly formed within a floodplain close to a river over which occasional floods have occurred.

Within the context of the Heidelberg Basin Drilling Project (GABRIEL et al. 2008), a highly resolved sediment succession was explored by deep drillings. The two successions of Heidelberg UniNord and Mannheim Käfertal can easily be correlated using sequence stratigraphical patterns. Together they represent one of the mostcomplete continental successions of the NW-European Quaternary in stratigraphical superposition. Here some new results supported from pollen analysis and micromorphology are presented. They are used to reconsider some of the climate transitions within the Pleistocene.

Lithology

Palynology

More than 90 samples have been processed from the Heidelberg UniNord core, and additionally 64 samples from Mannheim Käfertal. We found an almost complete succession of the Quaternary climate stages in the pollen assemblages.

Palynological evidence within the Ludwigshafen Formation comprises the **Holsteinian**, characterized by mainly *Abies* (fir), some *Fagus* (beech), Pterocarya and Azolla, and the Cromerian with a Pinus-Picea-QM (pine-spruce-QM) flora.

The **Bavelian** is documented in the upper part of the Viernheim Formation at Mannheim Käfertal with common Abies and Tsuga (hemlock fir) within a QM flora accompanied by phases with increased NAP and ning and end. *Pinus*. In the lower part of the Viernheim Formation in both sections, the **Waalian** (HAHNE et al. 2009) is indicated by warmth-loving species (QM and others) together with *Tsuga*. From around 220 m down into the Iffezheim Formation conifers predominate indicating the **Eburonian** cold phase. Below about 340 m depth at Heidelberg UniNord, typical warm assemblages document the **Tiglian** with *Fagus* & early Pleistocene taxa, especially *Sciadopytis*. Further, Tertiary taxa increase in number down to the final drilling depth of 500 m, but other than before expected, no true Tertiary pollen spectrum, not even a spectrum indicating the Pretiglian was found. This certifies that the Iffezheim Formation (seprovenance, almost diments of local goes well up into carbonate free) the Pleistocene at some localities.

Micromorphology

The sediment package was studied both, macro- and microscopically (MENZIES 2009) providing evidence of fluvial, lacustrine and mass movement processes. Some samples indicate periglacial processes as silt droplets within fine grained sands which suggest frozen ground conditions. These are often accompanied by pollen spectra dominated by pine and NAP.

The Tiglian part of the succession shows periglacial sediment structures at its base and top but not in its middle parts. That is that the Tiglian appears not as a series of warm and cold phases but rather as a constant warm period with warm-cold-alternations at its begin-

In the northern Upper Rhine Graben the lithostratigraphic column starts with quite coarse gravels of the Mannheim Formation reaching almost 60 metres in the central Heidelberg Basin. Below follows the fineclastic Ludwigshafen Formation. Down to 300 meters at UniNord, the Viernheim Formation consits in its upper part of uniform bedload clastics and deeper down of a variable interbedding of gutter and floodplane deposits shed by the alpine Rhine. The lowermost unit, the Iffezheim Formation, is composed of sand and pedogenic clay of local provenance.

Pollen and micromorphological analyses attest the presence of several climate transitions of the Pleistocene, making it one of the mostcomplete continental successions of the NW-European Quaternary.

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