



Supplement of

**Early Eocene carbon isotope excursions in a lignite-bearing
succession at the southern edge of the proto-North Sea
(Schöningen, Germany)**

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S1 Lithologic description of sampled sections

Detailed descriptions of sections “Schoe XLIX”, “Schoe IX”, “Schoe V”, “Schoe VI”, “Schoe XXV”, “Schoe XIII” and “Schoe I”.

Abbreviations for lignite lithotypes:

Macropetrographic lithotype classification adapted from Vogt (1981)

ML = matrix dominated lithotype

TL = tissue dominated lithotype

TML = mixed tissue/matrix lithotype

Section/horizon (thickness) Description

Schoe I/80	(28cm) Dark clayey silt to silty clay, reddish when fresh, bedding recognizable by light-colored streaks, rooting.
Schoe I/79	(17 cm) Dark sandy clay, sand content decreasing upward, some root structures, no bedding.
Schoe I/78	(20 cm) Medium brown sand, densely bioturbated, scattered rooting, dark clayey lenses.
Schoe I/77	(14 cm) Dark silty clay, no bedding.
Schoe I/76	(40 cm) Dark clayey silt with fine light silt lenses and flasers.

Base of Interbed 7

Top of Seam 6

Schoe I/75	(52 cm) Dark matrix lignite lithotype to layered lithotype, well bedded, alternation between leafy and charcoal layers, charcoal dominating.
Schoe I/74	(12 – 20 cm) Light-colored lignite lithotype, scattered light-colored tissue and gelified roots.
Schoe I/73	(96 cm) Dark tissue lignite lithotype to layered lithotype, well bedded, alternation between leafy and charcoal layers, regular with pyrite concretions, upper part more massive and reddish when fresh.
Schoe I/72	(36 cm) Dark mixed tissue/matrix lignite lithotype with scattered charcoal layers, xylitic, with some larger xylites and tree stumps.
Schoe I/71	(65 cm) Matrix to mixed tissue/matrix lignite lithotype, xylite with gelified xylites and roots, some tree stumps, distinctly reddish when fresh, resin particles.

Base of Seam 6

Top of Interbed 6

Schoe I/70	(3 – 5 cm) Brown clayey silt, flat-lying light-colored bioturbation lenticular in cross section, thick horizontal root branches.
Schoe I/69	(3 – 5 cm) Dark clay, dense horizontal rooting, no bedding.
Schoe I/68	(32 cm) Dark clayey silt, laminated below, increasingly rooted upward.
Schoe I/67	(4 – 6 cm) Coarse to medium grained light-colored sand, erosive lower contact, irregular bedding below, rooting above.
Schoe I/66	(2 – 7 cm) Dark silty clay to clayey silt, locally thin-bedded, rooted, sand filled bioturbation tubes, upper contact eroded.
Schoe I/65	(24 cm) Fine to medium sand with small scale cross-bedding and some dark clay/silt layers, thin bioturbation tubes, fine rooting.
Schoe I/64	(8 cm) Light-colored medium sand, in part (ripple?) cross-bedded, thick (1cm) bioturbation tubes with dark filling parallel to bedding, fine rooting.
Schoe I/63	(60 cm) Silty fine sand, mottled, densely bioturbated, upward light-colored and no bioturbation.
Schoe I/62	(21 cm) Dark clayey silt to fine sand, clay content decreasing upward, small scale (ripple?) cross-bedding, numerous bioturbation tubes filled with dark sand.

Schoe I/61	(17 cm) As bed Schoe I/60, more silty above, common thick bioturbation tubes (1cm in diameter) filled with dark fine sand.
Schoe I/60	(49 cm) Dark stiff silty clay with reddish-brown lenses and flasers of clayey silt, small scale cross-bedding (ripples?), no bioturbation.
Schoe I/59	(18 cm) Brown silty clay with fine silt lenses and laminae, upward lightening, bioturbation.
Schoe I/58	(41 cm) Dark clay with lenses and flasers of fine sand and silt internally laminated and in part graded, distinct bioturbation.
Schoe I/57	(70 cm) Lenses and flasers of light-colored fine sand in dark clay with randomly distributed bioturbation tubes.
Schoe I/56	(6 cm) Dark silty clay with silt lenses and laminae, in part with cross-bedding and bioturbation tubes filled with light-colored sand.
Schoe I/55	(7 cm) Light beige clayey silt, \pm parallel bedded with pyrite concretions and bioturbation tubes.
Schoe I/54	(12 cm) Slightly clayey silt with desiccation structures, originally laminated.
Schoe I/53	(60 cm) Light beige clayey silt with few bioturbation tubes, scattered xylites.
Schoe I/52	(55 cm) Light brown clayey silt with lenses and streaks of silt, clay content decreasing upward, hollow trunk 20cm above base.
Schoe I/51	(42 cm) Clayey silt with thick lenses of silt near base, decreasing in size upward.
Schoe I/50	(10 cm) Reddish brown clayey fine sand.
Schoe I/49	(15 cm) As bed Schoe I/48 but beige-brown, somewhat darker and more silty at top.
Schoe I/48	(36 cm) Brown-grey silty clay with fine streaks and lenses of silt.
Schoe I/47	(12 cm) Black carbonaceous clay, reddish when fresh, upper contact bioturbated, lower contact transitional.
Schoe I/46	(47 cm) Dark to black silty clay, near base bedding indicated, upward gelified root traces.
Schoe I/45	(33 cm) Dark brown silty clay, mainly massive, cup-shaped fracturing.
Schoe I/44	(28 cm) Silty clay, more silty below, more homogeneous above, well-bedded, darker than bed Schoe I/43.
Schoe I/43	(26 cm) Dark silty clay with light-colored silt laminae and lenses, cross-bedded, no bioturbation.
Schoe I/42	(33 cm) Dark brown stiff clay, slightly silty, with thin well- to cross-bedded silt layers, silt content increasing upward.
Schoe I/41	(12 cm) Dark silty clay with fine silt lenses and streaks.
Schoe I/40	(10 cm) As bed 39 but more clayey, darker, with fine lenses and flasers, less bioturbation, upper contact eroded.
Schoe I/39	(12 cm) Dark clayey silt alternating with light-colored silt in coarse lenses and flasers, distinct bioturbation, cross-bedding in some lenses.
Schoe I/38	(23 cm) Dark clayey silt alternating with light-colored silt in fine lenses and flasers, densely bioturbated with fine tubes.
Schoe I/37	(42 cm) Clayey silt alternating with lenses and thin layers of silt, in middle coarse silt lenses with cross-bedding, below and above dark with fine light-colored lenses and streaks, near top bioturbation.
Schoe I/36	(0-2 cm) Light brown medium to coarse sand, in channels up to 12cm thick, cross-bedded.
Schoe I/35	(6 cm) Dark brown clayey silt locally silt streak, but \pm unbedded.
Schoe I/34	(14 cm) Dark matrix lignite lithotype, well-bedded by fine silt laminae, reddish when fresh.
Schoe I/33	(18 cm) Clayey silt with lenses, flasers and streaks of light-colored silt, light colored bioturbation tubes, near base flat lying xylite.
Schoe I/32	(28 cm) Dark brown clayey silt with beige silt lenses and flasers mainly in lower part, slightly bioturbated.
Schoe I/31	(24 cm) Dark brown clayey silt, thin- to flaser-bedded.
Schoe I/30	(36 cm) Dark brown clay, lighter colored and more silty below, graded bedding.

Schoe I/29	(15 cm) Silty clay to clayey silt, well bedded by silt streaks, beige brown fine sand at top, single xylite.
Schoe I/28	(5-7 cm) Beige-brown sand, irregular ripple bedding.
Schoe I/27	(15 cm) Dark brown clay, bedding indicated.
Schoe I/26	(33 cm) Beige-brown clayey silt with white lenses and flasers of fine sand, more common upward, transition of flaser- to ripple-bedding.
Schoe I/25	(37 cm) Beige-brown clayey silt, below darker with light-colored silt flasers, upward lighter with fine ripple-bedding.
Schoe I/24	(51 cm) Beige-brown clayey silt, in middle clay and silt in distinct layers.
Schoe I/23	(11 cm) Brown compact clayey silt, largely unbedded, mottled.
Schoe I/22	(10 cm) Dark brown silty clay, fine bedding with silt laminae.
Schoe I/21	(20 cm) Dark silty clay with numerous lenses and flasers of silt and fine sand, bioturbation parallel to bedding, lower contact with breached surface of Seam 5.

Base of Interbed 6

Top of Seam 5

Schoe I/20	(50 cm) Mixed tissue/matrix to tissue lignite lithotype, reddish when fresh, charcoal on bedding plains.
Schoe I/19	(7 cm) Dark carbonaceous sand with gelified root traces, no bedding.
Schoe I/18	(6 cm) Dark clayey silt with fine sand, gelified root traces, some silt flasers.
Schoe I/17	(4 cm) Black gelified matrix lignite lithotype.
Schoe I/16	(23 cm) Dark brown matrix lignite lithotype, reddish when fresh, scattered resin particles and kaolinite filled bioturbation tubes, some xylites.
Schoe I/15	(11-13 cm) Carbonaceous clay with gelified root traces, some sand-filled bioturbation tubes, silt dispersed and in silt flasers.

Base of Seam 5

Top of Interbed 5

Schoe I/14	(75 cm) Fine sand coarsening upward with organic flasers and few dark clayey layers, ooting from middle of bed upward, small scale ripple bedding.
Schoe I/13	(90 cm) Fine sand/silt, sand content increasing upward, below light brown with organic flasers and laminae, small scale ripple bedding, upward light beige, fewer organic flasers and bedding features.
Schoe I/12	(7 cm) Transitional to bed Schoe I/13: light grayish brown, thin bedded, in lower part silt laminae and organic layers, scattered bioturbation tubes.
Schoe I/11	(18 cm) Medium gray brownish silt with numerous light-colored sand-filled bioturbation tubes, upward lighter colored, largely unbedded.
Schoe I/10	(37 cm) Highly clayey silt, darker than bed 9, with numerous silt laminae and flasers and bioturbation tubes filled with light-colored sand, both mainly in upper part.
Schoe I/9	(24 cm) Dark clayey silt with fine sand, some silt flasers and light-colored filled bioturbation tubes, unbedded, massive.
Schoe I/8	(22 cm) Dark clayey silt, silt in streaks and lenses and in bioturbation intense, tubes parallel to bedding, no vertical tubes!
Schoe I/7	(54 cm) Dark sand, unbedded, with dense bioturbation, tubes dark with light-colored sandy core.
Schoe I/6	(25 cm) Fine sandy clayey silt, flaser-bedded, dense bioturbation with tubes filled with light-colored sand, irregular top contact.
Schoe I/5	(23 cm) Dark sand with thin coaly streaks, no bedding, dense bioturbation with tubes filled with light-colored sand.
Schoe I/4	(27 cm) Reddish brown clayey silt darkening upon aerial exposure, compact, internally flaser- to lenticular bedding, upward increasing number of sand-filled bioturbation tubes.

Schoe I/3	(23 cm) Clayey silt with distinct silt streaks especially in lower part, upper part lighter colored
Schoe I/2	(5 cm) Dark silty clay with very fine silt streaks
Schoe I/1	(>15 cm) Open end: dark gelified matrix lignite lithotype, in part xylitic, numerous silt streaks and pockets, silt in breaches of seam top and bioturbation tubes.
Schoe XIII/37	(10 cm) Dark carbonaceous clay, rooted with numerous slickensides and thin light-colored clayey flasers, largely without bedding, tree stumps near base.

Base of Interbed 5

Top of Seam 4

Schoe XIII/36	(4-5 cm) Medium brown matrix lignite lithotype with some light-colored tissue, kaolinite-filled root traces, frequent slickensides, xylites (tree stumps) at top.
Schoe XIII/35	(14 cm) Dark matrix lignite lithotype with light-colored tissue, with gelified and frequently kaolinite-filled root traces.
Schoe XIII/34	(12 cm) Dark matrix to mixed tissue/matrix lignite lithotype with light-colored tissue and xylites, gelified and kaolinite-filled root traces.
Schoe XIII/33	(7 cm) Beige to dark brown clay, densely rooted with numerous flat xylitic roots.

Base of Seam 4

Top of Interbed 4

Schoe XIII/32	(18 cm) Beige silty clay, densely rooted, unbedded, scattered resin particles.
Schoe XIII/31	(17 cm) Beige silty clay, towards top increasingly coaly particles indicating thin bedding, organically preserved hollow axes crossing bedding.
Schoe XIII/30	(20 cm) Dark silty clay with irregular to wavy light-colored lenses and layers of silt, rooted with thick coaly root traces, horizontal embedded xylite in middle.
Schoe XIII/29	(480 cm) As bed Schoe XIII/28: Greenish when fresh, bioturbation tubes up to 2cm in diameter in middle part, at 240cm from base pyrite concretions, clay content increasing toward top. Boundary with bed Schoe XIII/29 mainly drawn on the basis of greater water content.
Schoe XIII/28	(220 cm) Greyish brown mixture of clay, silt and sand with high proportion of mica, light grey upon drying, totally bioturbated with tubes of 1cm in diameter, scattered pyrite nodules ("Glimmersand" in literature).
Schoe XIII/27	(165 cm) Medium to dark grey silty clay to clayey silt, silt content increasing toward top, thin-bedded by numerous thin light-colored silt streaks, scattered thicker silt layers and lenses, fine horizontal bioturbation tubes partly pyritized, abundant mica, forams in middle part(?).
Schoe XIII/26	(28 cm) Dark very silty clay, massive, unbedded, no bioturbation.
Schoe XIII/25	(52 cm) Similar to bed 20: alternation of brown silty clay and light-colored silt layers and lenses, in part cross-bedded, fine bioturbation (<1mm), top boundary uneven but sharp.
Schoe XIII/24	(32 cm) Dark clay, massive with very scattered light colored silt streaks, mica present.
Schoe XIII/23	(150 cm) Dark silty clay with light-colored silt lenses and layers, thin-bedded, silt layers particularly abundant in middle part with fine bioturbation.
Schoe XIII/22	(35 cm) As bed Schoe XIII/20, but with thin vertical bioturbation tubes, cross-bedding in thicker silt layer, no pyrite.
Schoe XIII/21	(9 cm) Dark silty clay, well bedded by light-colored silt lamina, pyrite on bedding planes, forams?
Schoe XIII/20	(25 cm) Alternation of more clayey and more silty layers about 1cm thick, silt content and silt layers increasing toward top, bioturbation random in direction, pyrite concretions.
Schoe XIII/19	(30 cm) As bed Schoe XIII/17 but silt content somewhat higher, bioturbation tubes in part filled with pyrite.
Schoe XIII/18	(14 cm) Coarse sand cross-bedded with finely bedded light-colored silt and clay flasers.
Schoe XIII/17	(69 cm) Alternation of dark clayey and light-colored silt layers frequently divided into lenses by dense bioturbation.

Schoe XIII/16	(48 cm) Similar to bed Schoe XIII/15: light grey fine sand with secondary discoloration streaks, fine bedding in lower 5cm, bioturbation tubes less dense but 1cm in diameter, in part thin netted bioturbation.
Schoe XIII/15	(17 cm) Light grey fine sand with dark discoloration streaks and mottling, densely bioturbated by light-colored tubes 2mm in width, no bedding, sharp boundary at top.
Schoe XIII/14	(42 cm) Medium brown clayey/silty fine sand at base to fine sand at top, unbedded, cryptic bedding in lower third, fine root traces, bioturbation in upper third, coal clasts at top, scattered pyrite concretions.
Schoe XIII/13	(32 cm) 4-fold coarsening upward alternation of well-bedded dark clayey and light-colored silt layers with beige unbedded fine sand, regularly with randomly oriented bioturbation tubes (2-3mm in diameter).
Schoe XIII/12	(22 cm) Reddish silt to fine sand, unbedded, with dark coaly streaks (root traces!) and scattered grains of coarse sand, pyrite concretions.
Schoe XIII/11	(1 cm) Coarse sand, in part mixed with underlying bed Schoe XIII/10 by bioturbation.
Schoe XIII/10	(41 cm) Medium brown clayey silt with minute cross-bedding, bioturbation increasing toward top, coaly detritus in layers.
Schoe XIII/9	(150 cm) Dark slightly silty clay, occasionally silt layers with cross-bedding, five-fold fining upward cycles each with ripple- to cross-bedding at base.
Schoe XIII/8	(140 cm) Medium light-colored silty clay, in part reddish, distinct but irregular fine bedding, locally with light-colored silt lamina and fine ripples, generally disrupted by fine randomly occurring bioturbation tubes up to 2mm in diameter, one layer (at 1.00 to 1.10m from base) more clayey, layer at 1.10 to 1.18m fine sand, top boundary sharp.
Schoe XIII/7	(24 cm) Clayey silt to silty clay, silt content decreasing toward top bedded by light-colored silt layer in lower part, distinct fining upward tendency, bioturbation rare.
Schoe XIII/6	(5 cm) Medium light-colored lightly greenish fine sandy silt, highly bioturbated, some \pm vertical tubes (0.5cm) extending into coal below.
Schoe XXV/39	(19 cm) Dark clayey silt with fine sand, well bedded by very thin light-colored silt/fine sand laminae, regular light-colored bioturbation tubes 2-5mm in diameter.
Schoe XXV/38	(10 cm) Gray silt to light-colored fine sand, thin bedding by interspersed light-colored layers in part with cross-bedding, pyritized bioturbation tubes, xylite at base, coarse sand in shallow channels.

Base of Interbed 4

Top of Seam 3

Schoe XXV/37	(31 cm) As bed 36, but lignite completely disrupted by an irregular network of layers, veins and tubes filled with poorly sorted medium to coarse sand, gelified root traces not as common as in bed Schoe XXV/36.
Schoe XXV/36	(37 cm) Medium brown xylitic matrix lignite lithotype, gelified root traces and resin particles common, thin silt layer near base.
Schoe XXV/35	(35 cm) Medium to light brown matrix lignite lithotype with silt lenses near base, xylites and gelified root traces.

Base of Seam 3

Top of Interbed 3

Schoe XXV/34	(38 cm) Light gray brown clayey silt, upward lighter colored and more silty, intensely rooted with thick gelified root branches, no bedding, thickness decreasing toward SE.
Schoe XXV/33	(42 cm) Dark silty clay to clayey silt bedded by organic rich silty layers, but generally massive, upward increasingly rooted, near top thick root branches and slickensides thickness decreasing toward SE.

Schoe XXV/32	(23 cm) Dark silty clay with layers and flasers of light-colored silt and fine sand particular in middle of bed, layers with small scale ripple bedding, thin continuous layer of silt and fine sand at top, equivalent to bed Schoe XXV/6 below.
Schoe XXV/31	(45 cm) Dark silty clay to clayey silt with silt streaks, fine near base, upward increasing in number and thickness, bioturbation rare but more common upward, pyrite finely dispersed, thickness of bed decreasing toward SE, equivalent to bed Schoe XXV/7 below.
Schoe XXV/30	(28 cm) Dark brown silty clay with fine sand and mica, massive, no bedding, some bioturbation tubes (5mm) filled with fine sand, bed thickening toward SE, equivalent to bed Schoe XXV/8 below.
Schoe XXV/29	(24 cm) Dark carbonaceous clayey fine sand, fining upward, distinctly brown when fresh, no rooting.
Schoe XXV/28	(96 cm) Dark carbonaceous fine to medium sand, in upper third fine sand, densely rooted throughout, root traces gelified, in part pyritized.
Schoe XXV/27	(13 cm) Dark silty clay, massive, light-colored silt layers widely dispersed, more concentrated at certain levels, upper 40cm increasingly with bioturbation tubes filled with light-colored silt and fine sand, at top massive, \pm unbedded.
Schoe XXV/26	(32 cm) Dark clayey silt with some light-colored cross-bedded silt layers, similar to bed 24, but without bioturbation.
Schoe XXV/25	(45 cm) Dark silty clay with scattered silt laminae, massive, \pm unbedded, very rare light-colored bioturbation tubes (5mm).
Schoe XXV/24	(22 cm) Dark clayey silt bedded by thin light-colored silt layers, lower part unbedded with small pyrite nodules, basal contact sharp but disrupted by bioturbation.
Schoe XXV/23	(37 cm) Dark very silty clay, massive, rarely with light-colored silt layers, pyrite in upper part, bioturbation tubes (5mm) terminating at top contact.
Schoe XXV/22	(7 cm) Grey silty clay with numerous silt laminae and lenses, sharp lower contact disrupted by bioturbation, small xylites, similar to bed Schoe XXV/6 below.
Schoe XXV/21	(50 cm) Dark clay finely bedded with light-colored silt layers and lenses and bioturbation tubes (1mm), bioturbation tubes from top down (5mm) filled with silt, equivalent to bed Schoe XXV/6 below.
Schoe XXV/20	(22 cm) Fine bedding of dark clayey and light-colored silt layers, no bioturbation, equivalent to bed Schoe XXV/6 below.
Schoe XXV/19	(60 cm) Light colored clayey silt with erosive base, darker and more clayey in densely bioturbated lower part (29cm), pyrite nodules, upper part less bioturbated and with scattered xylites, equivalent to bed Schoe XXV/5 below.
Schoe XXV/18	(41 cm) Equivalent to bed Schoe XXV/7 below, \pm vertical to diagonal bioturbation tubes (5mm) with light-colored silt filling, forams in upper part(?).
Schoe XXV/17	(19 cm) Equivalent to bed Schoe XXV/6, grey slightly clayey silt, flaser-bedded, scattered fine bioturbation tubes.
Schoe XXV/16	(150-160 cm) Equivalent to bed Schoe XXV/5 below, fining upward, mainly fine bioturbation tubes in lower 50cm, basal contact with erosional features.
Schoe XXV/15	(50 cm) Equivalent to bed Schoe XXV/8 below, but more sandy, upper 15cm with dense bioturbation of randomly directed tubes (2mm) filled with light-colored silt, sharp lower contact.
Schoe XXV/14	(28 cm) As bed Schoe XXV/7 below, more bioturbated at top, single xylite.
Schoe XXV/13	(21 cm) Equivalent to bed 6 below, alternation of dark clayey silt and light-colored silt laminae, in part fine cross-bedding (ripples), thin bioturbation tubes, sharp lower contact.
Schoe XXV/12	(60 cm) Beige brown flasered slightly clayey silt, in part densely bioturbated with fine tubes (1mm), sharp lower contact.
Schoe XXV/11	(23 cm) Equivalent to bed Schoe XXV/8 below, mostly fine bedded with flat pebbles and layers or pockets with forams(?).
Schoe XXV/10	(63 cm) As bed Schoe XXV/7

Schoe XXV/9	(51 cm) As bed Schoe XXV/5, fine bioturbation tubes randomly directed, single xylite at top, upward fine bedding.
Schoe XXV/8	(27 cm) Dark brown homogeneous silty clay, unbedded, scattered pyritized bioturbation tubes, forams?, very sharp upper contact.
Schoe XXV/7	(67 cm) Dark silty clay to clayey silt, compact, fine bedding throughout by fine light-colored silt lamina, no bioturbation.
Schoe XXV/6	(10 cm) Transitional, fine bedding of dark clayey (5mm) and light-colored silty layers (2-3mm), no bioturbation.
Schoe XXV/5	(22 cm) Light-colored clayey silt with sharp slightly erosive lower contact, irregular flaser-to lenticular bedding, clay content increasing upward, xylite at base, no bioturbation.
Schoe XXV/4	(22 cm) Dark silty clay, massive, but internally bedded by light-colored silt layers with abundant mica, top 4 cm with fine bioturbation, lower contact disturbed (see below).
Schoe XXV/3	(33 cm) Light-colored medium to coarse sand with some <i>Ophiomorpha</i> tubes and fragments of xylite, desiccation structures disrupting upper contact.
Schoe XXV/2	(11 cm) Light-colored fine to medium sand with somewhat indurated dark flasers and a 2cm thick dark layer (secondary coloration?), no bedding recognizable.
Schoe VI/24	(46 cm) Dark, more or less clayey silt with layers of dark sand including partially pyritized charcoal fragments; individual layers with foraminifera?, plant remains present and partially pyritized, common slickensides.

Base of Interbed 3

Top of Seam 2

Schoe XXV/1	(Open end) Dark xylitic lignite, medium brown when fresh, abundant gelified tissue, bioturbation tubes (5mm) from top down to 5cm filled with brown to light-colored sand.
Schoe VI/22	(18 cm) Medium brown TML, charcoal lenses at base, light colored xylites increasingly common toward top, projecting into overlying sediments at top.
Schoe VI/21	(14 cm) As bed 19, but more massive, less finely dispersed charcoal, less rooting, fewer silt pockets, no fern axes.
Schoe VI/20	(8 cm) As bed 19, but not bedded, no fern axes.
Schoe VI/19	(15 cm) Medium brown TML, intensely rooted with redbrown root traces, distinctly bedded, small charcoal fragments on bedding plains, light colored tissue common, scattered pockets of silt and pyrite, some xylites, possibly fern axes.
Schoe VI/18	(33 cm) Medium light colored to brown TML with numerous tissue remains: light colored tissue and charcoal, scattered charcoal lenses in lower and upper part, missing in middle; in upper part strikingly light colored xylites.
Schoe VI/17	(18 cm) Dark to medium brown ML with individual layers of tissues, fine rooting, at base 1 to 2cm thick layer finely bedded by charcoal particles (reworked from bed 16).
Schoe VI/16	(9 cm) Somewhat degraded medium brown TL with numerous charcoal fragments and particles and small plant remains, bed bounded at base and top by 1 to 2cm thick xylites charred on lower side; laterally changing thickness.
Schoe VI/15	(167 cm) Medium brown TML with some gelified tissues and xylite fragments, charcoal also concentrated in lenses, numerous light brown tree stumps not horizontally aligned, large xylites, irregular bedding, but no banding as in lower part of the seam. Resin particles present.
Schoe VI/14	(1-2 cm) Friable charcoal layer.
Schoe VI/13	(16 cm) As bed 12, but somewhat darker, root traces more frequent and mostly gelified.
Schoe VI/12	(7 cm) Light colored ML with light colored tissues, scattered xylites and common root traces, fine bedding indicated, rare charcoal.
Schoe VI/11	(29 cm) Medium light colored TML with light colored tissues as in bed 9, no notable rooting, common charcoal layers.
Schoe VI/10	(11 cm) Light colored ML with more or less gelified root traces, scattered charcoal and gelified tissues, 2cm thick charcoal layer on top.

Schoe VI/9	(33 cm) Medium light colored TML with numerous light colored tissue, partly in lenses, partly randomly distributed and finely fractured; fine dark root traces diagonally and horizontally to bedding, upward increasing in number, no gelified root branches, no resin, scattered charcoal lenses.
Schoe VI/8	(26 cm) Dark TML, well bedded, with gelified and charred tissue on bedding planes, charcoal layers mainly in upper part.
Schoe VI/7	(38-42 cm) Light colored ML with numerous light colored tissue remains and in part large resin grains concentrated in layers; dark layer with partially charred xylites in middle, thick gelified root traces in upper part.
Schoe VI/6	(6 cm) Light colored ML with gelified tissues and resin particles, strikingly light colored in weathered section, laterally with horizontally embedded xylites.
Schoe VI/5	(22 cm) Dark TML with numerous xylites and light colored tissues, reddish in fresh cut, internal fine bedding, blocky fracture, resin particles and gelified root cross sections.
Schoe VI/4	(19 cm) Medium light ML with gelified and light colored tissue remains, several robust gelified root traces, resin particles in upper part.
Schoe VI/3	(18 cm) Dark TML with numerous gelified tissues and partly not gelified xylites, somewhat clayey?

Base of Seam2

Top of Interbed 2

Schoe VI/2	(2 cm) Transition to Seam 2; dark silty clay with numerous gelified root traces and plant remains, slickensides, scattered xylites, small resinous plant remains common (conifer twigs?).
Schoe VI/1	(Open end) As bed Schoe V/34.
Schoe V/34	(15 cm) Dark greyish brown silty clay, permeated by broad coaly root traces increasing upward in number; no bedding, frequent slickensides, pyrite in small concretions; scattered plant remains and detritus.
Schoe V/33	(6.5 cm) Dark brown clayey silt to silty clay, with scattered silt layers, plant detritus, coaly pebbles, coaly root traces; in upper part also layers with fine bedding, common resin particles.
Schoe V/32	(12 cm) Dark silty clay, homogeneous, with rare silt laminae, scattered small coaly lenses and fine vertical coaly root traces.
Schoe V/31	(10 cm) Dark clayey silt with laminae of light colored silt and fine sand, pyrite?, foraminifera?
Schoe V/30	(11 cm) Dark silty clay with laminae and lenses of light colored fine sand, low angle cross-bedding, vertical bioturbation tubes, in part pyritized.
Schoe V/29	(6 cm) Light colored to white fine sand to medium? Sand, locally cross-bedded.
Schoe V/28	(1 cm) Dark grey (black when fresh) silty clay with silt laminae, irregular contact with underlying and overlying beds.
Schoe V/27	(36 cm) Light colored fine sand with clayey layers, wavy-flasered bedding marked by dark clay laminae, clay fraction very dark to black (carbonaceous?), thin vertical bioturbation tubes, rare cup-shaped depressions.
Schoe V/26	(33 cm) Light colored fine sand, distinct cross-bedding marked by clayey layers and laminae, cup-shaped bioturbation imprints (?) common and scattered bioturbation tubes (Ø 1 to 2cm).
Schoe V/25	(33 cm) Light colored to white fine sand, slightly coarsening upward, two layers near base and middle with flaser- and cross-bedding indicated by clay drapes and laminae. Sand with horizontal and fine vertical bioturbation tubes, rather frequent in upper part, in lower part cup-shaped depressions up to 2cm in diameter (bioturbation?).
Schoe V/24	(9 cm) Dark greyish brown silty clay with laminae of silt and fine sand in lower part, in upper part more massive, no bioturbation; irregular base.
Schoe V/23	(33 cm) As bed Schoe V/21. 4-5cm thick dark clay layer in middle, proportion of fine sand increasing upward.
Schoe V/22	(29 cm) As bed Schoe V/20.

Schoe V/21	(33 cm) Light colored fine sand in irregular lenses and layers partly with distinct cross-bedding, some clay layers and scattered fine bioturbation.
Schoe V/20	(44 cm) Dark silty clay with numerous lenses and laminae of fine sand partly with cross-bedding, fine bioturbation.
Schoe V/19	(40 cm) Fivefold alternation of dark silty clay and laminae of light colored fine sand, in part with cross-bedding, layers of fine sand regularly cross-bedded; lower half mixture of sand and clay layers, charcoal and plant detritus in upper sand layer.
Schoe V/18	(37 cm) Laminae and lenses of light colored fine sand with distinct cross-bedding, channels with clay laminae and layers, bioturbation in clayey layers.
Schoe V/17	(32 cm) Dark silty clay with laminae and lenses of fine sand, more common upward, there in part with bimodal cross-bedding.
Schoe V/16	(15 cm) As bed Schoe V/14; not as hard, slightly more clayey, somewhat bedded by laminae of silt and fine sand, locally fine bedding; foraminifera present.
Schoe V/15	(12 cm) As bed Schoe V/13; laminae of silt and fine sand more frequent.
Schoe V/14	(7.5 cm) Dark grey clayey silt, no recognizable bedding, homogeneous, fracturing irregularly, hard; scattered fine bioturbation tubes, irregular boundary at top.
Schoe V/13	(28 cm) Dark brown clayey silt with light colored laminae and lenses of silt and fine sand, in layers finely bedded with cross-bedding, thin bioturbation tubes.
Schoe V/12	(115 cm) Dark grey highly clayey silt, massive, with scattered silt laminae at some levels, completely homogeneous, concoidal fracture.
Schoe V/11	(9 cm) Dark grey highly silty clay, homogeneous in appearance, but with few distinct light colored silt laminae, fine bioturbation tubes recognizable in silt laminae.
Schoe V/10	(22 cm) Dark grey clayey silt with very fine laminae of light colored fine sand and silt, thin bioturbation tubes, distinct light/dark lamination.
Schoe V/9	(10 cm) Dark silty clay, totally homogeneous, unstructured.
Schoe V/8	(15 cm) Greyish brown silty clay with thick lenses and flasers of light colored silt and fine sand, frequently fine sand in bioturbation tubes.
Schoe V/7	(28 cm) Brownish grey, highly silty clay with layers and lenses of light colored fine sand, internal fine bedding, pyrite concretions common.
Schoe V/6	(12 cm) Medium to light grey, clayey silt with light colored flasers and lenses of fine sand and silt, some layers with charcoal.
Schoe V/5	(12 cm) Dark greyish brown clayey silt, homogeneous in appearance, but internally finely laminated, lenticular pyrite concentrations, charcoal fragments, scattered sand flasers, light colored 0.5cm thick sandy layer at base.
Schoe V/4	(16 cm) Medium grey silty clay, finely laminated, ostracod steinkerns on bedding planes, scattered charcoal fragments, 1cm in size.
Schoe V/3	(9.5 cm) Medium grey silty clay with light yellowish laminae and flasers of silt to fine sand, locally bioturbation, scattered charcoal and fine root traces.

Base of Interbed 2

Top of Seam1

Schoe IX/58	(22 cm) Dark greyish brown TL to TML, well bedded, bedding planes covered with charcoal fragments, gelified tissues and clay drapes, bioturbation tubes and voids filled with kaolinite(?) increasingly common upward, pyrite clusters in upper part.
Schoe IX/57	(18 cm) Dark brown TML to ML (in middle), internal fine bedding, charcoal concentrated on bedding planes, red root traces scattered, but common in middle; striate pyritized tubes in upper part.
Schoe IX/56	(24 cm) Brown TML with light colored tissue concentrated in layers together with small gelified tissue fragments, dispersed charcoal, scattered resin and gelified tissue, few red root traces.

Schoe IX/55	(19 cm) Reddish brown TML with red root traces, charcoal on bedding planes; light colored tissue in upper part, at top distinct layer of charcoal, laterally replaced by xylite.
Schoe IX/54	(22 cm) Reddish brown TML, reddish in fresh cut, few reddish root traces, some charcoal layers and lenses, numerous gelified tissue, scattered small pyrite clusters.
Schoe IX/53	(52 cm) Medium brown TML to TL, reddish mottled, with numerous charcoal fragments dispersed and in layers; reddish root traces throughout, some small pyrite concretions, tissue remains partly gelified or pyritized; xylites concentrated near top, increasingly gelified and in part charred.
Schoe IX/52	(54 cm) Medium brown tissue bearing ML, reddish in fresh cut, with fine gelified tissue fragments and isolated xylites, succession of charcoal layers and lenses, light colored tissue present, no pyrite; distinct internal bedding.
Schoe IX/51	(22 cm) Dark mixed tissue/matrix lignite lithotype (TML) with numerous fine gelified tissue fragments, isolated xylites and few small pyrite concretions (Ø 1-2mm), partly within xylites, some resin and charcoal fragments, charcoal in part associated with xylites, distinct charcoal layer (about 1cm) at top.
Schoe IX/50	(20 cm) Medium light colored reddish ML with some light colored tissue, xylites and resin occurring regularly, reddish root traces in upper part; top boundary transitional.
Schoe IX/49	(19 cm) Dark ML, reddish in fresh cut, including layers with small tissue fragments and some xylites, small pyrite concretions common, also occurring within partially charred xylites; scattered charcoal at top.
Schoe IX/48	(19 cm) Dark brown matrix dominated lignite lithotype (ML) with some gelified and light colored tissues; xylites common, distinct charcoal layer at top.

Base of Seam1

Top of Interbed 1

Schoe IX/47	(20 cm) Medium to dark greyish brown clay with sand lenses, numerous root branches (tree stumps?), frequent slickensides.
Schoe IX/46	(18 cm) Dark brown silty clay with intermittent laminae, lenses and layers of silt to fine sand, no bedding, some flat lying root branches.
Schoe IX/45	(42 cm) Dark silty clay with dispersed sand, layers and lenses of light-colored medium sand up to 1cm thick at base and top, near base distinctly bioturbated, in upper part lenticular and flaser-bedding, decreasing bioturbation, scattered rooting and sand-filled bioturbation tubes.
Schoe IX/44	(32 cm) Very dark silty clay with numerous small pyrite aggregates, forams(?), silt laminae and flasers in middle of bed, upward some sand-filled bioturbation tubes, one vertical gel-filled tube 1cm wide.
Schoe IX/43	(3 cm) Light-colored silt laminated by dark clay laminae.
Schoe IX/42	(28 cm) Very dark silty clay with numerous small pyrite aggregates, forams(?), scattered vertical sand-filled tubes and pyrite concretions, silt laminae in upper part.
Schoe IX/41	(23 cm) Medium gray silty clay, bedded by some silt laminae and bioturbation parallel to bedding.
Schoe IX/40	(94 cm) Beige brown clayey silt, in part fine bedding by thin silt layers, flasers and laminae, dense bioturbation parallel to bedding, in part vertical tubes crossing silt layers.
Schoe IX/39	(38 cm) Beige brown clayey silt, no bedding due to intensive bioturbation.
Schoe IX/38	(22 cm) Beige brown clayey silt at base grading into silty clay upward with silt laminae and flasers and dense bioturbation parallel to bedding.
Schoe IX/37	(22 cm) Dark slightly silty clay, unbedded, densely bioturbated by thin randomly oriented pyritized tubes.
Schoe IX/36	(32 cm) Medium brown clayey silt to light-colored silt at top, bedded, but intensely bioturbated parallel to bedding, vertical in part pyritized tubes in upper 8cm.
Schoe IX/35	(22 cm) Dark slightly silty clay, fine bedded by silt lamina, fine pyritized bioturbation tubes, pyrite concretions common.

Schoe IX/34	(11 cm) Medium gray clayey silt, bedded by silt laminae, intensely bioturbated parallel to bedding, partly with fine pyritized tubes.
Schoe IX/33	(26 cm) Dark slightly silty clay, massive with few silt laminae.
Schoe IX/32	(12 cm) Slightly clayey silt to pure silt, intensely bioturbated parallel to bedding, distinctly lighter than bed Schoe IX/31.
Schoe IX/31	(50 cm) Medium gray brownish silty clay to clayey silt with dense horizontal bioturbation, nearly no bedding.
Schoe IX/30	(11 cm) Light-colored, slightly clayey silt, densely bioturbated, 2cm light beige pure silt at top.
Schoe IX/29	(28 cm) Dark gray silty clay with few light-colored silt laminae, very fine bedding at some levels, no pyrite, bioturbation entering from top.
Schoe IX/28	(38 cm) Brown gray to greenish gray clayey silt, somewhat lighter than bed Schoe IX/27 densely bioturbated by \pm horizontal tubes filled with light-colored silt, bioturbation particularly dense at base, scattered coaly particles.
Schoe IX/27	(44 cm) Medium gray slightly greenish clayey silt, completely bioturbated by horizontal tubes with color as background sediment, finely dispersed pyrite.
Schoe IX/26	(34 cm) Dark brown silty clay, densely bioturbated by \pm horizontal tubes filled with light-colored silt especially in lowermost 3-5cm, pyrite concentration at base.
Schoe IX/25	(25 cm) Irregular alternation of light gray clayey silt and light-colored silt/fine sand, silt increasing upward, thin vertical sand-filled bioturbation tubes and horizontal bioturbation, no bedding.
Schoe IX/24	(6 cm) Brown silty clay, densely bioturbated by horizontal tubes, some vertical sand-filled tubes, small pyrite concretions, no bedding.
Schoe IX/23	(75 cm) Light beige alternation of clayey silt and somewhat lighter colored silt with fine sand, mica content increasing with fine sand, some pyrite concretions.
Schoe IX/22	(68 cm) Light gray slightly clayey silt, proportion of silt and mica increasing upward, small pyrite nodules in layers of lower part.
Schoe IX/21	(11 cm) Light gray silt with fine sand, homogeneous, no bedding.
Schoe IX/20	(19 cm) Light beige silty clay to clayey silt with mica in upper part, clay fraction increasing upward.
Schoe IX/19	(70 cm) Light gray silt to clayey silt with some fine sand, bedding locally indicated, no bioturbation, no rooting, but slide structures throughout.
Schoe IX/18	(74 cm) Fivefold alternation of light-colored fine sand and slightly darker silt with fine sand, some bioturbation, cross-bedding indicated in sand layers, no rooting.
Schoe IX/17	(44 cm) Light gray silt to fine sand, some layers of slightly darker silt with bioturbation transitional to sandy layers.
Schoe IX/16	(52 cm) \pm distinct alternation of light gray silt and light-colored fine sand, partly obscured by bioturbation, coaly root branches in upper part.
Schoe IX/15	(48 cm) Light gray silt with fine sand, locally horizontal bioturbation obscuring primary bedding(?), no rooting, scattered pyrite concretions at top.
Schoe IX/14	(60 cm) Light gray silt with fine sand and mica, light medium sand in irregular layers and lenses, fine carbonaceous roots present and decreasing towards the top, single organic-rich layers; single carbonaceous hollow axes.
Schoe IX/13	(15 cm) Almost white medium sand with occasional, slightly siltier parts, rooted throughout, with fine carbonaceous remains of axes \varnothing 1 cm (?branches).
Schoe IX/12	(40 cm) Light gray clayey silt to fine sand, some organic layers in the lower part; densely interspersed with fine roots, irregularly wavy stratification.
Schoe IX/11	(30 cm) Fine to medium sand, light gray to white, with a few flasers of clayey silt; densely interspersed with fine carbonaceous roots, regularly interspersed with thick carbonaceous and in parts hollow axes (?roots).

Schoe IX/10	(42 cm) Medium to fine sand, in lower part yellowish, in upper part light gray to white, thin intercalations of light gray clayey silt, fine rooting, bioturbation in silt layers increasing upward.
Schoe IX/9	(8 cm) Light gray clayey silt with occasionally organic layers, concentrated at the top, fine vertical bioturbation tubes, but less than in layer Schoe IX/8.
Schoe IX/8	(30 cm) As bed Schoe IX/6, but more bioturbated, pronounced layer of medium sand at the top.
Schoe IX/7	(11 cm) Double bed of light gray clayey silt, separated by 2cm fine to medium sand, ± vertical thin sand-filled tubes; isolated charcoal remains.
Schoe IX/6	(84 cm) Alternation of organic layers, silty clay/clayey silt, beige to light gray fine to medium sand, overall wavy and flaser bedding, 10cm below top medium sand layer with clayey and organic flasers, no bioturbation at the base, at approx. 30cm increasing individual ± vertical tubes filled with sand (Ø up to 0.5cm), no cross-bedding.
Schoe IX/5	(29 cm) Alternation of brown clayey silt, light gray layers of fine sand and thin organic layers in part cutting into underlying bed.
Schoe IX/4	(10 cm) Reddish brown clayey fine sand with much mica and carbonaceous layers.
Schoe IX/3	(31 cm) Alternation of light brown clayey silt and light-colored layers of silt/fine sand, commonly in lenses and flasers, xylite with much pyrite 17cm above base.
Schoe IX/2	(5-6 cm) Light gray clayey silt well-bedded by darker clayey flasers and layers.
Schoe XLIX 29	(>50 cm) Massive grey silty clay with small pyrite lenses.

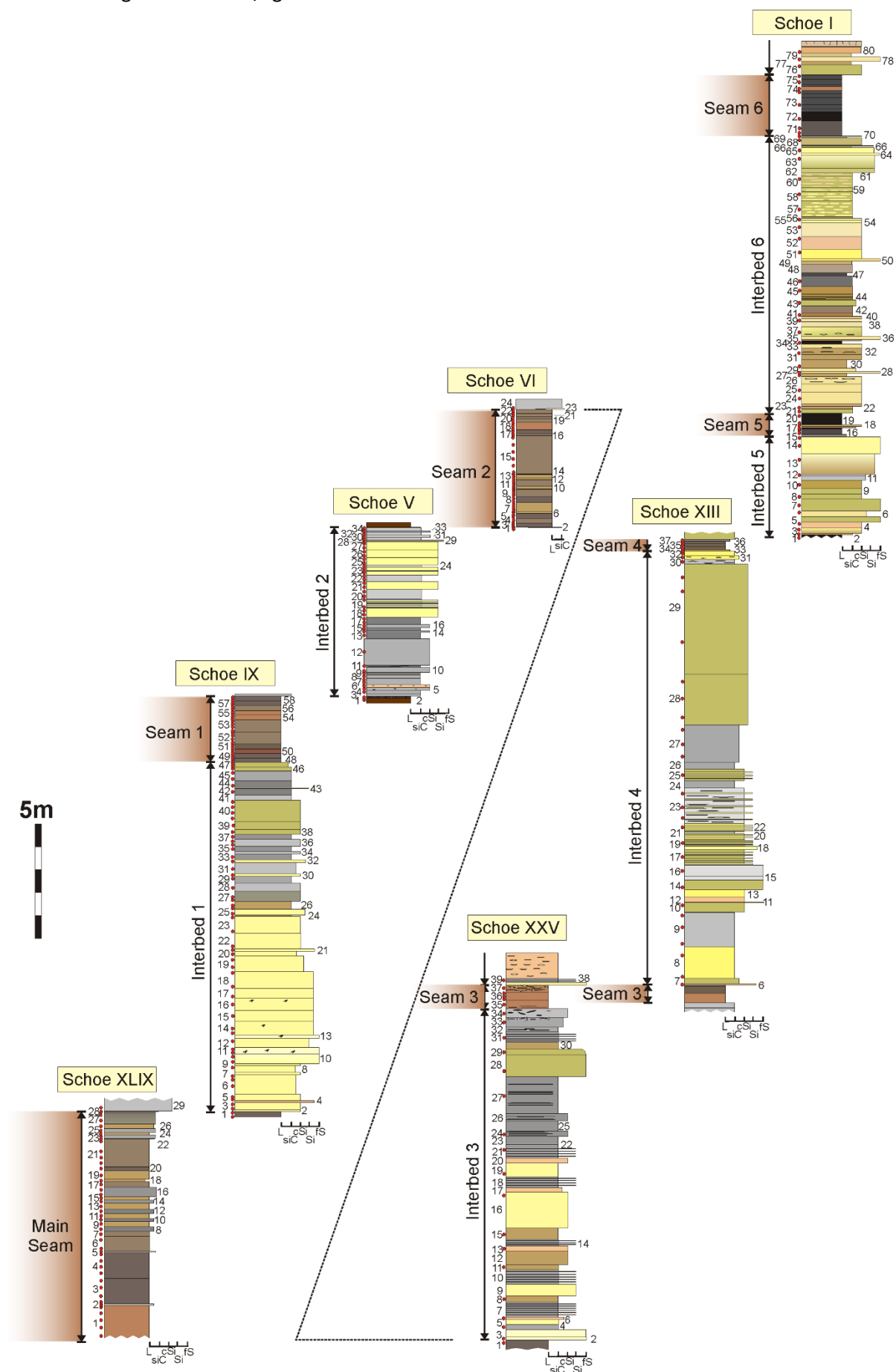
Base of Interbed 1

Top of Main Seam

Schoe XLIX/28	(2-3 cm) Dark grey carbonaceous clay with some charcoal and xylites, sharp top boundary.
Schoe IX/1	(30 cm) Dark brown bedded mixed matrix/tissue lignite lithotype with light-colored tissue, charcoal and pyrite, scattered sand veins.
Schoe XLIX/27	(52 cm) Carbonaceous clay to clayey lignite, greenish in lower part, transitional to dark-brown above, numerous colored tissue in upper part, scattered charcoal, gelification in lenses, resin dispersed, reddish root traces.
Schoe XLIX/26	(20 cm) Light brown to greenish brown clayey matrix lithotype with partially gelified xylites, intensely penetrated by brown streaks (roots), scattered resin, light colored tissue and charcoal.
Schoe XLIX/25	(18 cm) Dark to medium grey carbonaceous clay to pure clay, completely penetrated by slickensides, numerous in part thick xylites, light colored tissue in layers, scattered charcoal, reddish root traces.
Schoe XLIX/24	(10 cm) Light brown to pale matrix lithotype, intensely penetrated by medium brown streaks (roots), roots partially gelified, isolated xylite and partially pyritized charcoal slickensides rare.
Schoe XLIX/23	(15 cm) Dark clayey lignite to carbonaceous clay with xylites, charcoal in layers penetrated by reddish root traces, scattered resin in layers numerous slickenside, bedding indicated.
Schoe XLIX/22	(0-3 cm) Very light-colored clay layer.
Schoe XLIX/21	(120 cm) Medium to light brown mixed tissue/matrix lithotype, numerous xylite, intense rooting with reddish root traces, dark layer (5—10cm] with abundant charcoal in middle charcoal otherwise dispersed, resin scattered and in lenses, light colored tissue near top.
Schoe XLIX/20	(17 cm) Dark brown to dark olive grey clayey lignite with partially charcoalified xylites, dispersed charcoal, minute resin grains, intense rooting with red sides common.
Schoe XLIX/19	(39 cm) Greenish light brown matrix lithotype, numerous thick xylites mainly in upper part, light colored tissue commonly xylite bound, scattered resin and charcoal.
Schoe XLIX/18	(8 cm) Heterogeneous layer, friable with clay laminae, much pyritized charcoal, xylites common.

Schoe XLIX/17	(26 cm) Medium to light brown matrix lithotype with partially gelified xylites, numerous resin particles, densely rooted some light-colored tissue, rare charcoal.
Schoe XLIX/16	(41 cm) Dark carbonaceous clay with some thick xylites, intensely penetrated by slickensides, scattered resin.
Schoe XLIX/15	(13-16 cm) Light brown to pale (weathered) slightly clayey matrix lithotype, numerous small resin particles, scattered xylites and slickensides, no charcoal.
Schoe XLIX/14	(10-15 cm) Dark clayey lignite to carbonaceous clay with some tissue, reddish brown mottled numerous slickensides, scattered charcoal and xylites, rooted.
Schoe XLIX/13	(27 cm) Light brown mixed tissue/matrix lithotype, frequent xylites mainly at top, top heavily pyritized, resin common partly within tissue, scattered charcoal.
Schoe XLIX/12	(18 cm) Dark clayey lignite with numerous slickensides, scattered xylites, rare resin, less densely rooted.
Schoe XLIX/11	(23 cm) Light brown tissue lithotype, numerous xylites, intense fine rooting, scattered resin and charcoal, resin-rich xylite at top.
Schoe XLIX/10	(12 cm) Dark clayey lignite to carbonaceous clay with xylite parallel to bedding, some resin, light colored tissue and charcoal, slickensides common, internal fine bedding, no rooting.
Schoe XLIX/9	(24 cm) Pale brown matrix lithotype with some tissue, xylites, and light-colored tissue, numerous black root traces, some slickensides, no charcoal.
Schoe XLIX/8	(22 cm) Dark clayey lignite to carbonaceous clay, intensely penetrated by slickensides, scattered xylites and charcoal.
Schoe XLIX/7	(20-22 cm) Medium brown matrix lithotype with some tissue, bedded at 1-2cm scale with clay laminae, charcoal and xylites parallel to bedding, no rooting.
Schoe XLIX/6	(65 cm) Greenish grey slightly clayey lignite rich in tissue, intensely penetrated by fine roots, in part distinct charcoal lenses, scattered xylites and light-colored tissue.
Schoe XLIX/5	(1-4 cm) Pale greyish brown clay layer with light colored clay laminae, fine tissue detritus, scattered charcoal and xylite, slickensides.
Schoe XLIX/4	(115 cm) As bed Schoe XLIX/3 but with much more charcoal lenses, some light-colored tissue and resin, charcoal in part pyritized, lowermost part greenish grey.
Schoe XLIX/3	(110 cm) Dark brown highly xylitic lignite, xylites dominating over matrix, reddish in fresh cut, abundant charcoal partly in massive lenses, scattered light colored tissue, fine rooting, samples taken from matrix.
Schoe XLIX/2	(8 cm) Greenish grey clayey lignite with some xylites and charcoal, light-colored tissue rare, numerous light grey clay lamina transitional light-colored clay layer, fine rooting.
Schoe XLIX/1	(145 cm) Xylitic lignite, xylites reddish in fresh cut, embedded in greenish brown somewhat clayey matrix, numerous tissue and charcoal particles, some resin particles, light-colored tissue rare, fine reddish brown root traces.

Fig. S1 Lithological logs of the seven sections from the Schöningen Formation. Grain size distribution is based on filed observations. Numbers indicate described horizons (see above). The different colors are reflecting the sediment/lignite colors.



S2 Panels

Fig. S2: *Apectodinium* species (SEM pictures) from the PETM interval (lower part of Interbed 1) of the Schöningen Formation. The scale bars represent 10 μm . **(A) – (D)** *Apectodinium parvum*; **(E)** *Apectodinium quinquelatum*; **(F)** *Apectodinium homomorphum*

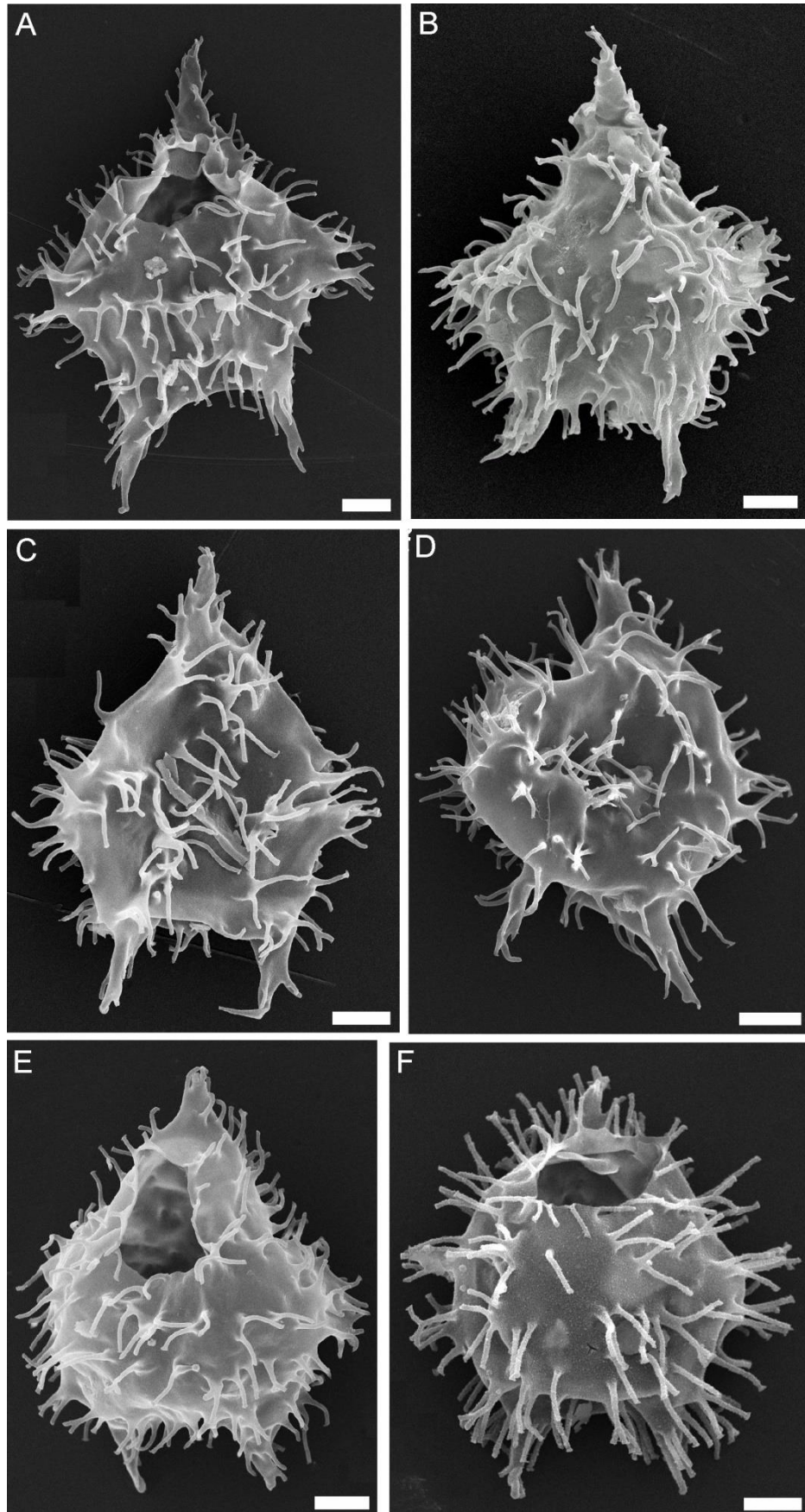


Fig. S3: Selected dinoflagellate cysts (SEM pictures) from Interbed 2 of the Schöningen Formation. The scale bars represent 10 μm . **(A), (C)** *Cleistosphaeridium placacanthum/ancyreum* complex: **(A)** *Cleistosphaeridium ancyreum*, **(C)** *Cleistosphaeridium* sp.; **(B)** *Cordosphaeridium gracile*; **(D)** *Spiniferites ramosus*; **(E)** *Cribroperidinium tenuitabulatum*; **(F)** *Cordosphaeridium fibrospinosum*

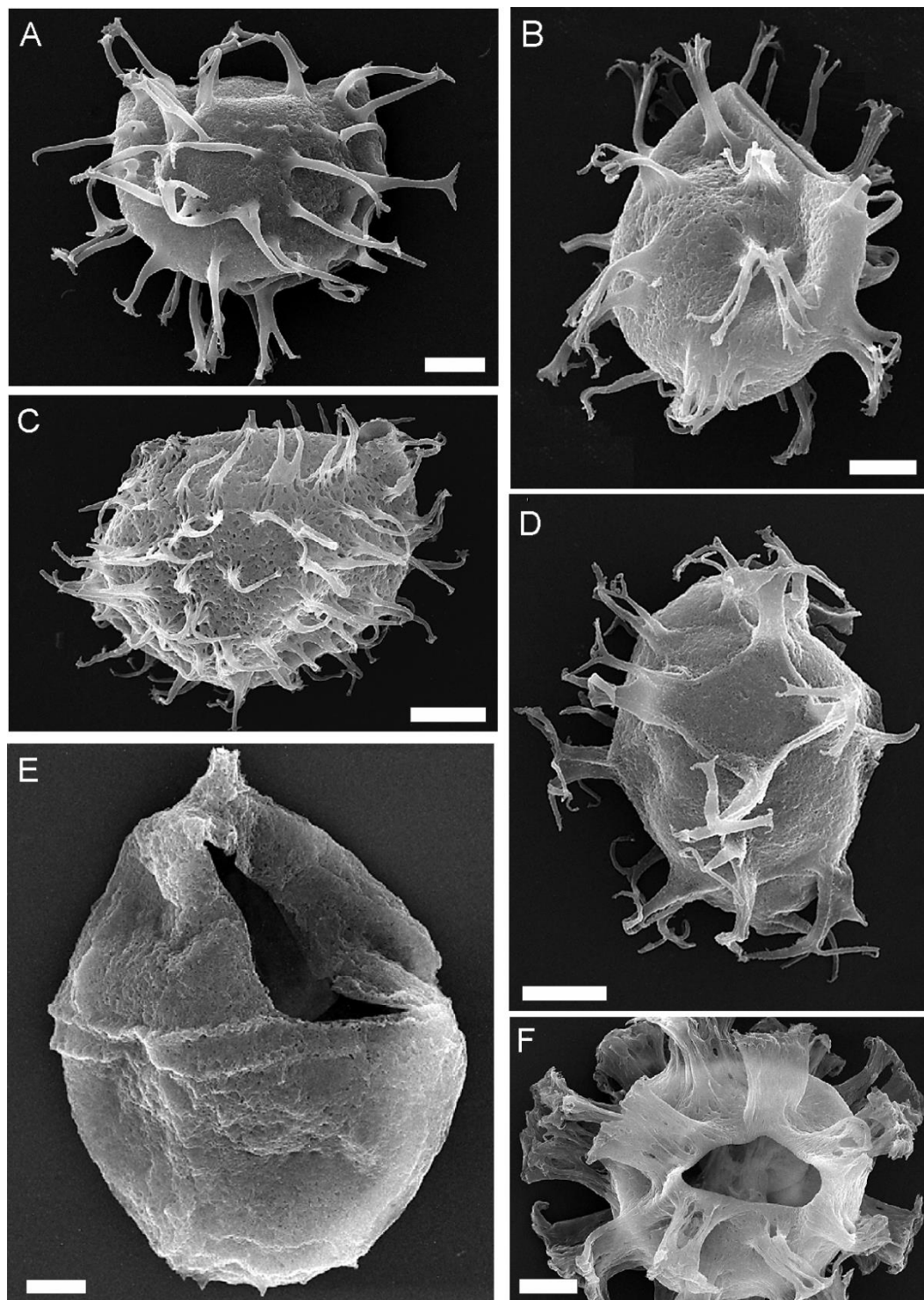
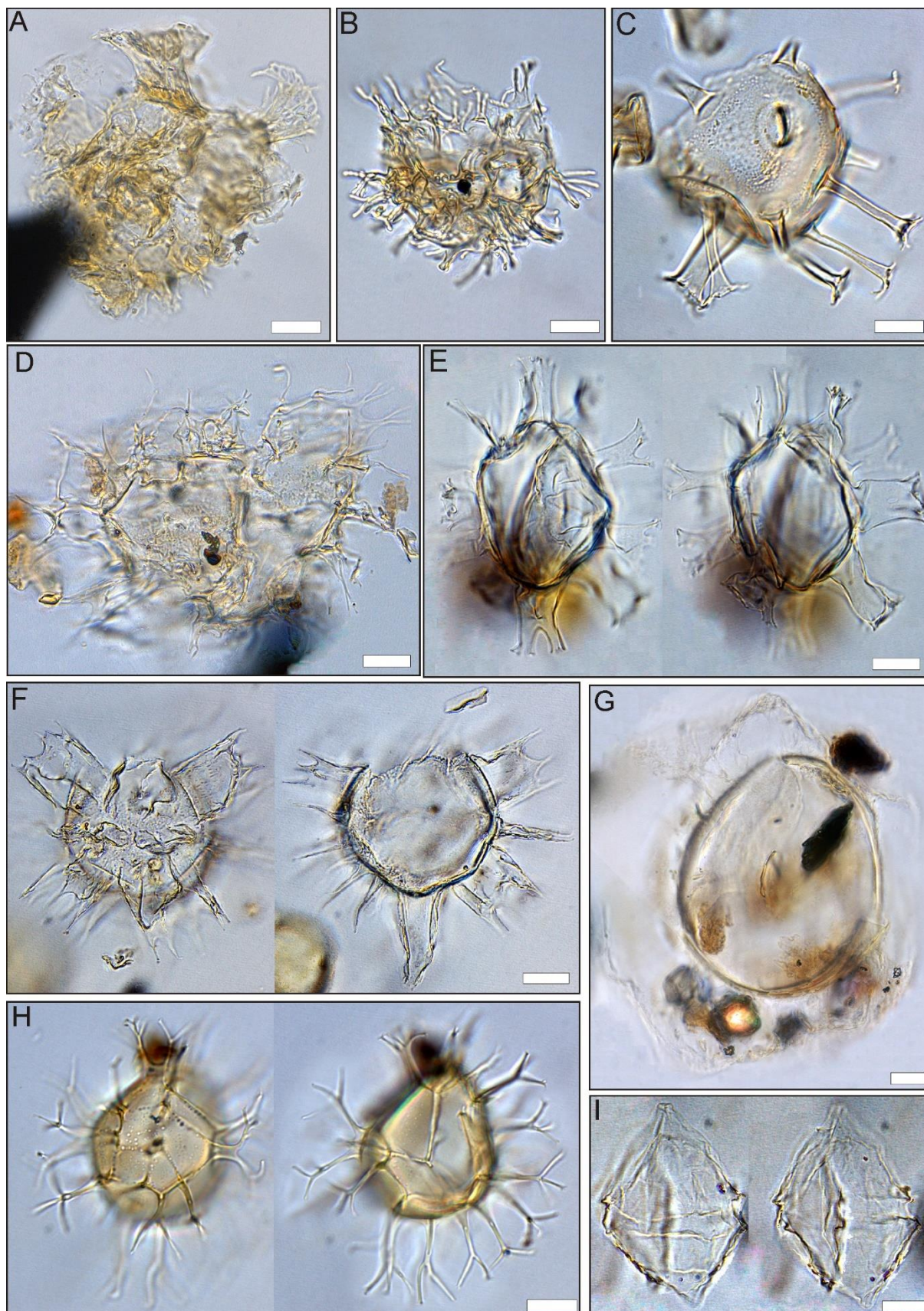


Fig. S4: Selected dinoflagellate cysts (LM pictures) from Interbed 3 of the Schöningen Formation. The scale bars represent 20 μm . **(A)** *Cordosphaeridium fibrospinosum*; **(B)** *Cleistosphaeridium placacanthum/ancyreum* complex; **(C)** *Homotryblium tenuispinosum*; **(D)** *Glaphyrocysta ordinata*; **(E)** *Hystrichokolpoma rigaudae*; **(F)** *Hystrichokolpoma cinctum*; **(G)** *Thalassiphora pelagica*; **(H)** *Achomosphaera crassipellis*; **(I)** cf. *Phthanoperidinium*



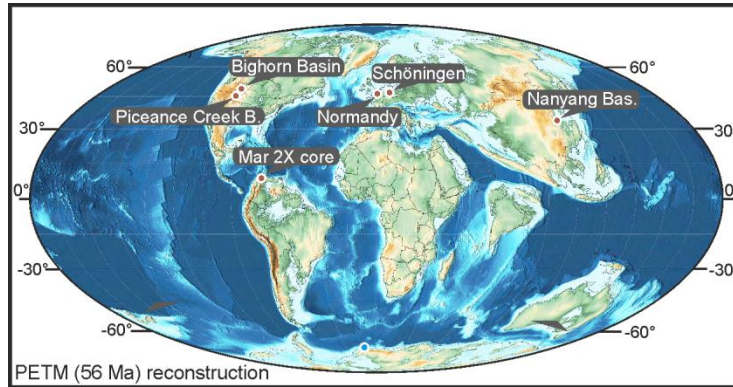


Fig. S5 (extension of Fig. 6 in the main text): Comparison of $\delta^{13}\text{C}$ data for the Paleocene-Eocene Thermal Maximum (PETM) in continental/marginal marine records indicating that non-marine records commonly show a rebound to higher $\delta^{13}\text{C}$ values during the CIE body (black arrows). Data for continental and marginal marine records: *Polecat Bench, Bighorn Basin, USA* (Bowen et al., 2015; measurements of carbon in pedogenic carbonate), the black line corresponds to a 5-point running mean of bulk data; *North Butte, Bighorn Basin, USA* (Baczynski et al., 2013); *Wasatch Formation, Piceance Creek Basin, Colorado, USA* (Foreman et al., 2012), the black line corresponds to a 5-point running mean of bulk data; *Mar 2X core, Venezuela* (Jaramillo et al., 2010), the black line corresponds to a 5-point running mean of bulk data; *Vasterival, France* (Storme et al., 2012), *Beigou section, Nanyang Basin, central China* (Chen et al., 2014; in contrast to standard measurements of $\delta^{13}\text{C}$ (bulk organic matter) not only carbonates were removed from the samples prior to $\delta^{13}\text{C}_{\text{BC}}$ measurements but also silicates by using hydrofluoric acid). Locations of the study sites are presented on a continental reconstruction for the PETM (PALEOMAP project, Map 14; Scotese, 2014)

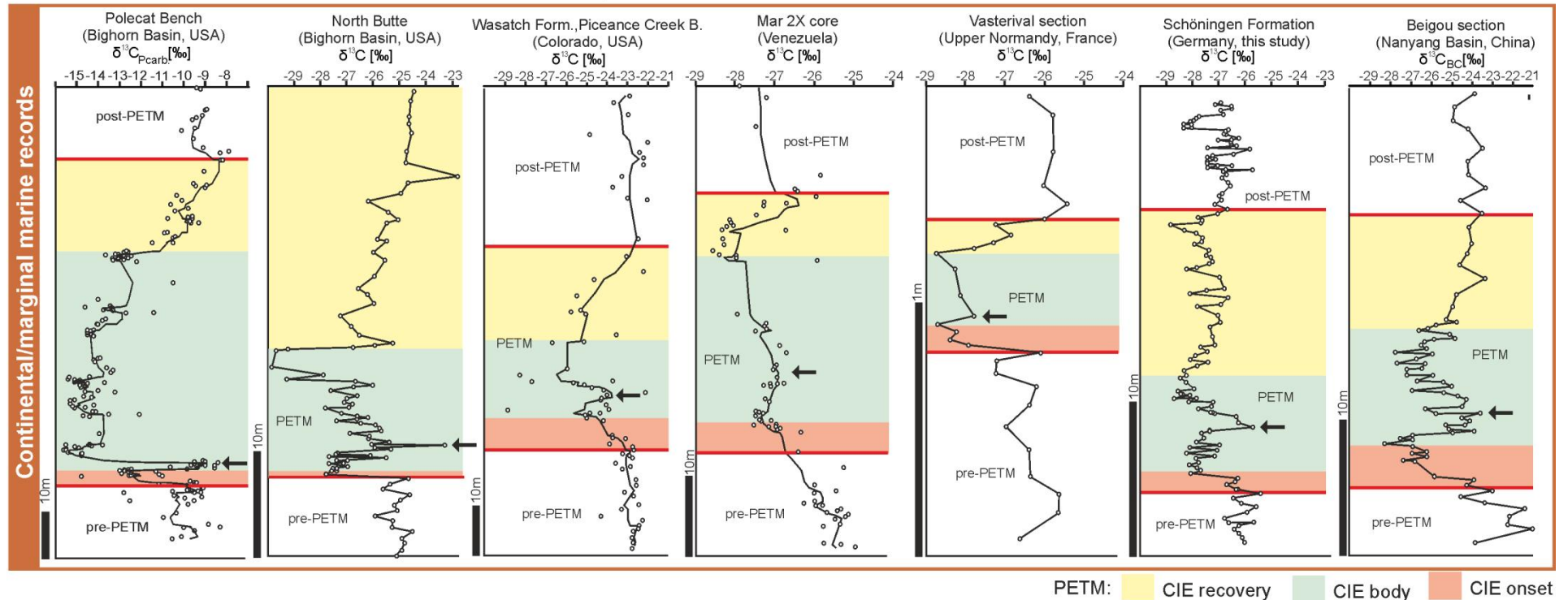
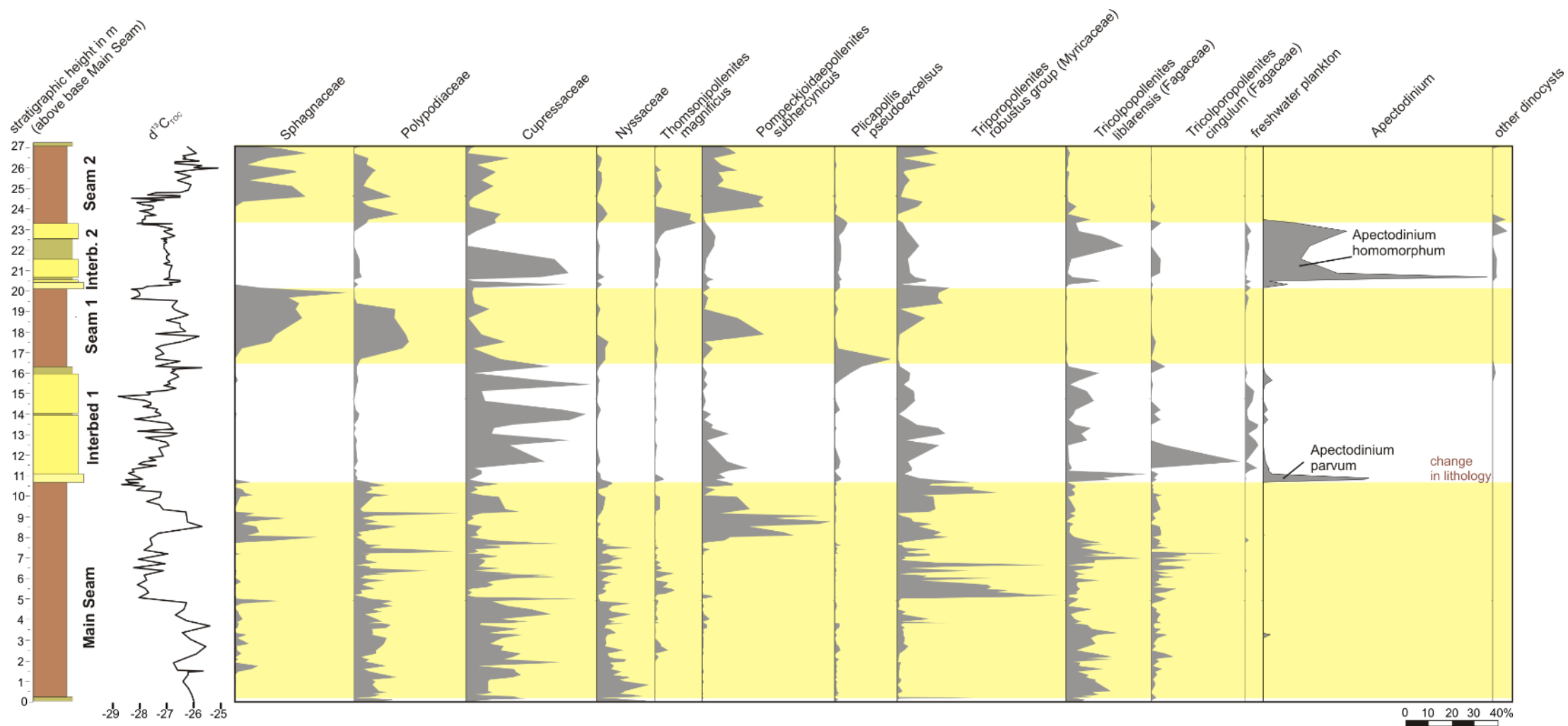


Fig. S6: Simplified pollen diagram of the base of the Main Seam up to the top of Seam 2, showing palynological abundance changes of dominant taxa. Due to the different thicknesses of interbed sections that were studied for palynology and carbon isotopes, $\delta^{13}\text{C}_{\text{TOC}}$ values of the interbeds have been tied to the top of the Main Seam and the base of Seam 1 as well as the top of Seam 1 and the base of Seam 2. Data for the part between the top of the Main Seam and the top of Seam 2 are taken from Methner et al. (2019).



S3 Data tables

Tab. S1 Total organic carbon concentration (%TOC) and carbon isotope data of bulk organics ($\delta^{13}\text{C}_{\text{TOC}}$).

	Sample	strat. position	$\delta^{13}\text{C}$	TOC (IRMS)
		[m]	[‰]	[%]
IB 7	Schoe I 80a	98.23	-26.21	8.85
	Schoe I 78	98.15	-26.44	6.13
	Schoe I 76c	97.95	-26.57	5.18
Seam 6	Schoe I 75d	97.51	-26.26	53.48
	Schoe I 75b	97.25	-26.22	59.4
	Schoe I 74	96.99	-26.52	63.64
	Schoe I 73d	96.83	-26.45	60.66
	Schoe I 73b	96.34	-26.53	59.23
	Schoe I 72a	95.71	-26.74	59.24
	Schoe I 71b	95.3	-27.01	49.91
	Schoe I 71/2	95.06	-26.37	60.62
Interbed 6	Schoe I 70	94.84	-26.61	5.98
	Schoe I 68b	94.58	-26.39	3.35
	Schoe I 65	94.35	-26.27	1.17
	Schoe I 63b	94.03	-26.5	0.46
	Schoe I 60b	93.05	-26.37	2.15
	Schoe I 58b	92.38	-26.65	9.86
	Schoe I 57b	91.7	-26.44	2.68
	Schoe I 55	91.21	-27.06	0.66
	Schoe I 53b	91.02	-27.16	1.18
	Schoe I 52c	90.42	-27.43	1.83
	Schoe I 51b	89.87	-27.19	0.92
	Schoe I 46b	88.56	-26.94	10.54
	Schoe I 45	88.25	-26.6	7.5
	Schoe I 43	87.64	-26.62	2.68
	Schoe I 41	87.05	-26.95	2.05
	Schoe I 39	86.83	-27.27	2.53
	Schoe I 37b	86.32	-27.04	4.31
	Schoe I 34	85.99	-26.79	40.94
	Schoe I 32a	85.53	-27.38	5.16
	Schoe I 30a	84.98	-27.39	3.03
	Schoe I 28	84.64	-27.4	1.85
	Schoe I 27	84.58	-27.28	2.68
	Schoe I 25b	84.1	-27.72	1.34
	Schoe I 24b	83.53	-27.72	8.16
	Schoe I 22	83.11	-27.44	7.2
	Schoe I 21	83.01	-27.06	12.19
Seam 5	Schoe I 20c	82.89	-26.76	55.1
	Schoe I 20a	82.49	-26.71	56.6
	Schoe I 19	82.31	-26.73	12.08
	Schoe I 17	82.18	-26.46	59.3
	Schoe I 16b	82.14	-26.5	55.82
Interbed 5	Schoe I 16a	82.03	-26.17	56.79
	Schoe I 14d	81.8	-26.64	3.32
	Schoe I 14b	81.41	-26.55	0.09
	Schoe I 13b	81.05	-26.59	0.17
	Schoe I 12	80.15	-26.55	1.2
	Schoe I 10	79.9	-26.64	5.42
	Schoe I 8	79.29	-26.43	4.61
	Schoe I 7b	78.87	-26.21	0.81
	Schoe I 6a	78.53	-26.25	3.52
	Schoe I 4b	78.05	-26.1	5.28
	Schoe I 3b	77.79	-27.02	5.24
	Schoe I 2	77.56	-26.74	14.36
	Schoe I 1b	77.51	-26.7	22.7
	Schoe XIII 37	77.31	-28.16	35.54
Seam 4	Schoe XIII 36	77.21	-27.36	52.73
	Schoe XIII 35	77.16	-26.85	52.25
	Schoe XIII 34	77.02	-26.8	49.09
	Schoe XIII 33	76.9	-27.49	21.63
	Schoe XIII 32	76.83	-27.95	20.85

	Sample	strat. position	$\delta^{13}\text{C}$	TOC (IRMS)
		[m]	[‰]	[%]
Interbed 4	Schoe XIII 31	76.65	-27.62	16.33
	Schoe XIII 30	76.48	-27.68	2.21
	Schoe XIII 29e	75.9	-27.86	1.4
	Schoe XIII 29d	74.68	-27.81	1.02
	Schoe XIII 29b	73.08	-27.48	0.72
	Schoe XIII 28c	71.48	-27.42	1.68
	Schoe XIII 28b	70.74	-27.63	1.44
	Schoe XIII 28a	70.01	-27.37	1.79
	Schoe XIII 27c	69.28	-27.53	4.64
	Schoe XIII 27b	68.73	-28.2	5.39
	Schoe XIII 27a	68.18	-27.56	5.11
	Schoe XIII 25	67.35	-26.88	1.57
	Schoe XIII 23c	66.51	-27.14	2.92
	Schoe XIII 23b	66.01	-27.1	4.87
	Schoe XIII 23a	65.51	-27.34	7.28
	Schoe XIII 22	65.01	-26.95	6.02
	Schoe XIII 20	64.57	-27.12	2.59
	Schoe XIII 19	64.32	-26.9	1.52
	Schoe XIII 17	63.88	-26.59	2.65
	Schoe XIII 16	63.19	-26.71	0.75
	Schoe XIII 14a	62.39	-27.21	1.46
	Schoe XIII 10b	61.57	-27.03	3.32
	Schoe XIII 9e	61.16	-26.99	3.75
	Schoe XIII 9c	60.44	-27.19	7.03
	Schoe XIII 9a	59.8	-27.39	6.12
	Schoe XIII 8c	59.2	-27.27	2.73
	Schoe XIII 8a	58.4	-27.16	2.21
	Schoe XIII 6	58.02	-27.07	1.14
	Schoe XXV 39	56.78	-27.41	14.14
Seam 3	Schoe XXV 37	56.49	-26.91	52.63
	Schoe XXV 36c	56.18	-27.4	69.2
	Schoe XXV 36b	56	-27.37	68.77
	Schoe XXV 36a	55.9	-27.41	48.8
	Schoe XXV 35	55.81	-27.48	61.25
Interbed 3	Schoe XXV 34	55.46	-27.06	14.03
	Schoe XXV 33	55.08	-27.07	14.97
	Schoe XXV 31	54.43	-26.91	10.59
	Schoe XXV 29a	53.59	-27.01	6.13
	Schoe XXV 28a	53	-26.95	3.64
	Schoe XXV 27b	52.1	-27.61	9.52
	Schoe XXV 24	50.1	-26.84	6.96
	Schoe XXV 21b	49.24	-27.01	12.68
	Schoe XXV 19a	48.52	-26.89	5.85
	Schoe XXV 16c	47.48	-27.09	3.47
	Schoe XXV 15	46.12	-27.6	12.68
	Schoe XXV 13	45.34	-26.88	5.1
	Schoe XXV 11	44.53	-27.7	11.7
	Schoe XXV 8	43.16	-27.51	7.97
	Schoe XXV 6	42.22	-27.79	7.28
	Schoe XXV 4	41.9	-27.38	12.28
	Schoe XXV 2	41.35	-26.88	0.08
	Schoe VI 24	41.24	-26.8	12.6
Seam 2	Schoe XXV 1	41.14	-26.25	64.74
	Schoe VI 22b	40.65	-25.9	60.2
	Schoe VI 22a	40.53	-26.2	61
	Schoe VI 21	40.47	-26.4	61.6
	Schoe VI 20	40.33	-26.3	61
	Schoe VI 19	40.25	-26.4	59.6
	Schoe VI 18c	40.1	-25.8	63.9
	Schoe VI 18b	40.02	-26.7	63.7
	Schoe VI 18a	39.92	-26.7	62.3

	Sample	strat. position	$\delta^{13}\text{C}$	TOC (IRMS)
		[m]	[‰]	[%]
Seam 2	Schoe VI 17b	39.77	-25.7	63.2
	Schoe VI 17a	39.61	-26	62.9
	Schoe VI 16	39.59	-25.1	66.4
	Schoe VI 15f	39.5	-25.8	65.5
	Schoe VI 15e	39.3	-26.7	63.4
	Schoe VI 15d	39	-26.1	61.9
	Schoe VI 15c	38.7	-26.6	63.1
	Schoe VI 15b	38.4	-26.1	63.1
	Schoe VI 15a	38	-26.2	65.9
	Schoe VI 14	37.83	-26.5	65
	Schoe VI 13	37.82	-27.4	67.3
	Schoe VI 12	37.66	-27.7	68.1
	Schoe VI 11c	37.59	-26.5	63.8
	Schoe VI 11b	37.49	-26.5	62.6
	Schoe VI 11a	37.41	-28.3	67.7
	Schoe VI 10b	37.3	-27.1	66
	Schoe VI 10a	37.22	-27.6	68.4
	Schoe VI 9c	37.19	-27.4	68.2
	Schoe VI 9b	37.11	-28.1	55
	Schoe VI 9a	36.96	-27.9	63.3
	Schoe VI 8b	36.86	-27.5	59.2
	Schoe VI 8a	36.7	-27.5	56
	Schoe VI 7d	36.6	-27.6	60.2
	Schoe VI 7c	36.5	-28	60.9
	Schoe VI 7b	36.4	-27.7	59.9
	Schoe VI 7a	36.3	-27.6	60.4
	Schoe VI 6	36.2	-27.4	58.9
	Schoe VI 5b	36.14	-27.8	50
	Schoe VI 5a	36.05	-27.8	56.7
	Schoe VI 4b	35.92	-27.8	59.8
	Schoe VI 4a	35.87	-27.9	52.9
	Schoe VI 3b	35.73	-27.9	56.9
	Schoe VI 3a	35.65	-27.9	55.8
Interbed 2	Schoe VI 2	35.55	-28.1	39.8
	Schoe VI 1	35.53	-26.8	19.7
	Schoe V 34b	35.5	-27.1	15.7
	Schoe V 34a	35.45	-27.9	14.5
	Schoe V 33	35.35	-27.3	27
	Schoe V 32	35.29	-27.3	8.9
	Schoe V 31	35.17	-27.1	7
	Schoe V 30	35.07	-27	3.1
	Schoe V 29	34.96	-26.8	0.2
	Schoe V 27b	34.89	-26.8	0.3
	Schoe V 27a	34.7	-27.1	1.6
	Schoe V 26b	34.53	-27	0.8
	Schoe V 26a	34.4	-26.9	0.5
	Schoe V 25b	34.2	-26.7	0.2
	Schoe V 25a	34	-26.9	0.2
	Schoe V 24	33.87	-27.2	5.2
	Schoe V 23c	33.78	-27	0.6
	Schoe V 23b	33.6	-27.1	4
	Schoe V 23a	33.5	-27	0.6
	Schoe V 22b	33.45	-27	3.6
	Schoe V 22a	33.3	-27.1	3.7
	Schoe V 21b	33.16	-27.1	2.5
	Schoe V 21a	32.95	-27.1	2.8
	Schoe V 20b	32.83	-27.1	4.8
	Schoe V 20a	32.5	-27	3.8
	Schoe V 19b	32.39	-27	3.1
	Schoe V 19a	32.15	-26.9	1.4
	Schoe V 18b	31.99	-27	1.5
	Schoe V 18a	31.76	-27	1.3
	Schoe V 17b	31.62	-27	4.4
	Schoe V 17a	31.4	-26.9	5.3
	Schoe V 16	31.3	-26.9	7.2
	Schoe V 15	31.15	-27.1	4.5

	Sample	strat. position	$\delta^{13}\text{C}$	TOC (IRMS)
		[m]	[‰]	[%]
Interbed 2	Schoe V 14	31.03	-27	7.3
	Schoe V 13	30.94	-26.8	4.3
	Schoe V 12c	30.23	-26.9	8.8
	Schoe V 11	29.61	-26.9	9.4
	Schoe V 10a	29.4	-27.1	8.7
	Schoe V 9	29.3	-26.5	8.1
	Schoe V 8	29.17	-26.5	2.7
	Schoe V 7b	29.02	-26.9	4.4
	Schoe V 7a	28.79	-26.8	3.7
	Schoe V 6	28.65	-27.7	4.1
	Schoe V 5	28.54	-27.8	7.3
	Schoe V 4	28.4	-27.9	9.7
Seam 1	Schoe V 2	28.18	-28.3	52.8
	Schoe V 1	28.14	-28.1	64.4
	Schoe IX 58b	28.03	-28	54.7
	Schoe IX 58a	27.93	-28	59.5
	Schoe IX 57b	27.82	-28.3	61.1
	Schoe IX 57a	27.74	-26.6	66.5
	Schoe IX 56b	27.63	-26.7	66
	Schoe IX 56a	27.51	-26.8	62
	Schoe IX 55b	27.4	-26.7	66
	Schoe IX 55a	27.31	-26.5	65.2
	Schoe IX 54b	27.2	-26.2	66.6
	Schoe IX 54a	27.1	-26.5	64.7
	Schoe IX 53d	26.99	-27	67.2
	Schoe IX 53c	26.87	-26.5	68.2
	Schoe IX 53b	26.72	-26.5	66.8
	Schoe IX 53a	26.57	-26.3	64.9
	Schoe IX 52d	26.47	-27.4	63.2
	Schoe IX 52c	26.38	-25.8	67
	Schoe IX 52b	26.18	-26.4	66.7
	Schoe IX 52a	26.02	-27.2	61.1
	Schoe IX 51b	25.92	-27.4	58.8
	Schoe IX 51a	25.82	-27.2	57.8
	Schoe IX 50b	25.71	-27.1	58.8
	Schoe IX 50a	25.61	-27.4	62.1
	Schoe IX 49b	25.51	-27.4	63.1
	Schoe IX 49a	25.42	-26.5	58.7
	Schoe IX 48b	25.32	-27	58.8
	Schoe IX 48a	25.23	-27.4	57.5
Interbed 1	Schoe IX 47b	25.16	-26.7	46.9
	Schoe IX 47a	25.08	-25.7	26.5
	Schoe IX 46	24.89	-26.8	6.9
	Schoe IX 45c	24.73	-26.69	4.97
	Schoe IX 45a	24.45	-26.85	4.5
	Schoe IX 44a	24.14	-26.62	7.64
	Schoe IX 42	23.89	-26.56	7.09
	Schoe IX 40d	23.48	-26.83	1.41
	Schoe IX 40c	23.23	-26.96	2.13
	Schoe IX 40b	22.98	-26.87	1.77
	Schoe IX 40a	22.73	-27.1	2.79
	Schoe IX 39	22.39	-26.66	2.66
	Schoe IX 38	22.09	-27.02	2.14
	Schoe IX 37	21.87	-27.75	2.27
	Schoe IX 36b	21.68	-27.61	1.63
	Schoe IX 36a	21.52	-27.65	1.35
	Schoe IX 35	21.33	-28.8	2.32
	Schoe IX 33	20.98	-28.28	1.79
	Schoe IX 32	20.79	-27.82	0.9
	Schoe IX 31b	20.48	-27.59	1.52
	Schoe IX 30	20.17	-27.6	1.45
	Schoe IX 29b	19.98	-27.88	1.74
	Schoe IX 28b	19.65	-27.34	1.08
	Schoe IX 27b	19.27	-27.43	1.26
	Schoe IX 27a	19.09	-27.27	1.46
	Schoe IX 26b	18.85	-27.21	1.45

	Sample	strat. position	$\delta^{13}\text{C}$ [‰]	TOC (IRMS) [%]
Interbed 1	Schoe IX 26a	18.74	-27.33	1.93
	Schoe IX 25a	18.49	-27.81	0.12
	Schoe IX 23d	18.35	-28.19	0.26
	Schoe IX 23a	17.77	-26.94	0.08
	Schoe IX 22a	17.02	-26.76	0.1
	Schoe IX 21	16.89	-27.44	0.11
	Schoe IX 20	16.74	-28.07	0.14
	Schoe IX 19b	16.46	-26.62	0.1
	Schoe IX 19a	16.12	-26.9	0.08
	Schoe IX 18d	15.9	-27.79	0.1
	Schoe IX 18a	15.28	-27.01	0.06
	Schoe IX 17a	14.87	-26.92	0.08
	Schoe IX 16b	14.5	-27.3	0.05
	Schoe IX 15b	14	-27.21	0.07
	Schoe IX 14b	13.46	-27.13	0.09
	Schoe IX 14a	13.26	-27.66	0.09
	Schoe IX 12b	12.91	-27.41	0.03
	Schoe IX 12a	12.71	-27.86	0.14
	Schoe IX 11a	12.39	-28.05	0.12
	Schoe IX 10b	12.2	-27.39	0.05
	Schoe IX 10a	11.99	-27.8	0.14
	Schoe IX 8b	11.73	-28.28	1.21
	Schoe IX 6d	11.38	-28.21	0.63
	Schoe IX 6c	11.21	-28.42	0.55
	Schoe IX 6b	10.91	-28.2	0.33
	Schoe IX 5b	10.42	-27.9	0.1
	Schoe IX 5a	10.34	-28.52	2.37
	Schoe IX 3c	10.11	-28.42	1.08
	Schoe IX 3a	10.01	-28.43	1.45
	Schoe XLIX/29	10	-28.35	2.05
Main Seam	Schoe XLIX/28	9.92	-28.04	53.38
	Schoe IX 1b	9.85	-28.67	64.62
	Schoe XLIX/27b	9.77	-27.81	58.37
	Schoe IX 1a	9.6	-28.12	64.56
	Schoe XLIX/27a	9.51	-27.20	50.03
	Schoe XLIX/26	9.28	-27.26	48.69
	Schoe XLIX/25	9.09	-27.74	42.43
	Schoe XLIX/24	8.95	-27.28	60.81
	Schoe XLIX/23	8.83	-27.20	56.59
	Schoe XLIX/22	8.73	-27.13	43.55
	Schoe XLIX/21d	8.62	-26.29	58.44
	Schoe XLIX/21c	8.17	-26.23	59.22
	Schoe XLIX/21b	7.97	-25.69	58.8
	Schoe XLIX/21a	7.67	-27.31	63.53
	Schoe XLIX/20	7.43	-27.62	56.42
	Schoe XLIX/19	7.15	-27.54	62.01
	Schoe XLIX/18	6.92	-27.84	58.67
	Schoe XLIX/17	6.75	-26.96	61.41
	Schoe XLIX/16b	6.51	-28.06	23.23
	Schoe XLIX/16a	6.31	-27.06	56.49
	Schoe XLIX/15	6.13	-28.23	57.88
	Schoe XLIX/14	6	-27.12	52.64
	Schoe XLIX/13	5.8	-27.84	55.95
	Schoe XLIX/12	5.58	-27.74	43.76
	Schoe XLIX/11	5.37	-28.09	60.01
	Schoe XLIX/10	5.2	-27.79	48.51
	Schoe XLIX/9	5.02	-27.67	48.23
	Schoe XLIX/8	4.79	-28.03	33.86
	Schoe XLIX/7	4.57	-26.27	59.18
	Schoe XLIX/6b	4.27	-26.36	61.38
	Schoe XLIX/6a	4.02	-26.68	57.31
	Schoe XLIX/5	3.8	-26.32	43.56
	Schoe XLIX/4d	3.76	-26.26	59.49
	Schoe XLIX/4c	3.53	-25.4	60.72
	Schoe XLIX/4b	3.23	-26.42	60.11
	Schoe XLIX/4a	2.93	-26.12	62.38

	Sample	strat. position	$\delta^{13}\text{C}$ [‰]	TOC (IRMS) [%]
Main Seam	Schoe XLIX/3d	2.61	-25.55	59.35
	Schoe XLIX/3c	2.28	-25.9	60.71
	Schoe XLIX/3b	1.88	-26.75	63.08
	Schoe XLIX/3a	1.55	-26.6	59.99
	Schoe XLIX/2b	1.51	-25.65	40.55
	Schoe XLIX/2a	1.47	-26.21	54.77
	Schoe XLIX/1e	1.35	-26.21	61.01
	Schoe XLIX/1d	1.05	-26.4	59.45
	Schoe XLIX/1c	0.75	-26.2	60.28
	Schoe XLIX/1b	0.45	-26.07	60.32
	Schoe XLIX/1a	0.15	-25.99	56.49

Tab. S2 Palynological data of the Main Seam (raw data).

m above base Main Seam	Fagaceae (<i>Tricolpopollenites asper</i>)	Ericaceae (<i>Ericipites</i> spp.)	<i>Labrapollis</i> spp. (unknown botanical affinity)	Nyssaceae (<i>Nyssapollenites</i> spp.)	Cupressaceae (<i>Inaperturopollenites</i>)	Fabaceae (<i>Tricolpopollenites</i> . <i>liblarensis</i> group)	Juglandaceae (<i>Plicatopollis</i> spp.)	<i>Spinapollis spinosus</i> (unknown botanical affinity)	<i>Thomsonipollis</i> <i>magnificus</i> (unknown botanical affinity)	Fagaceae (<i>Tricolporopollenites</i> <i>cingulum</i> group)	Palmae (<i>Monocolpopollenites</i> <i>tranquillus</i>)	Polypodiaceae (<i>Verrucatosporites</i> spp.)	Myricaceae (<i>Tripaporollenites</i> <i>robustus/henanus</i> group)	Sphagnaceae (<i>Sphagnumsporites</i> spp.)	<i>Pompeckioideapollen</i> . <i>subhercynicus</i> (unknown botanical affinity)	other pollen and spores (not presented in the pollen diagram)
11.05	0	0	3	10	16	83	16	0	17	7	8	1	48	1	51	237
10.98	0	0	2	8	5	61	9	1	12	8	3	0	49	2	19	128
10.87	0	0	0	19	22	3	9	1	0	2	0	2	98	21	34	89
10.78	0	0	2	22	44	7	16	0	0	1	0	3	47	2	42	116
10.70	0	0	2	16	30	12	6	3	0	4	6	3	43	3	40	132
10.59	3	0	0	15	11	13	6	10	1	2	18	8	102	0	4	106
10.50	0	0	1	3	16	8	8	0	0	4	5	0	100	11	18	127
10.34	0	0	0	3	6	12	4	0	0	3	6	4	134	14	8	106
10.21	0	0	5	7	23	12	12	0	2	15	0	23	34	25	4	144
10.11	0	3	2	12	44	4	7	2	7	7	4	4	49	8	48	102
9.52	0	1	2	9	53	13	8	0	7	13	1	2	51	0	64	76
9.41	0	0	2	7	71	12	15	2	1	8	1	3	44	2	40	94
9.32	0	0	0	6	21	6	2	0	2	3	1	1	1	27	24	206
9.19	0	0	0	3	8	13	6	0	0	4	0	0	6	14	160	91
9.06	0	0	1	2	11	7	4	1	0	7	0	0	19	73	97	90
8.90	0	0	1	0	3	1	4	0	0	1	0	2	22	19	172	75
8.77	2	1	3	6	3	11	2	0	1	0	1	0	47	9	157	57
8.67	1	0	0	3	23	6	7	0	0	12	1	0	30	30	65	133
8.37	0	0	0	2	13	5	10	0	0	14	0	0	59	33	109	56
8.23	0	0	0	3	17	9	6	0	0	13	0	0	49	17	123	63
8.13	0	1	3	1	5	12	2	1	0	3	1	0	69	112	38	52
7.98	0	0	9	10	35	30	14	2	1	12	2	1	25	58	31	70
7.86	1	0	7	8	96	47	13	7	1	11	0	1	5	2	2	99
7.82	0	0	7	8	123	17	12	7	0	15	1	3	0	1	2	104
7.77	1	0	13	19	59	51	22	11	0	10	0	2	3	2	1	106
7.73	1	0	12	12	24	36	17	9	3	9	3	4	7	0	1	165
7.70	3	0	12	20	47	34	29	9	0	8	3	5	8	2	2	138
7.62	0	0	10	50	47	21	14	3	5	24	1	2	11	2	1	116
7.52	1	1	7	15	12	34	6	6	2	1	0	1	40	2	11	162
7.39	1	0	1	8	17	53	15	4	0	1	1	0	10	2	2	187
7.34	0	0	1	8	3	68	9	11	0	96	0	0	26	3	4	71
7.31	1	0	2	15	21	28	11	11	0	46	3	2	43	11	2	105
7.25	0	0	1	18	29	45	9	7	4	48	0	2	45	0	1	92
7.19	0	0	0	30	43	22	15	20	3	29	4	0	38	0	0	101
7.15	0	0	1	19	40	74	9	7	2	43	1	0	10	0	0	95
7.09	2	1	1	37	18	103	7	7	3	4	8	1	12	1	0	101
6.98	0	1	0	22	26	40	9	3	0	57	23	1	6	0	0	117
6.88	0	1	1	22	29	46	11	1	9	17	22	0	62	0	0	140
6.76	0	0	0	1	20	4	9	0	2	10	2	0	198	0	0	55
6.66	0	1	1	32	17	39	8	4	7	43	4	1	72	1	0	79
6.58	0	0	0	35	46	35	4	4	10	46	4	0	16	0	1	100
6.47	0	0	3	2	11	11	5	0	0	3	4	0	99	3	1	160
6.34	0	1	0	22	63	18	20	13	25	25	2	0	15	2	1	95
6.29	0	0	2	29	45	27	4	25	23	9	2	4	4	3	3	120
6.26	0	1	0	22	114	16	10	10	17	13	0	2	24	0	0	76
6.21	0	0	1	16	83	17	6	23	12	12	7	0	40	0	0	83
6.15	0	0	0	13	120	15	6	3	7	31	2	0	35	0	0	68
6.09	0	0	0	10	67	12	8	3	2	11	6	0	126	1	0	55

m above base Main Seam	Fagaceae (<i>Tricolpopollenites asper</i>)	Ericaceae (<i>Ericipites</i> spp.)	<i>Labrapollis</i> spp. (unknown botanical affinity)	Myrsaceae (<i>Myssapollenites</i> spp.)	Cupressaceae (<i>Inaperturopollenites</i>)	Fabaceae (<i>Tricolpopollenites</i> . <i>liblarensis</i> group)	Juglandaceae (<i>Plicatopollis</i> spp.)	<i>Spinopollis spinosus</i> (unknown botanical affinity)	<i>Thomsonipollis</i> <i>maginificus</i> (unknown botanical affinity)	Fagaceae (<i>Tricolporopollenites</i> <i>cingulum</i> group)	Palmae (<i>Monacolpopollenites</i> <i>tranquillus</i>)	Polypodiaceae (<i>Verrucatosporites</i> spp.)	Myricaceae (<i>Tripoporopollenites</i> <i>robustus/rhenanus</i> group)	Sphagnaceae (<i>Sphagnumsporites</i> spp.)	<i>Pompeckjoidaeipollen.</i> <i>subhircynicus</i> (unknown botanical affinity)	other pollen and spores (not presented in the pollen diagram)
5.99	2	0	5	7	39	46	14	8	2	11	2	0	31	7	1	124
5.90	1	0	2	20	28	16	12	8	18	5	0	0	71	8	3	108
5.79	0	0	0	11	37	15	6	13	16	16	0	0	121	1	0	66
5.67	0	0	1	12	29	17	4	6	11	4	0	0	129	0	0	94
5.57	0	0	0	7	7	19	7	2	22	33	1	2	117	2	1	74
5.49	0	0	0	13	3	17	6	0	27	27	3	0	149	0	0	56
5.42	0	0	2	13	9	14	6	0	21	21	9	0	135	1	0	77
5.35	0	1	0	8	6	16	4	0	15	5	3	0	167	0	2	74
5.30	0	0	1	4	5	10	3	1	4	6	10	0	179	0	0	88
5.25	0	0	0	3	1	4	3	2	3	8	1	0	220	0	11	46
5.18	0	0	0	3	12	5	7	0	1	13	0	1	150	3	15	90
5.09	0	0	0	4	149	17	5	0	0	21	0	1	6	2	1	96
4.97	0	0	4	5	34	14	15	6	5	13	0	5	3	60	0	136
4.84	0	0	19	45	44	7	26	7	4	2	0	2	3	9	1	132
4.72	0	1	1	21	56	4	20	6	2	1	0	5	4	2	3	174
4.57	0	0	11	16	86	36	17	2	3	8	0	5	1	2	0	113
4.43	0	0	6	21	101	17	15	3	2	7	0	6	12	5	2	104
4.33	0	9	3	47	114	7	13	0	1	13	0	1	6	6	3	79
4.07	0	2	2	14	43	12	12	2	4	8	0	3	42	10	10	121
3.95	1	3	10	24	82	21	16	7	0	9	0	1	6	5	2	113
3.89	0	0	4	16	56	13	11	2	7	15	4	1	72	3	3	101
3.87	0	1	13	37	20	11	19	17	0	6	1	1	9	6	4	156
3.78	0	3	17	14	19	30	20	3	0	4	0	4	5	5	7	179
3.64	0	1	5	11	62	35	14	8	0	5	0	2	11	4	7	149
3.59	2	4	10	18	72	36	13	14	1	14	0	0	8	0	2	112
3.38	0	3	14	27	28	72	18	12	1	5	0	1	9	3	3	106
3.30	0	2	0	15	76	43	7	6	0	23	3	0	8	16	1	101
3.14	5	2	11	12	49	34	12	10	0	9	3	0	11	4	2	136
2.87	1	0	11	13	32	41	10	14	8	4	2	2	9	20	2	134
2.73	1	1	0	12	54	33	18	21	9	7	1	0	17	3	2	141
2.55	2	6	13	36	46	15	11	14	18	1	1	3	10	4	1	120
2.38	0	2	18	15	73	40	3	11	0	19	0	4	4	9	2	99
2.23	0	0	12	17	64	63	16	8	5	31	3	1	3	2	0	79
2.14	1	0	11	25	57	30	19	11	4	11	0	0	2	3	1	136
2.07	1	2	10	40	50	63	14	9	3	7	0	1	3	5	1	91
1.98	0	2	13	39	121	10	15	6	0	12	0	0	1	0	0	97
1.91	0	3	14	18	126	19	11	8	0	8	1	2	6	1	1	82
1.77	6	4	11	24	17	18	16	6	0	3	2	3	4	32	1	160
1.61	0	0	2	20	65	51	18	3	0	16	4	0	4	23	1	94
1.50	1	4	14	34	67	16	13	8	0	6	1	1	3	5	3	130
1.31	0	7	7	22	74	31	12	13	0	8	1	1	3	0	0	123
1.19	0	2	13	46	63	28	5	8	0	5	0	0	3	1	0	127
1.09	6	4	37	31	31	40	12	8	0	3	0	0	6	1	0	121
0.98	6	3	20	39	30	40	20	0	0	5	3	2	5	2	3	124
0.85	3	1	8	71	30	47	12	1	0	6	0	2	1	1	0	118
0.52	4	1	14	37	30	61	17	0	0	1	0	2	8	1	0	129
0.45	11	3	14	37	35	36	6	0	1	1	1	2	6	0	0	147
0.40	15	3	21	31	27	40	15	0	0	1	1	2	0	0	2	145
0.36	5	1	19	49	13	46	6	1	0	4	3	1	3	0	0	159
0.32	3	2	25	55	29	36	6	0	0	4	3	1	1	0	0	141

m above base Main Seam	Fagaceae (<i>Tricolpopollenites asper</i>)	Ericaceae (<i>Ericipites</i> spp.)	<i>Labrapollis</i> spp. (unknown botanical affinity)	Myrsaceae (<i>Myrsapollenites</i> spp.)	Cupressaceae (<i>Inaperturopollenites</i>)	Fabaceae (<i>Tricolpopollenites</i> . <i>liblarensis</i> group)	Juglandaceae (<i>Plicatopollis</i> spp.)	<i>Spinapollis spinosus</i> (unknown botanical affinity)	<i>Thomsonipollis</i> <i>magnificus</i> (unknown botanical affinity)	Fagaceae (<i>Tricolporopollenites</i> <i>cingulum</i> group)	Palmae (<i>Monacolpopollenites</i> <i>tranquillus</i>)	Polypodiaceae (<i>Verrucatosporites</i> spp.)	Myricaceae (<i>Tripoporopollenites</i> <i>robustus/menanus</i> group)	Sphagnaceae (<i>Sphagnumsporites</i> spp.)	<i>Pompeckjoidapollen.</i> <i>subhercynicus</i> (unknown botanical affinity)	other pollen and spores (not presented in the pollen diagram)
0.28	1	3	14	62	61	20	8	0	0	6	1	2	3	0	0	119
0.23	4	3	25	46	68	35	6	0	0	6	6	2	3	0	0	100
0.18	0	1	4	4	47	6	0	0	1	5	1	0	69	0	2	60
0.15	2	0	16	30	82	18	12	0	0	5	2	0	4	0	0	141
0.12	3	0	25	40	35	26	11	0	0	3	0	2	1	0	0	156
0.08	3	1	17	68	22	22	20	0	0	1	3	0	1	0	0	147
0.03	15	0	13	63	10	24	20	0	0	1	8	0	2	0	1	143

Tab. S3 Palynological data of the Main Seam (in %).

m above base Main Seam	Fagaceae (<i>Tricolpopollenites asper</i>)	Ericaceae (<i>Ericipites</i> spp.)	<i>Labrapollis</i> spp. (unknown botanical affinity)	Nyssaceae (<i>Nyssapollenites</i> spp.)	Cupressaceae (<i>Inaperturopollenites</i>)	Fabaceae (<i>Tricolpopollenites</i> . <i>libarensis</i> group)	Juglandaceae (<i>Plicatopollis</i> spp.)	<i>Spinapollis spinosus</i> (unknown botanical affinity)	<i>Thomsonipollis</i> <i>magnificus</i> (unknown botanical affinity)	Fagaceae (<i>Tricolpopollenites</i> <i>cingulum</i> group)	Palmae (<i>Monocolpopollenites</i> <i>tranquillus</i>)	Polypodiaceae (<i>Verrucatosporites</i> spp.)	Myricaceae (<i>Tripapollenites</i> <i>robustus/henanus</i> group)	Sphagnaceae (<i>Sphagnumsporites</i> spp.)	<i>Pompeckjoidapollen.</i> <i>subhercynicus</i> (unknown botanical affinity)	other pollen and spores (not presented in the pollen diagram)
11.05	0.0	0.0	0.6	2.0	3.2	16.7	3.2	0.0	3.4	1.4	1.6	0.2	9.6	0.2	10.2	47.6
10.98	0.0	0.0	0.7	2.6	1.6	19.9	2.9	0.3	3.9	2.6	1.0	0.0	16.0	0.7	6.2	41.7
10.87	0.0	0.0	0.0	6.3	7.3	1.0	3.0	0.3	0.0	0.7	0.0	0.7	32.7	7.0	11.3	29.7
10.78	0.0	0.0	0.7	7.3	14.6	2.3	5.3	0.0	0.0	0.3	0.0	1.0	15.6	0.7	13.9	38.4
10.70	0.0	0.0	0.7	5.3	10.0	4.0	2.0	1.0	0.0	1.3	2.0	1.0	14.3	1.0	13.3	44.0
10.59	1.0	0.0	0.0	5.0	3.7	4.3	2.0	3.3	0.3	0.7	6.0	2.7	34.1	0.0	1.3	35.5
10.50	0.0	0.0	0.3	1.0	5.3	2.7	2.7	0.0	0.0	1.3	1.7	0.0	33.2	3.7	6.0	42.2
10.34	0.0	0.0	0.0	1.0	2.0	4.0	1.3	0.0	0.0	1.0	2.0	1.3	44.7	4.7	2.7	35.3
10.21	0.0	0.0	1.6	2.3	7.5	3.9	3.9	0.0	0.7	4.9	0.0	7.5	11.1	8.2	1.3	47.1
10.11	0.0	1.0	0.7	4.0	14.5	1.3	2.3	0.7	2.3	2.3	1.3	1.3	16.2	2.6	15.8	33.7
9.52	0.0	0.3	0.7	3.0	17.7	4.3	2.7	0.0	2.3	4.3	0.3	0.7	17.0	0.0	21.3	25.3
9.41	0.0	0.0	0.7	2.3	23.5	4.0	5.0	0.7	0.3	2.6	0.3	1.0	14.6	0.7	13.2	31.1
9.32	0.0	0.0	0.0	2.0	7.0	2.0	0.7	0.0	0.7	1.0	0.3	0.3	0.3	9.0	8.0	68.7
9.19	0.0	0.0	0.0	1.0	2.6	4.3	2.0	0.0	0.0	1.3	0.0	0.0	2.0	4.6	52.5	29.8
9.06	0.0	0.0	0.3	0.6	3.5	2.2	1.3	0.3	0.0	2.2	0.0	0.0	6.1	23.4	31.1	28.8
8.90	0.0	0.0	0.3	0.0	1.0	0.3	1.3	0.0	0.0	0.3	0.0	0.7	7.3	6.3	57.3	25.0
8.77	0.7	0.3	1.0	2.0	1.0	3.7	0.7	0.0	0.3	0.0	0.3	0.0	15.7	3.0	52.3	19.0
8.67	0.3	0.0	0.0	1.0	7.4	1.9	2.3	0.0	0.0	3.9	0.3	0.0	9.6	9.6	20.9	42.8
8.37	0.0	0.0	0.0	0.7	4.3	1.7	3.3	0.0	0.0	4.7	0.0	0.0	19.6	11.0	36.2	18.6
8.23	0.0	0.0	0.0	1.0	5.7	3.0	2.0	0.0	0.0	4.3	0.0	0.0	16.3	5.7	41.0	21.0
8.13	0.0	0.3	1.0	0.3	1.7	4.0	0.7	0.3	0.0	1.0	0.3	0.0	23.0	37.3	12.7	17.3
7.98	0.0	0.0	3.0	3.3	11.7	10.0	4.7	0.7	0.3	4.0	0.7	0.3	8.3	19.3	10.3	23.3
7.86	0.3	0.0	2.3	2.7	32.0	15.7	4.3	2.3	0.3	3.7	0.0	0.3	1.7	0.7	0.7	33.0
7.82	0.0	0.0	2.3	2.7	41.0	5.7	4.0	2.3	0.0	5.0	0.3	1.0	0.0	0.3	0.7	34.7
7.77	0.3	0.0	4.3	6.3	19.7	17.0	7.3	3.7	0.0	3.3	0.0	0.7	1.0	0.7	0.3	35.3
7.73	0.3	0.0	4.0	4.0	7.9	11.9	5.6	3.0	1.0	3.0	1.0	1.3	2.3	0.0	0.3	54.5
7.70	0.9	0.0	3.8	6.3	14.7	10.6	9.1	2.8	0.0	2.5	0.9	1.6	2.5	0.6	0.6	43.1
7.62	0.0	0.0	3.3	16.3	15.3	6.8	4.6	1.0	1.6	7.8	0.3	0.7	3.6	0.7	0.3	37.8
7.52	0.3	0.3	2.3	5.0	4.0	11.3	2.0	2.0	0.7	0.3	0.0	0.3	13.3	0.7	3.7	53.8
7.39	0.3	0.0	0.3	2.6	5.6	17.5	5.0	1.3	0.0	0.3	0.3	0.0	3.3	0.7	0.7	61.9
7.34	0.0	0.0	0.3	2.7	1.0	22.7	3.0	3.7	0.0	32.0	0.0	0.0	8.7	1.0	1.3	23.7
7.31	0.3	0.0	0.7	5.0	7.0	9.3	3.7	3.7	0.0	15.3	1.0	0.7	14.3	3.7	0.7	34.9
7.25	0.0	0.0	0.3	6.0	9.6	15.0	3.0	2.3	1.3	15.9	0.0	0.7	15.0	0.0	0.3	30.6
7.19	0.0	0.0	0.0	9.8	14.1	7.2	4.9	6.6	1.0	9.5	1.3	0.0	12.5	0.0	0.0	33.1
7.15	0.0	0.0	0.3	6.3	13.3	24.6	3.0	2.3	0.7	14.3	0.3	0.0	3.3	0.0	0.0	31.6
7.09	0.7	0.3	0.3	12.1	5.9	33.7	2.3	2.3	1.0	1.3	2.6	0.3	3.9	0.3	0.0	33.0
6.98	0.0	0.3	0.0	7.2	8.5	13.1	3.0	1.0	0.0	18.7	7.5	0.3	2.0	0.0	0.0	38.4
6.88	0.0	0.3	0.3	6.1	8.0	12.7	3.0	0.3	2.5	4.7	6.1	0.0	17.2	0.0	0.0	38.8
6.76	0.0	0.0	0.0	0.3	6.6	1.3	3.0	0.0	0.7	3.3	0.7	0.0	65.8	0.0	0.0	18.3
6.66	0.0	0.3	0.3	10.4	5.5	12.6	2.6	1.3	2.3	13.9	1.3	0.3	23.3	0.3	0.0	25.6
6.58	0.0	0.0	0.0	11.6	15.3	11.6	1.3	1.3	3.3	15.3	1.3	0.0	5.3	0.0	0.3	33.2
6.47	0.0	0.0	1.0	0.7	3.6	3.6	1.7	0.0	0.0	1.0	1.3	0.0	32.8	1.0	0.3	53.0
6.34	0.0	0.3	0.0	7.3	20.9	6.0	6.6	4.3	8.3	8.3	0.7	0.0	5.0	0.7	0.3	31.5
6.29	0.0	0.0	0.7	9.7	15.0	9.0	1.3	8.3	7.7	3.0	0.7	1.3	1.3	1.0	1.0	40.0
6.26	0.0	0.3	0.0	7.2	37.4	5.2	3.3	3.3	5.6	4.3	0.0	0.7	7.9	0.0	0.0	24.9
6.21	0.0	0.0	0.3	5.3	27.7	5.7	2.0	7.7	4.0	4.0	2.3	0.0	13.3	0.0	0.0	27.7
6.15	0.0	0.0	0.0	4.3	40.0	5.0	2.0	1.0	2.3	10.3	0.7	0.0	11.7	0.0	0.0	22.7
6.09	0.0	0.0	0.0	3.3	22.3	4.0	2.7	1.0	0.7	3.7	2.0	0.0	41.9	0.3	0.0	18.3

m above base Main Seam	Fagaceae (<i>Tricolpopollenites asper</i>)	Ericaceae (<i>Ericipites</i> spp.)	<i>Labrapollis</i> spp. (unknown botanical affinity)	Myrsaceae (<i>Myssapollenites</i> spp.)	Cupressaceae (<i>Inaperturopollenites</i>)	Fabaceae (<i>Tricolpopollenites</i> . <i>liblarensis</i> group)	Juglandaceae (<i>Plicatopollis</i> spp.)	<i>Spinapollis spinosus</i> (unknown botanical affinity)	<i>Thomsonipollis</i> <i>magnificus</i> (unknown botanical affinity)	Fagaceae (<i>Tricolporopollenites</i> <i>cingulum</i> group)	Palmae (<i>Monacopollenites</i> <i>tranquillus</i>)	Polypodiaceae (<i>Verrucatosporites</i> spp.)	Myricaceae (<i>Triporopollenites</i> <i>robustus/rhenanus</i> group)	Sphagnaceae (<i>Sphagnumsporites</i> spp.)	<i>Pompeckjoidapollen.</i> <i>subhircynicus</i> (unknown botanical affinity)	other pollen and spores (not presented in the pollen diagram)
5.99	0.7	0.0	1.7	2.3	13.0	15.4	4.7	2.7	0.7	3.7	0.7	0.0	10.4	2.3	0.3	41.5
5.90	0.3	0.0	0.7	6.7	9.3	5.3	4.0	2.7	6.0	1.7	0.0	0.0	23.7	2.7	1.0	36.0
5.79	0.0	0.0	0.0	3.6	12.3	5.0	2.0	4.3	5.3	5.3	0.0	0.0	40.1	0.3	0.0	21.9
5.67	0.0	0.0	0.3	3.9	9.4	5.5	1.3	2.0	3.6	1.3	0.0	0.0	42.0	0.0	0.0	30.6
5.57	0.0	0.0	0.0	2.4	2.4	6.5	2.4	0.7	7.5	11.2	0.3	0.7	39.8	0.7	0.3	25.2
5.49	0.0	0.0	0.0	4.3	1.0	5.6	2.0	0.0	9.0	9.0	1.0	0.0	49.5	0.0	0.0	18.6
5.42	0.0	0.0	0.6	4.2	2.9	4.5	1.9	0.0	6.8	6.8	2.9	0.0	43.8	0.3	0.0	25.0
5.35	0.0	0.3	0.0	2.7	2.0	5.3	1.3	0.0	5.0	1.7	1.0	0.0	55.5	0.0	0.7	24.6
5.30	0.0	0.0	0.3	1.3	1.6	3.2	1.0	0.3	1.3	1.9	3.2	0.0	57.6	0.0	0.0	28.3
5.25	0.0	0.0	0.0	1.0	0.3	1.3	1.0	0.7	1.0	2.6	0.3	0.0	72.8	0.0	3.6	15.2
5.18	0.0	0.0	0.0	1.0	4.0	1.7	2.3	0.0	0.3	4.3	0.0	0.3	50.0	1.0	5.0	30.0
5.09	0.0	0.0	0.0	1.3	49.3	5.6	1.7	0.0	0.0	7.0	0.0	0.3	2.0	0.7	0.3	31.8
4.97	0.0	0.0	1.3	1.7	11.3	4.7	5.0	2.0	1.7	4.3	0.0	1.7	1.0	20.0	0.0	45.3
4.84	0.0	0.0	6.3	15.0	14.6	2.3	8.6	2.3	1.3	0.7	0.0	0.7	1.0	3.0	0.3	43.9
4.72	0.0	0.3	0.3	7.0	18.7	1.3	6.7	2.0	0.7	0.3	0.0	1.7	1.3	0.7	1.0	58.0
4.57	0.0	0.0	3.7	5.3	28.7	12.0	5.7	0.7	1.0	2.7	0.0	1.7	0.3	0.7	0.0	37.7
4.43	0.0	0.0	2.0	7.0	33.6	5.6	5.0	1.0	0.7	2.3	0.0	2.0	4.0	1.7	0.7	34.6
4.33	0.0	3.0	1.0	15.6	37.7	2.3	4.3	0.0	0.3	4.3	0.0	0.3	2.0	2.0	1.0	26.2
4.07	0.0	0.7	0.7	4.9	15.1	4.2	4.2	0.7	1.4	2.8	0.0	1.1	14.7	3.5	3.5	42.5
3.95	0.3	1.0	3.3	8.0	27.3	7.0	5.3	2.3	0.0	3.0	0.0	0.3	2.0	1.7	0.7	37.7
3.89	0.0	0.0	1.3	5.2	18.2	4.2	3.6	0.6	2.3	4.9	1.3	0.3	23.4	1.0	1.0	32.8
3.87	0.0	0.3	4.3	12.3	6.6	3.7	6.3	5.6	0.0	2.0	0.3	0.3	3.0	2.0	1.3	51.8
3.78	0.0	1.0	5.5	4.5	6.1	9.7	6.5	1.0	0.0	1.3	0.0	1.3	1.6	1.6	2.3	57.7
3.64	0.0	0.3	1.6	3.5	19.7	11.1	4.5	2.5	0.0	1.6	0.0	0.6	3.5	1.3	2.2	47.5
3.59	0.7	1.3	3.3	5.9	23.5	11.8	4.2	4.6	0.3	4.6	0.0	0.0	2.6	0.0	0.7	36.6
3.38	0.0	1.0	4.6	8.9	9.3	23.8	6.0	4.0	0.3	1.7	0.0	0.3	3.0	1.0	1.0	35.1
3.30	0.0	0.7	0.0	5.0	25.2	14.3	2.3	2.0	0.0	7.6	1.0	0.0	2.7	5.3	0.3	33.6
3.14	1.7	0.7	3.7	4.0	16.3	11.3	4.0	3.3	0.0	3.0	1.0	0.0	3.7	1.3	0.7	45.3
2.87	0.3	0.0	3.6	4.3	10.6	13.5	3.3	4.6	2.6	1.3	0.7	0.7	3.0	6.6	0.7	44.2
2.73	0.3	0.3	0.0	3.8	16.9	10.3	5.6	6.6	2.8	2.2	0.3	0.0	5.3	0.9	0.6	44.1
2.55	0.7	2.0	4.3	12.0	15.3	5.0	3.7	4.7	6.0	0.3	0.3	1.0	3.3	1.3	0.3	39.9
2.38	0.0	0.7	6.0	5.0	24.4	13.4	1.0	3.7	0.0	6.4	0.0	1.3	1.3	3.0	0.7	33.1
2.23	0.0	0.0	3.9	5.6	21.1	20.7	5.3	2.6	1.6	10.2	1.0	0.3	1.0	0.7	0.0	26.0
2.14	0.3	0.0	3.5	8.0	18.3	9.6	6.1	3.5	1.3	3.5	0.0	0.0	0.6	1.0	0.3	43.7
2.07	0.3	0.7	3.3	13.3	16.7	21.0	4.7	3.0	1.0	2.3	0.0	0.3	1.0	1.7	0.3	30.3
1.98	0.0	0.6	4.1	12.3	38.3	3.2	4.7	1.9	0.0	3.8	0.0	0.0	0.3	0.0	0.0	30.7
1.91	0.0	1.0	4.7	6.0	42.0	6.3	3.7	2.7	0.0	2.7	0.3	0.7	2.0	0.3	0.3	27.3
1.77	2.0	1.3	3.6	7.8	5.5	5.9	5.2	2.0	0.0	1.0	0.7	1.0	1.3	10.4	0.3	52.1
1.61	0.0	0.0	0.7	6.6	21.6	16.9	6.0	1.0	0.0	5.3	1.3	0.0	1.3	7.6	0.3	31.2
1.50	0.3	1.3	4.6	11.1	21.9	5.2	4.2	2.6	0.0	2.0	0.3	0.3	1.0	1.6	1.0	42.5
1.31	0.0	2.3	2.3	7.3	24.5	10.3	4.0	4.3	0.0	2.6	0.3	0.3	1.0	0.0	0.0	40.7
1.19	0.0	0.7	4.3	15.3	20.9	9.3	1.7	2.7	0.0	1.7	0.0	0.0	1.0	0.3	0.0	42.2
1.09	2.0	1.3	12.3	10.3	10.3	13.3	4.0	2.7	0.0	1.0	0.0	0.0	2.0	0.3	0.0	40.3
0.98	2.0	1.0	6.6	12.9	9.9	13.2	6.6	0.0	0.0	1.7	1.0	0.7	1.7	0.7	1.0	41.1
0.85	1.0	0.3	2.7	23.6	10.0	15.6	4.0	0.3	0.0	2.0	0.0	0.7	0.3	0.3	0.0	39.2
0.52	1.3	0.3	4.6	12.1	9.8	20.0	5.6	0.0	0.0	0.3	0.0	0.7	2.6	0.3	0.0	42.3
0.45	3.7	1.0	4.7	12.3	11.7	12.0	2.0	0.0	0.3	0.3	0.3	0.7	2.0	0.0	0.0	49.0
0.40	5.0	1.0	6.9	10.2	8.9	13.2	5.0	0.0	0.0	0.3	0.3	0.7	0.0	0.0	0.7	47.9
0.36	1.6	0.3	6.1	15.8	4.2	14.8	1.9	0.3	0.0	1.3	1.0	0.3	1.0	0.0	0.0	51.3
0.32	1.0	0.7	8.2	18.0	9.5	11.8	2.0	0.0	0.0	1.3	1.0	0.3	0.3	0.0	0.0	46.1

m above base Main Seam	Fagaceae (<i>Tricolpopollenites asper</i>)	Ericaceae (<i>Ericipites</i> spp.)	<i>Labrapollis</i> spp. (unknown botanical affinity)	Myrsaceae (<i>Myrsapollenites</i> spp.)	Cupressaceae (<i>Inaperturopollenites</i>)	Fabaceae (<i>Tricolpopollenites</i> <i>liblarensis</i> group)	Juglandaceae (<i>Plicatopollis</i> spp.)	<i>Spinopollis spinosus</i> (unknown botanical affinity)	<i>Thomsonipollis</i> <i>magnificus</i> (unknown botanical affinity)	Fagaceae (<i>Tricolpopollenites</i> <i>cingulum</i> group)	Palmae (<i>Monacolpopollenites</i> <i>tranquillus</i>)	Polypodiaceae (<i>Verrucatosporites</i> spp.)	Myricaceae (<i>Tripopollenites</i> <i>robustus/menianus</i> group)	Sphagnaceae (<i>Sphagnosporites</i> spp.)	<i>Pompeckjoidapollen.</i> <i>subhercynicus</i> (unknown botanical affinity)	other pollen and spores (not presented in the pollen diagram)
0.28	0.3	1.0	4.7	20.7	20.3	6.7	2.7	0.0	0.0	2.0	0.3	0.7	1.0	0.0	0.0	39.7
0.23	1.3	1.0	8.2	15.1	22.4	11.5	2.0	0.0	0.0	2.0	2.0	0.7	1.0	0.0	0.0	32.9
0.18	0.0	0.5	2.0	2.0	23.5	3.0	0.0	0.0	0.5	2.5	0.5	0.0	34.5	0.0	1.0	30.0
0.15	0.6	0.0	5.1	9.6	26.3	5.8	3.8	0.0	0.0	1.6	0.6	0.0	1.3	0.0	0.0	45.2
0.12	1.0	0.0	8.3	13.2	11.6	8.6	3.6	0.0	0.0	1.0	0.0	0.7	0.3	0.0	0.0	51.7
0.08	1.0	0.3	5.6	22.3	7.2	7.2	6.6	0.0	0.0	0.3	1.0	0.0	0.3	0.0	0.0	48.2
0.03	5.0	0.0	4.3	21.0	3.3	8.0	6.7	0.0	0.0	0.3	2.7	0.0	0.7	0.0	0.3	47.7

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