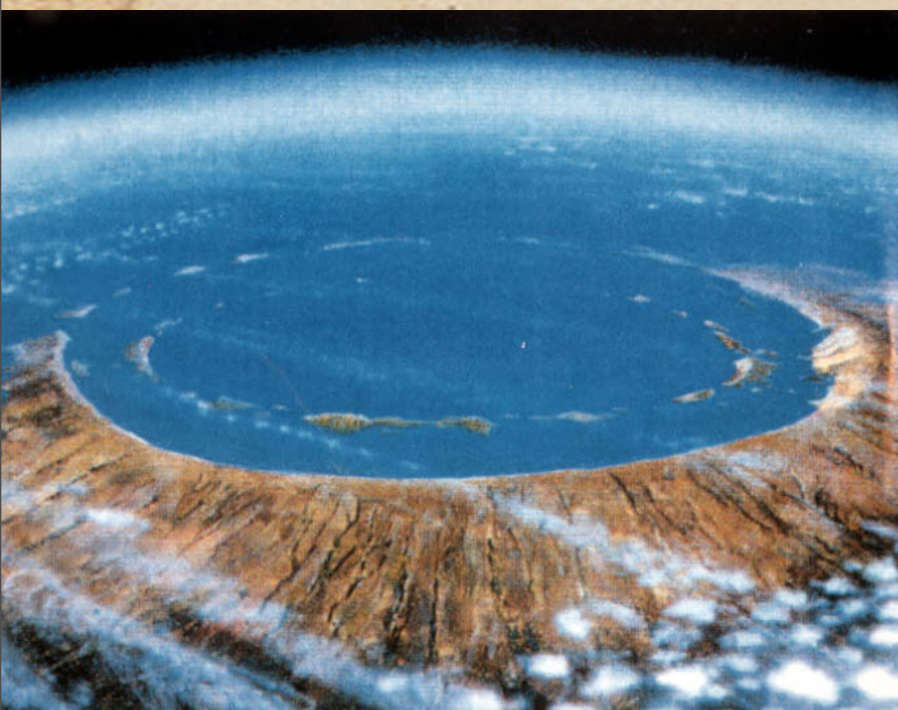
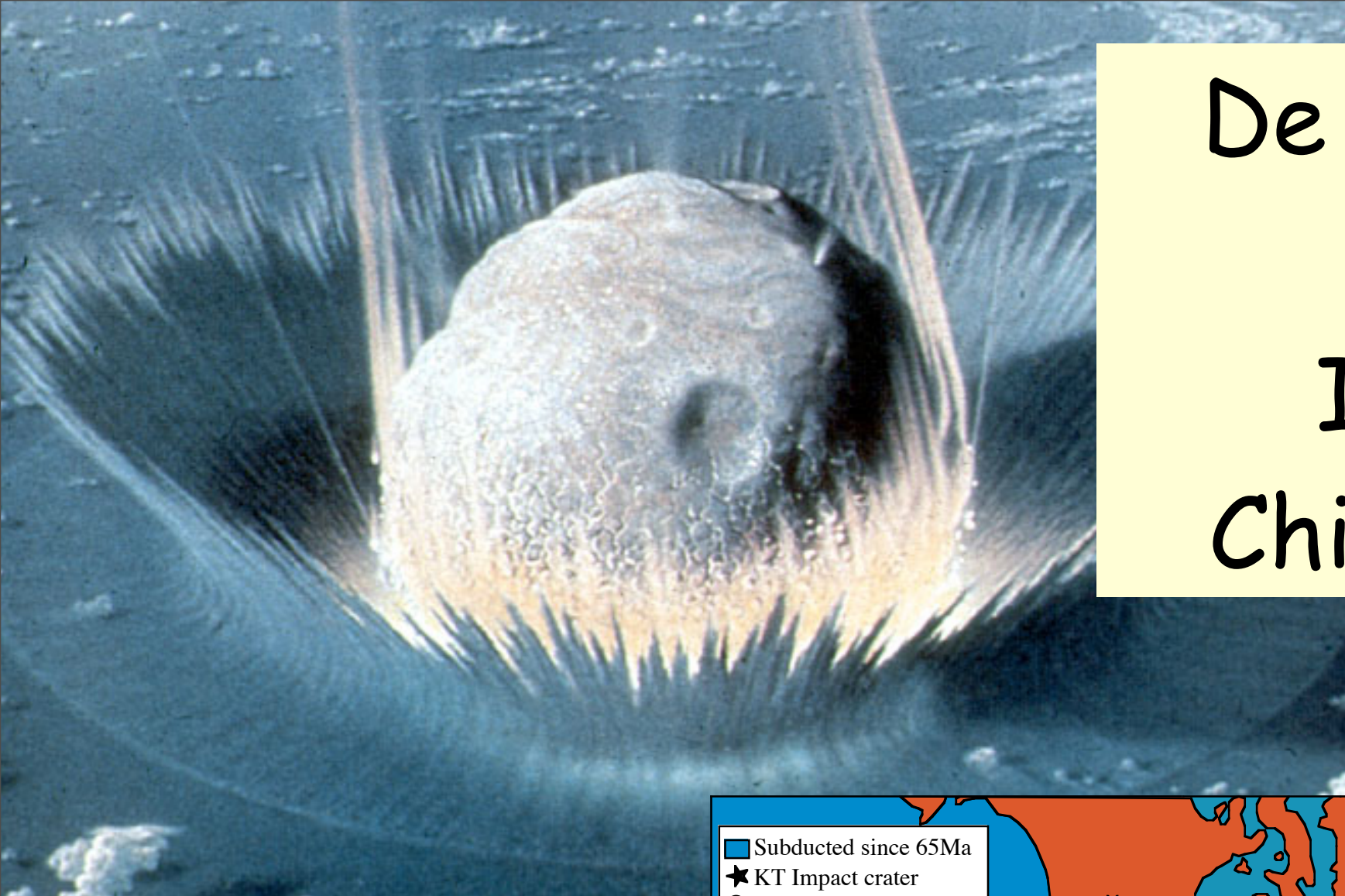


De Krijt-Tertiair grens: In en Uit de Chicxulub krater



Op 2000m diepte in de voormalige Tethys oceaan.....



Gola del Bottaccione, near Gubbio, Italy

Wat gebeurde er op de Krijt-Tertiair grens in de Oceaan?

Op 2000m diepte in de voormalige Tethys oceaan.....



Cretaceous

Gola del Bottaccione, near Gubbio, Italy

Wat gebeurde er op de Krijt-Tertiair grens in de Oceaan?

Op 2000m diepte in de voormalige Tethys oceaan.....

Tertiary

Cretaceous

Gola del Bottaccione, near Gubbio, Italy

Wat gebeurde er op de Krijt-Tertiair grens in de Oceaan?

Op 2000m diepte in de voormalige Tethys oceaan.....

Tertiary

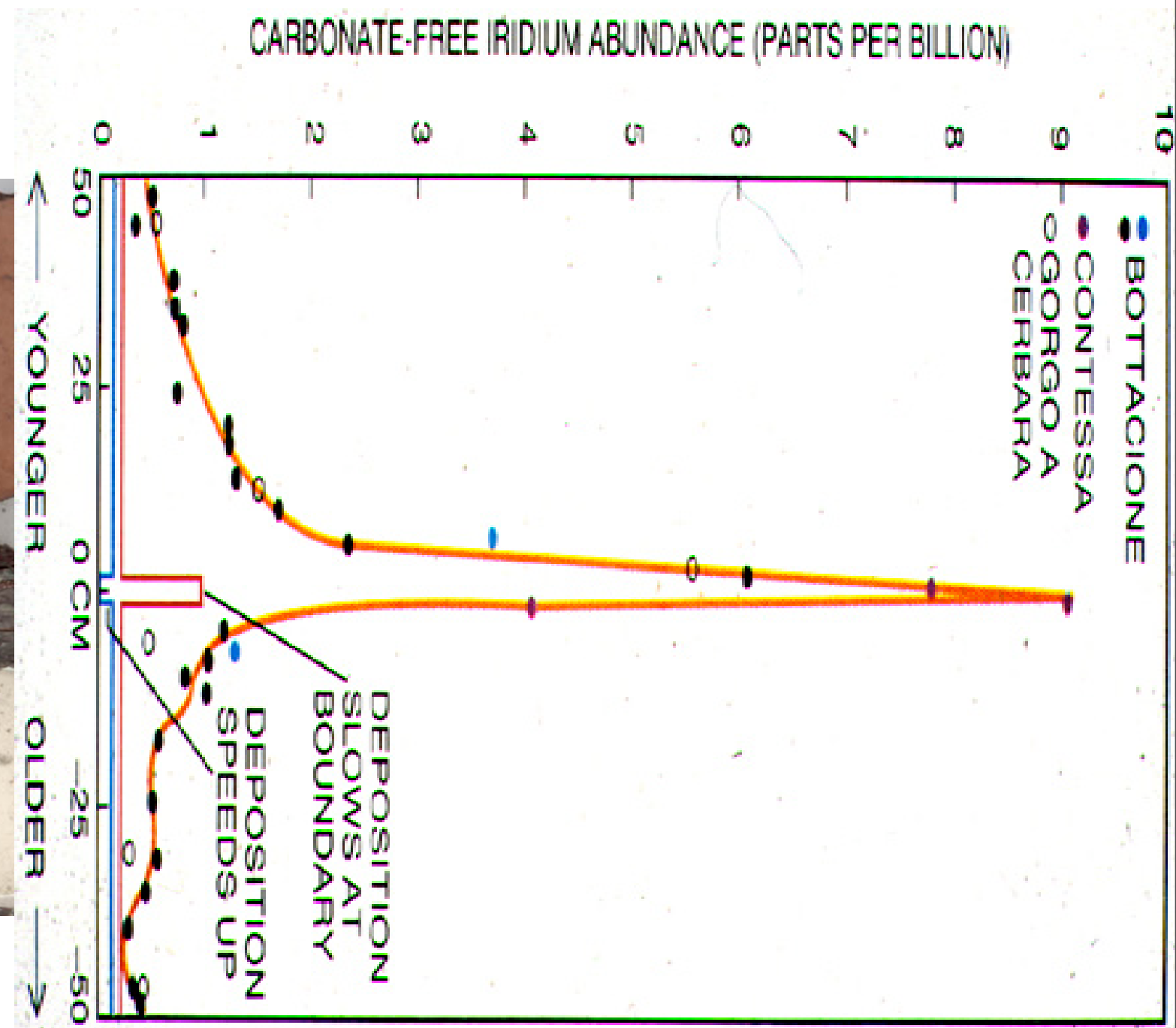
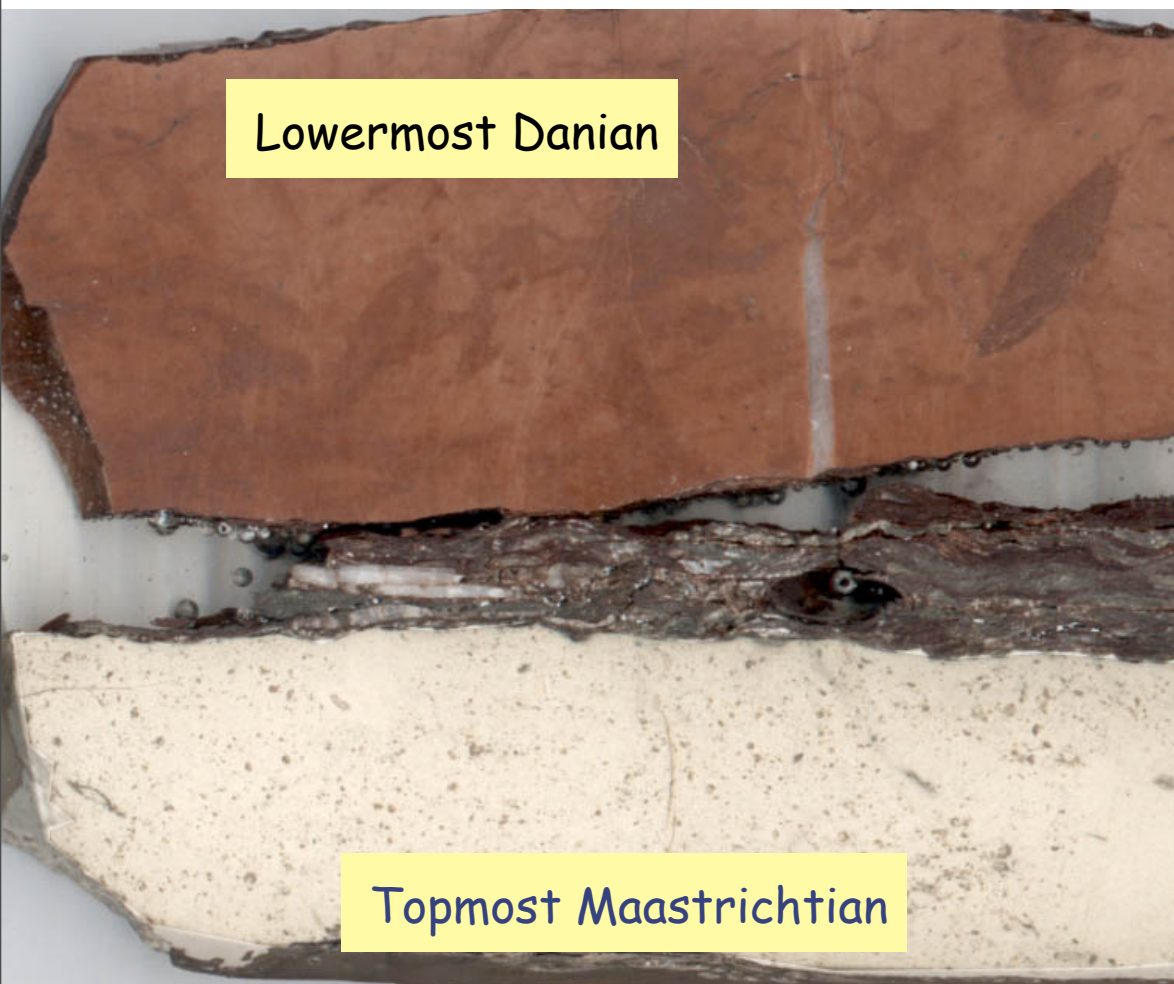


Cretaceous

Gola del Bottaccione, near Gubbio, Italy

Wat gebeurde er op de Krijt-Tertiair grens in de Oceaan?

K/T grens in de Valle della Contessa near Gubbio



Iridium anomalie Gubbio, Italie

Agost en Caravaca, Spanje: veel meer detail



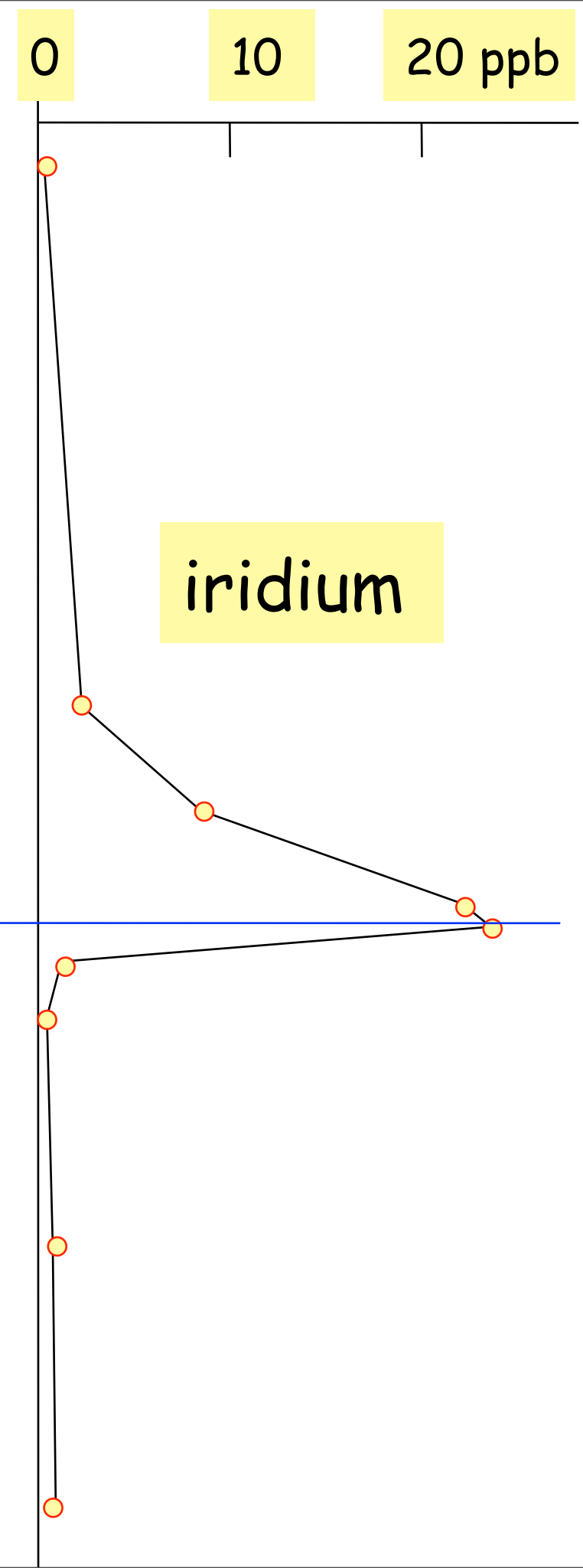
Caravaca, Spain Iridium profile

(J. Hertogen and F. Asaro, 1979)



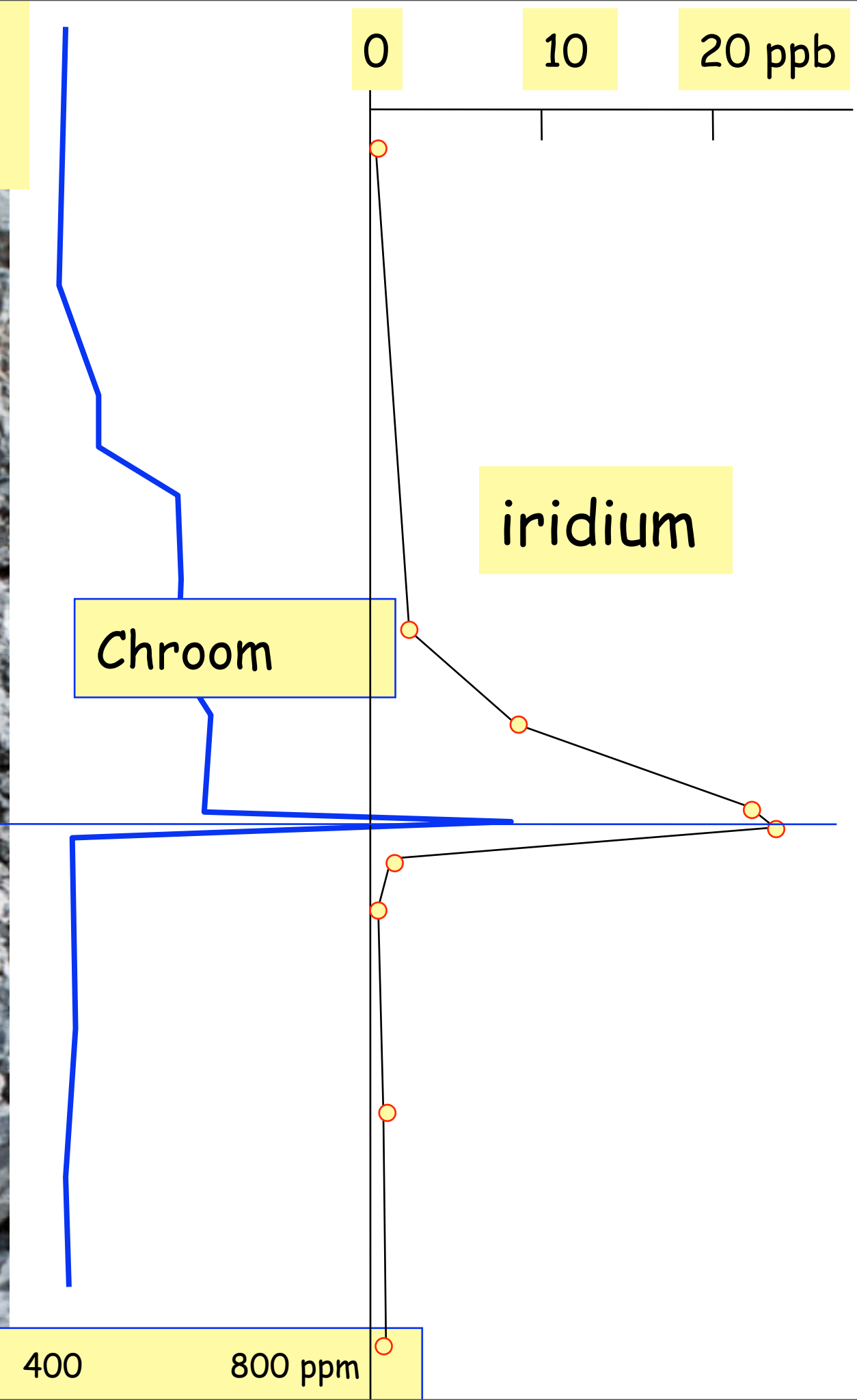
Caravaca, Spain Iridium profile

(J. Hertogen and F. Asaro, 1979)



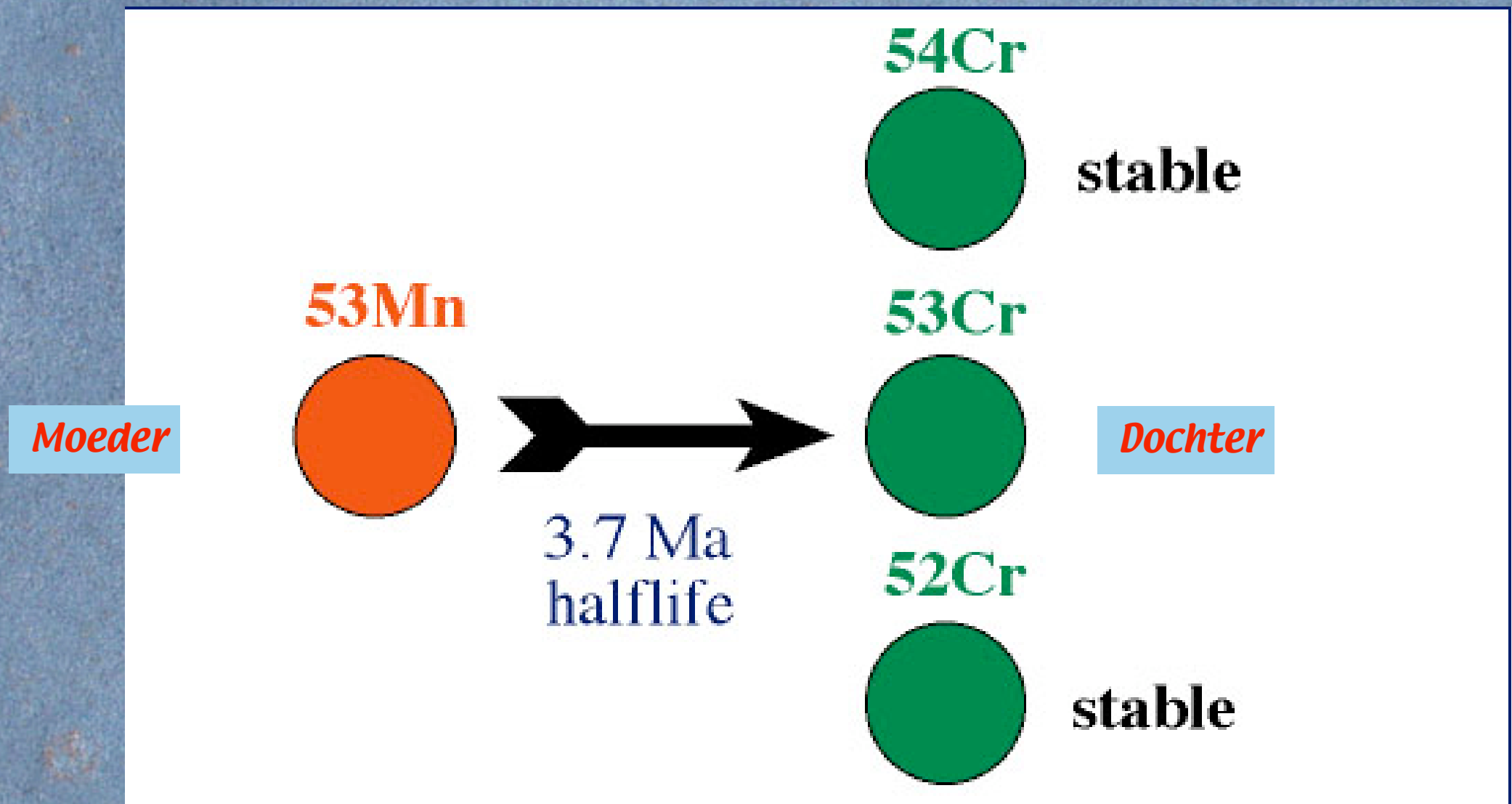
Caravaca, Spain Iridium profile

(J. Hertogen and F. Asaro, 1979)



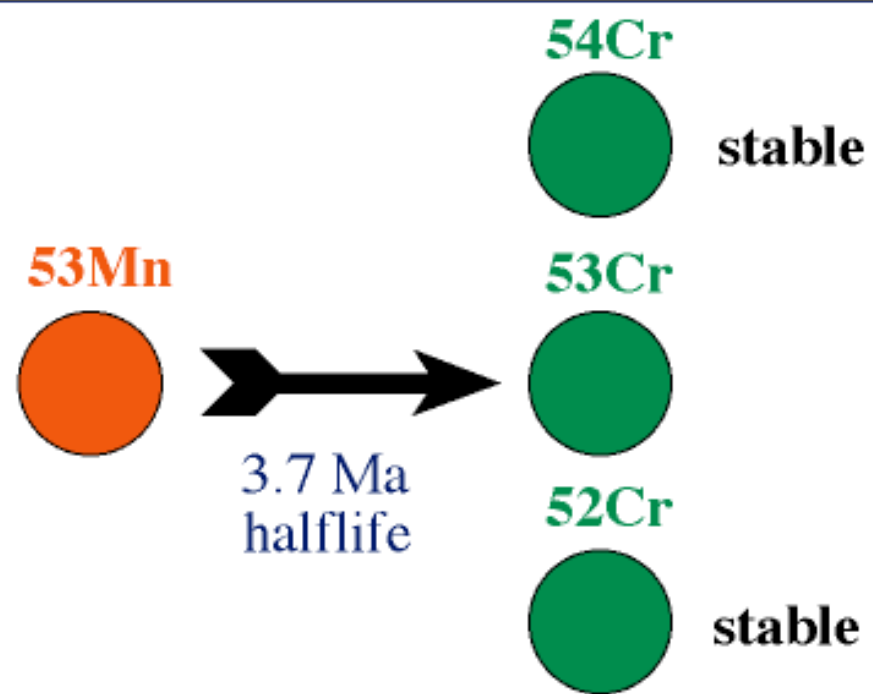
Chondrites (CM, CV, H, L, LL, E) 4.21 +/- 0.76 Ga
Carbonaceous chondrites 4.37 +/- 0.34 Ga
Eucrites (polymict) 4.53 +/- 0.19 Ga
Eucrites 4.44 +/- 0.30 Ga
Diogenites 4.45 +/- 0.18 Ga
Iron (plus iron from St. Severin) 4.57 +/- 0.21 Ga (=Giga annum of Miljard Jaar)

Chroom isotopen

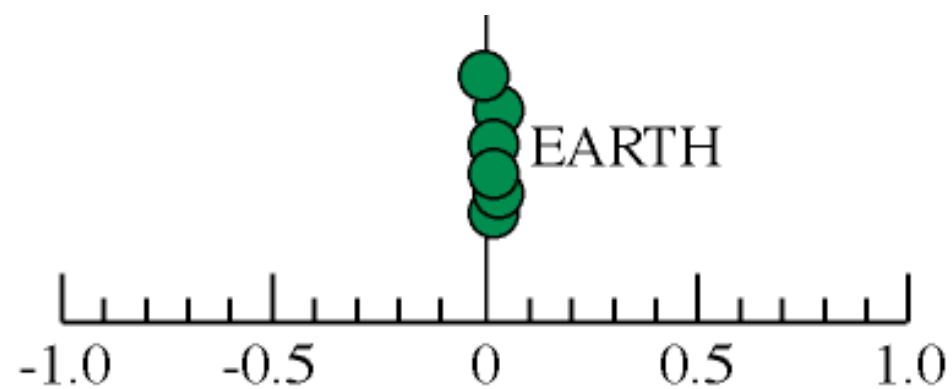


*Na 37 miljoen jaar is alle ⁵³Mn vervallen naar ⁵³Cr
D.W.Z dat (de aarde is 4550 miljoen jaar oud) 4515 miljoen jaar geleden
Alle ⁵³Mn verdwenen is.*

Chroom isotopen

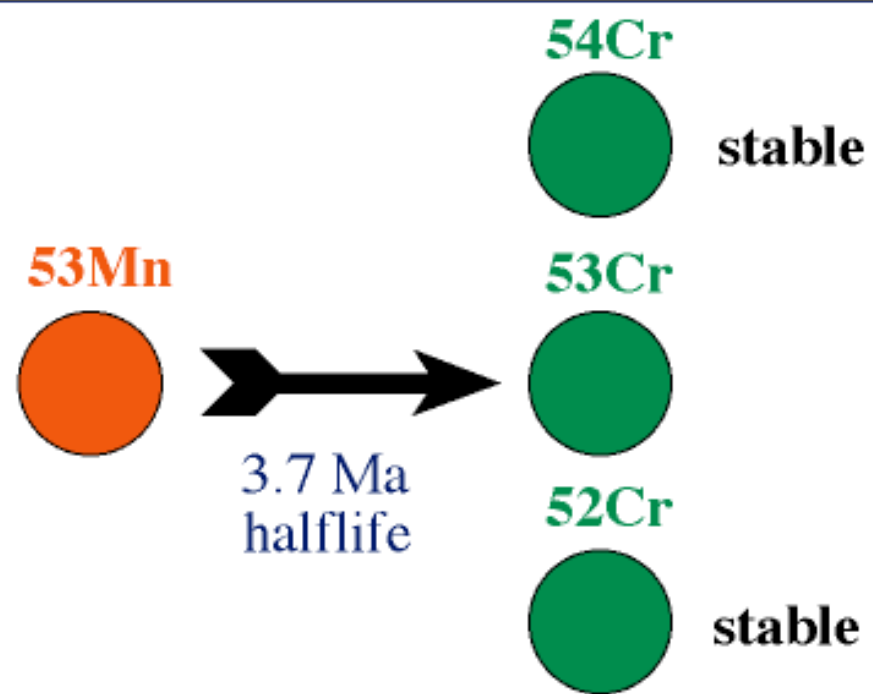


$\epsilon^{53}\text{Cr}$

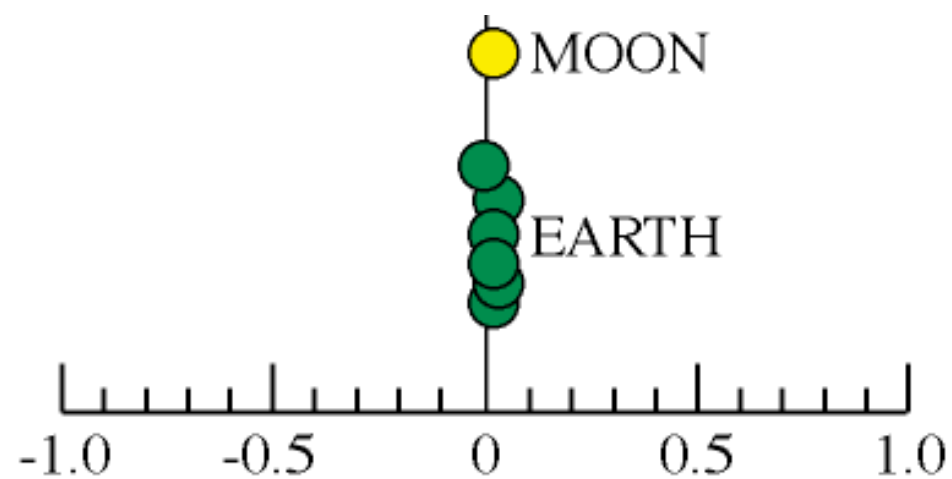


*Op de aarde is de chroom isotopen
Verhouding overal hetzelfde*

Chroom isotopen



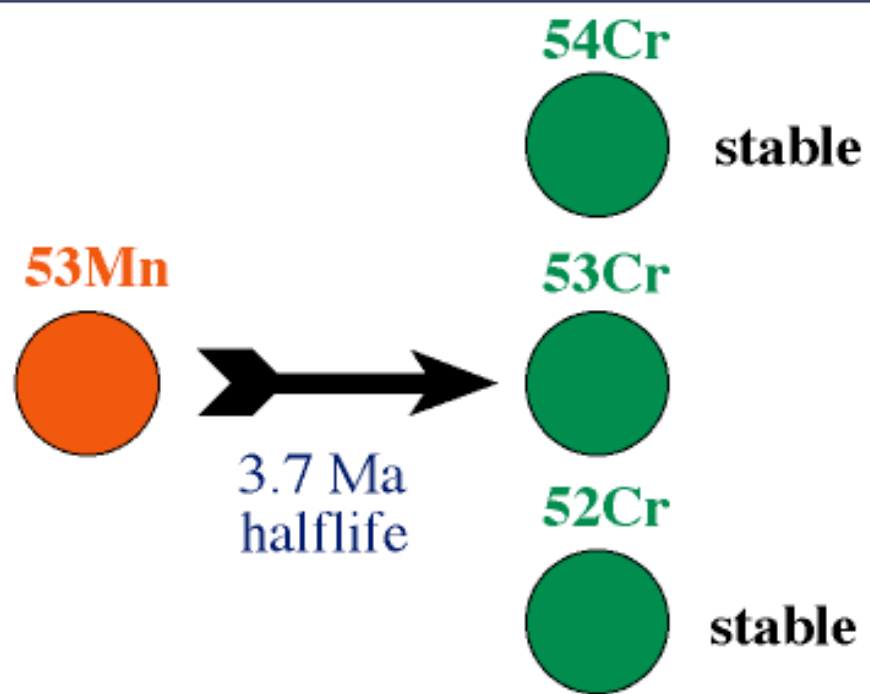
$\epsilon^{53}\text{Cr}$



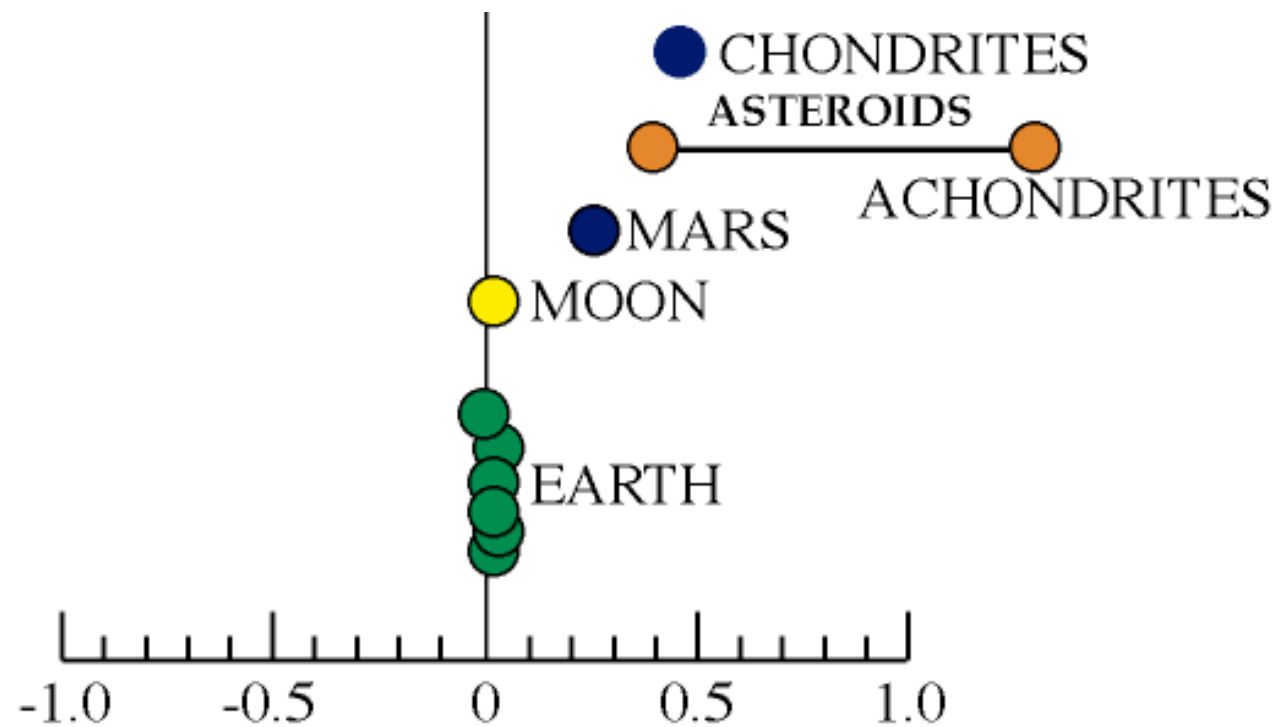
De Maan heeft precies dezelfde verhouding!

Op de aarde is de chroom isotopen Verhouding overal hetzelfde

Chroom isotopen



$\epsilon^{53}\text{Cr}$

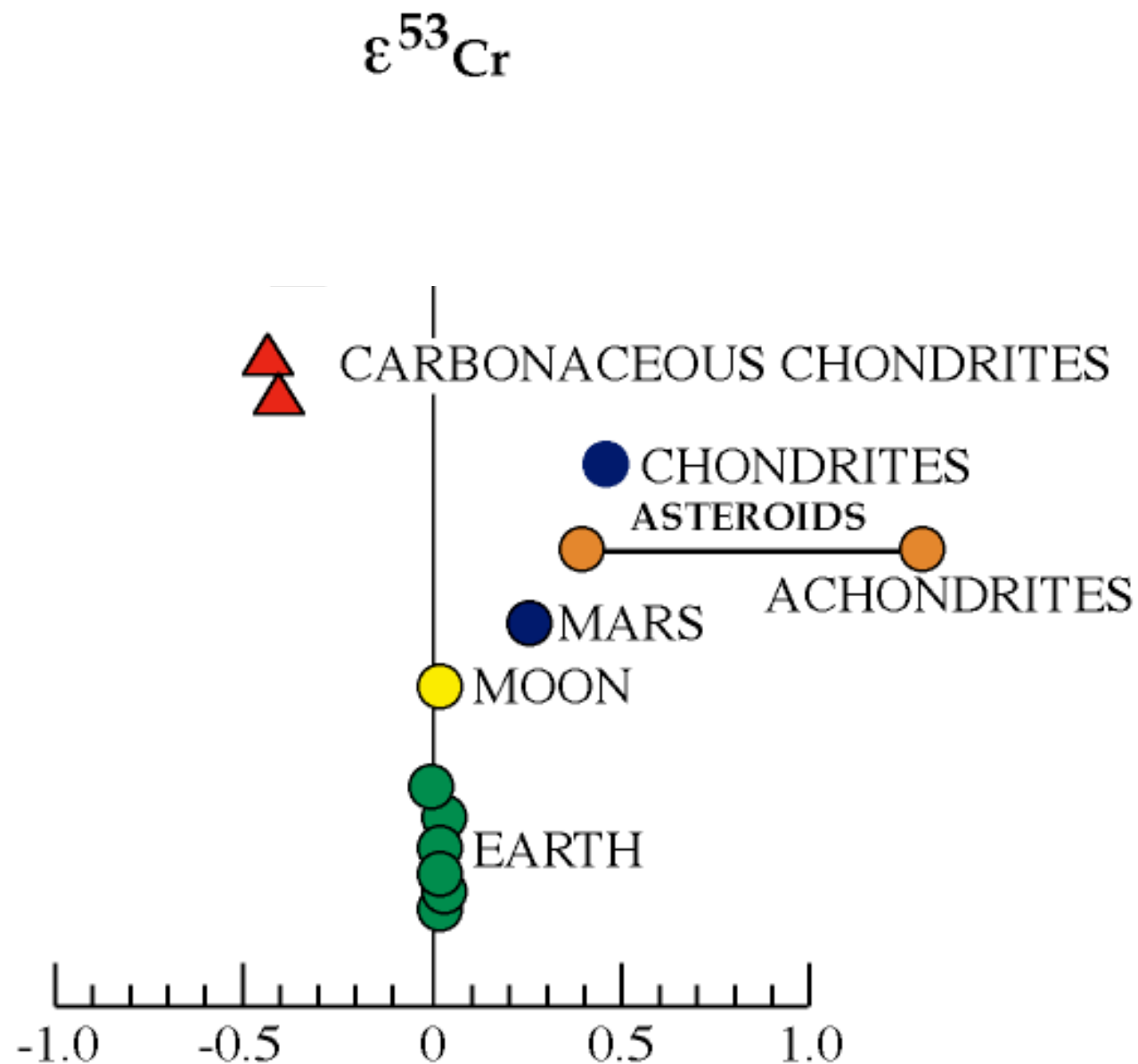
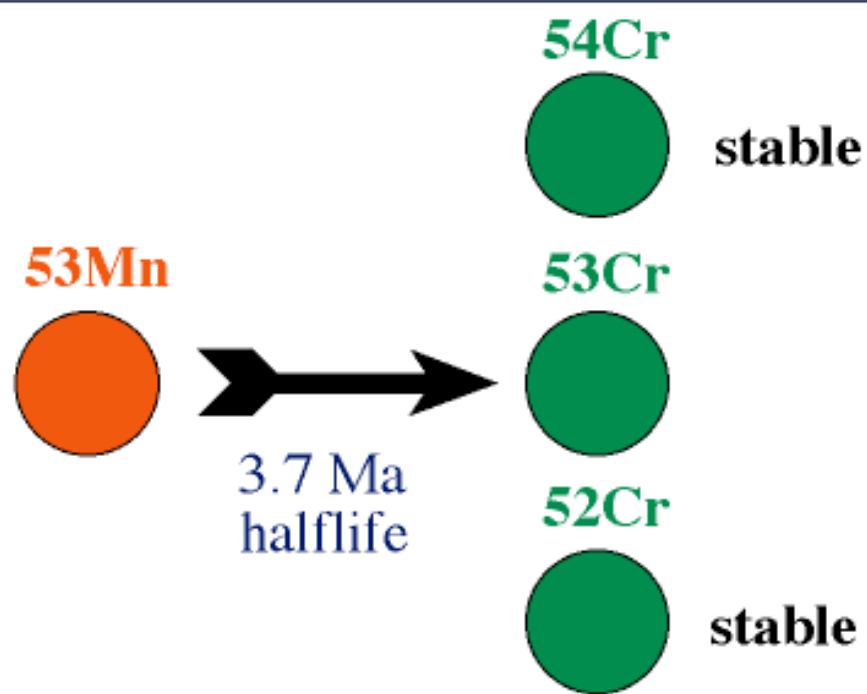


Op Mars en de asteroiden is de $\epsilon^{53}\text{Cr}$ Hoger

De Maan heeft precies dezelfde verhouding!

Op de aarde is de chroom isotopen Verhouding overal hetzelfde

Chroom isotopen



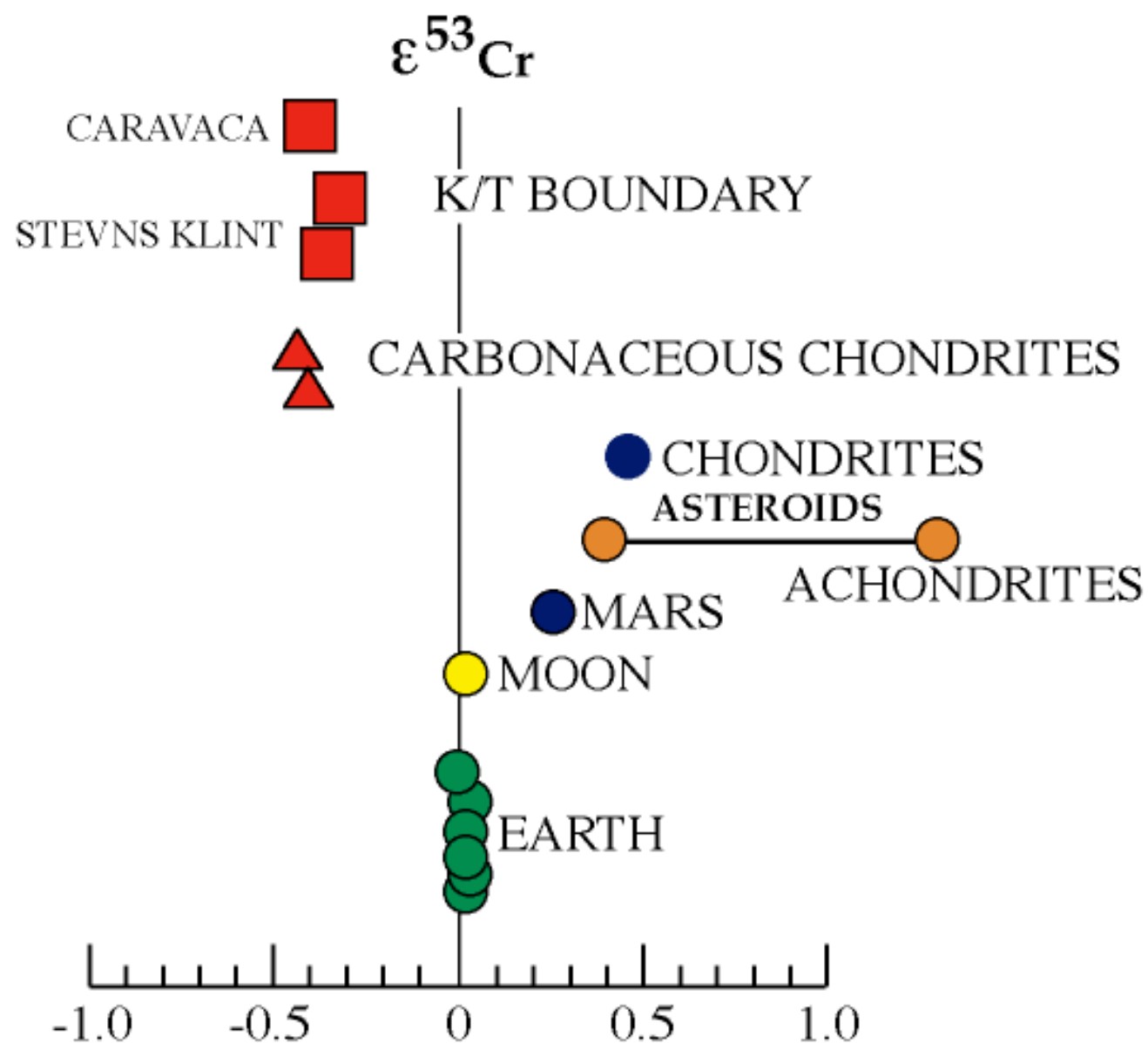
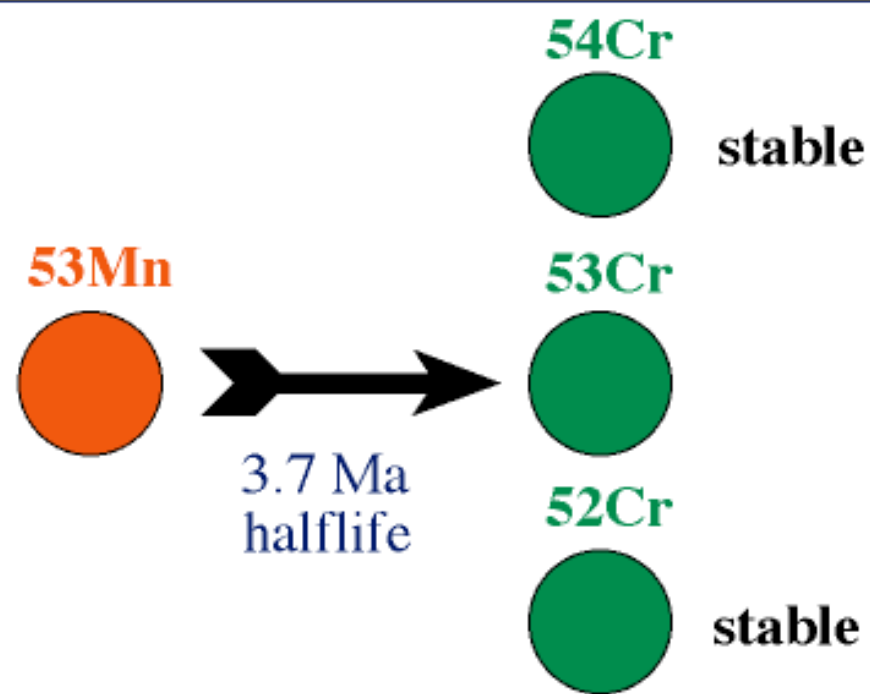
*Maar in Koolstof chondrieten
(=Verwant aan kometen) is de $\epsilon^{53}\text{Cr}$
Juist lager!*

*Op Mars en de asteroiden is de $\epsilon^{53}\text{Cr}$
Hoger*

*De Maan heeft precies
dezelfde verhouding!*

*Op de aarde is de chroom isotopen
Verhouding overal hetzelfde*

Chroom isotopen



In de Krijt Tertiair ejectalaag is de $\epsilon^{53}\text{Cr}$ verhouding eveneens hoger

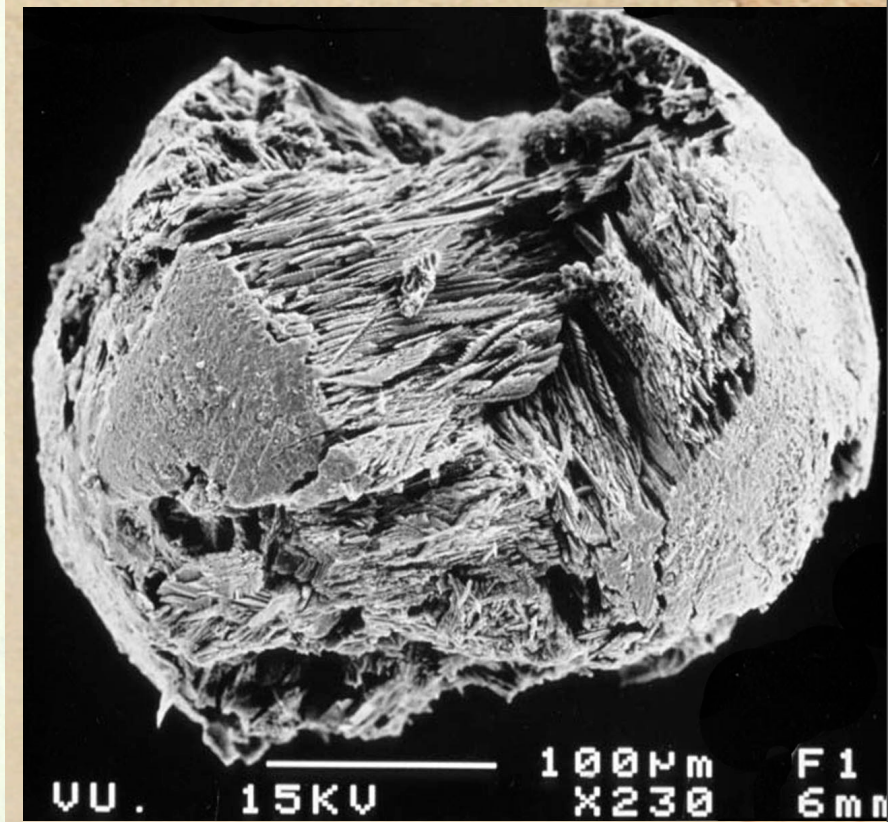
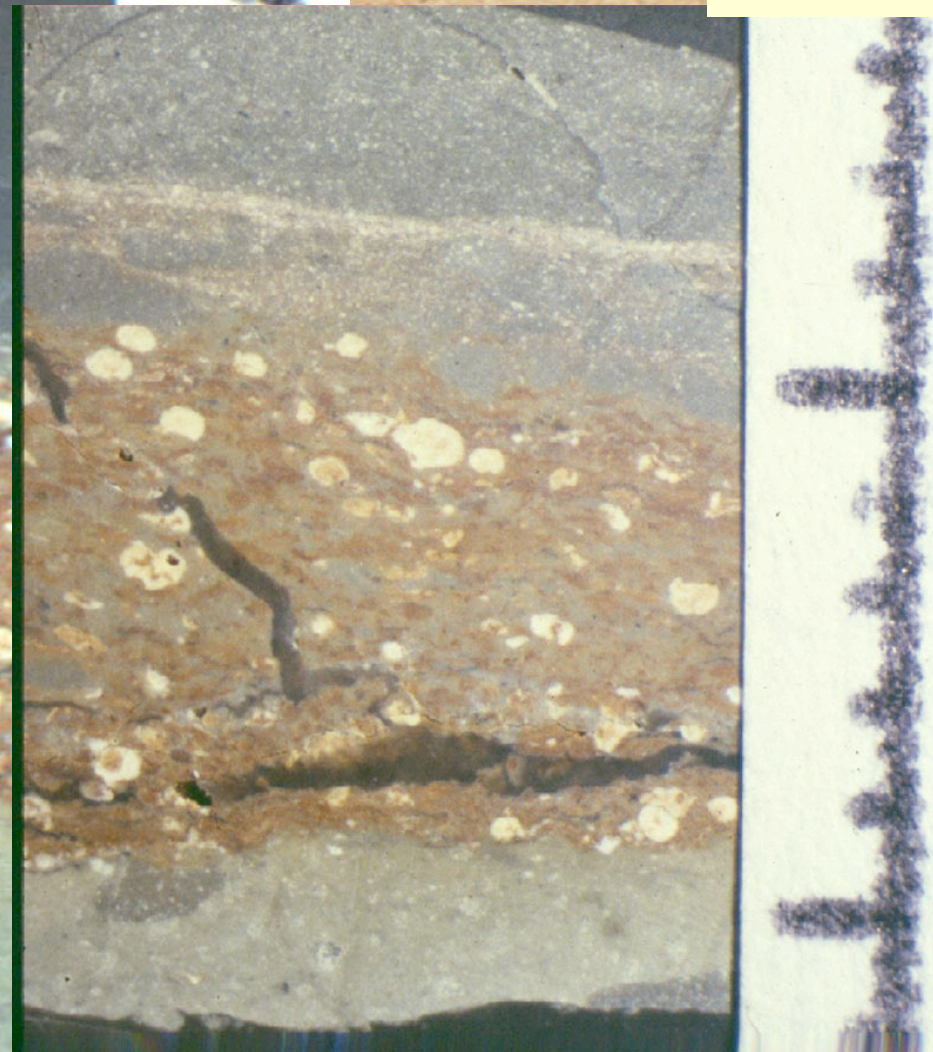
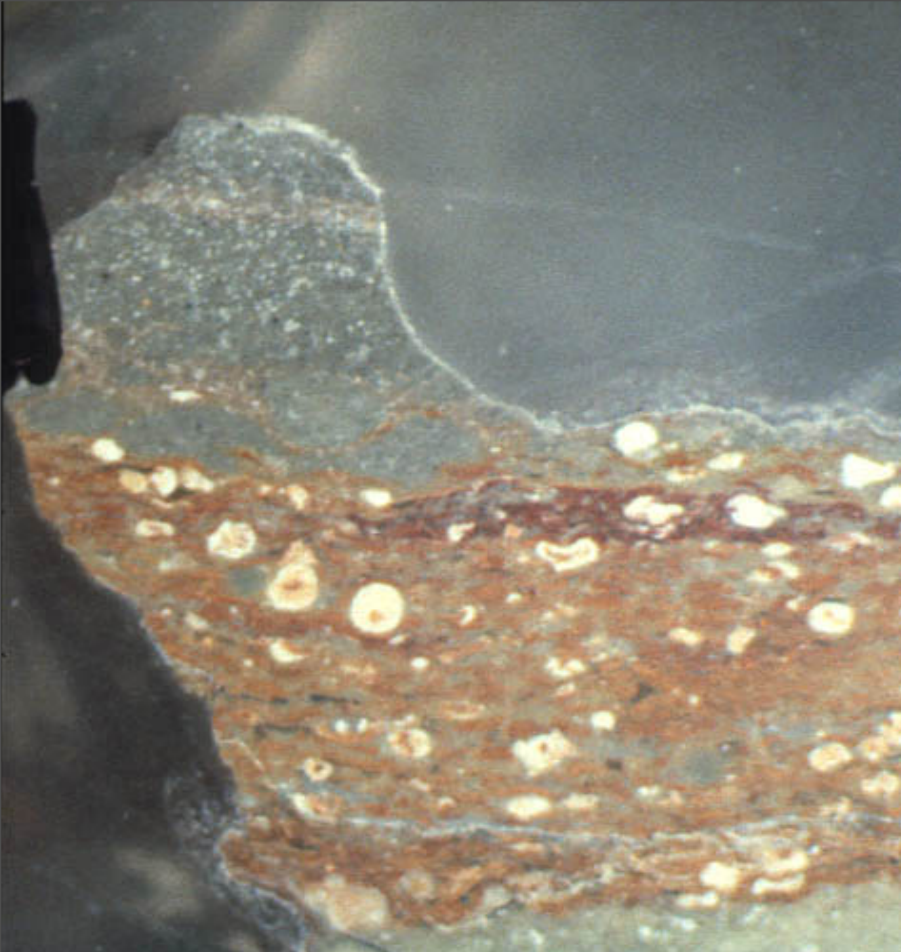
Maar in Koolstof chondrieten (=Verwant aan kometen) is de $\epsilon^{53}\text{Cr}$ juist lager!

Op Mars en de asteroiden is de $\epsilon^{53}\text{Cr}$ Hoger

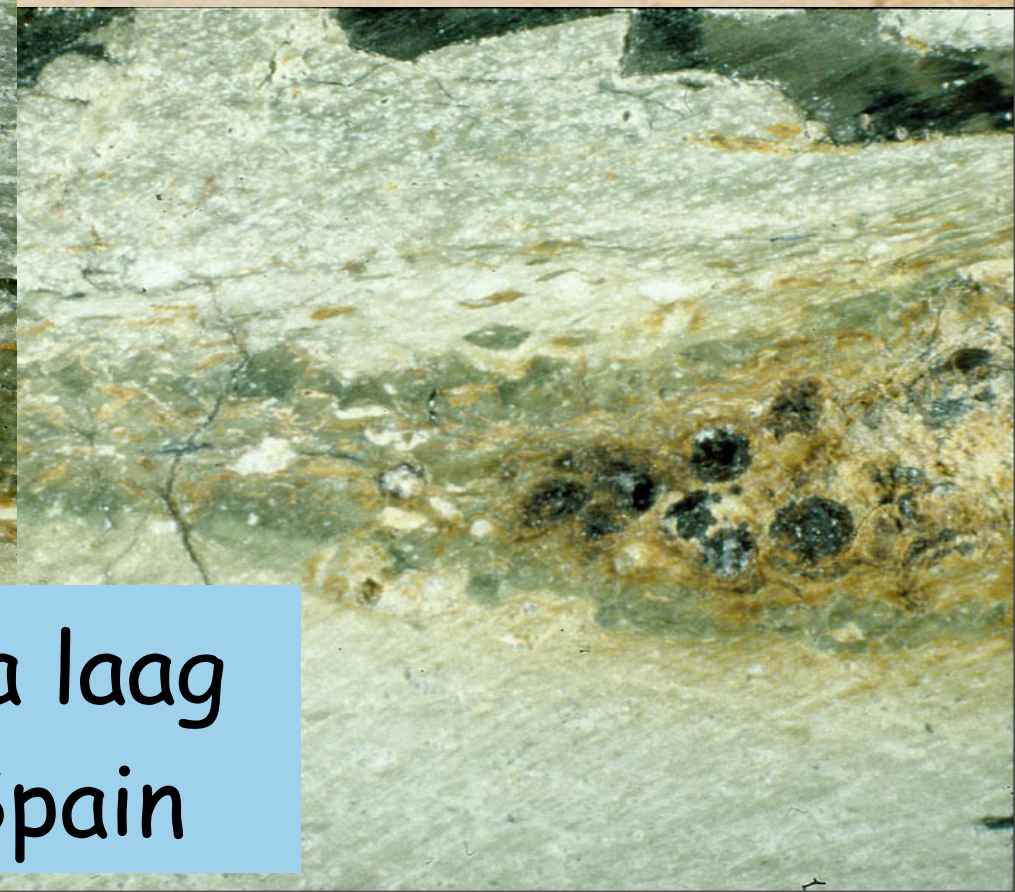
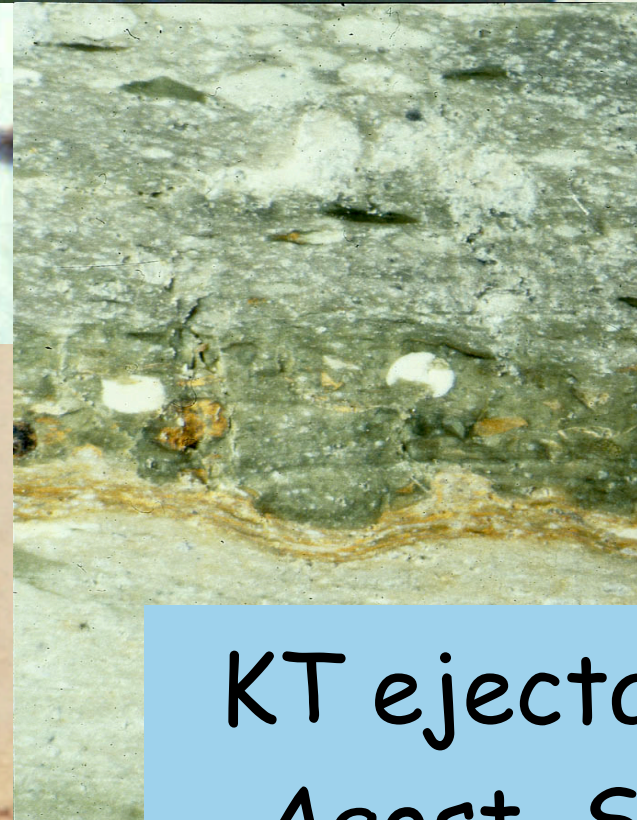
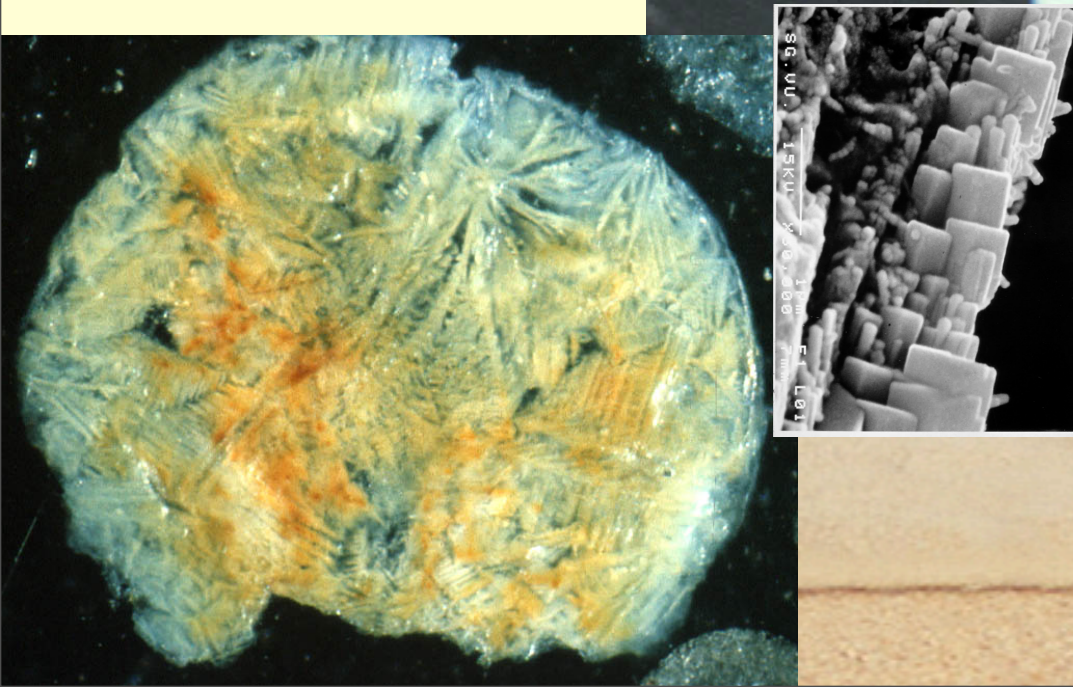
De Maan heeft precies dezelfde verhouding!

Op de aarde is de chroom isotopen Verhouding overal hetzelfde

Microkrystites in the ejecta laag



KT ejecta laag
Caravaca,



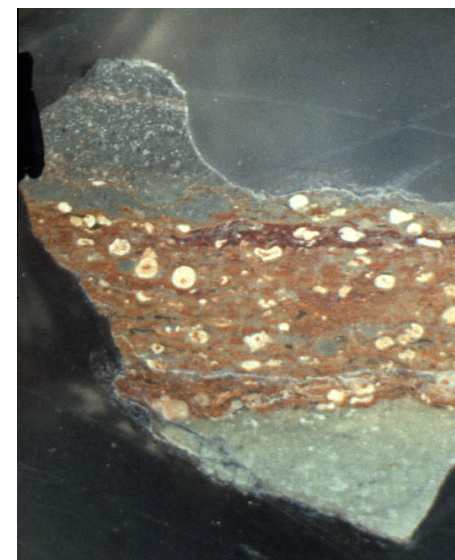
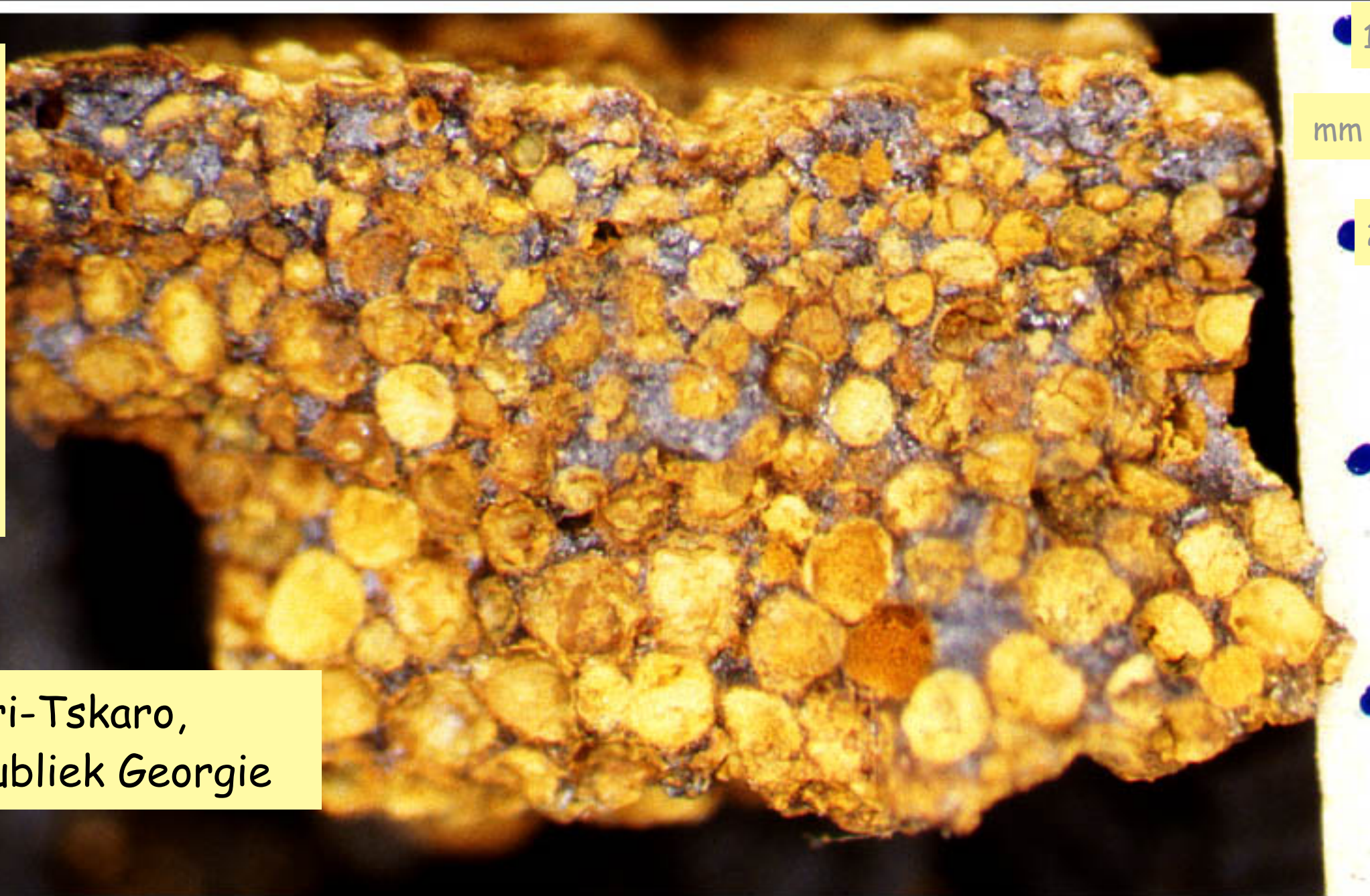
KT ejecta laag
Agost, Spain

Microkrystieten:
(bolletjes)

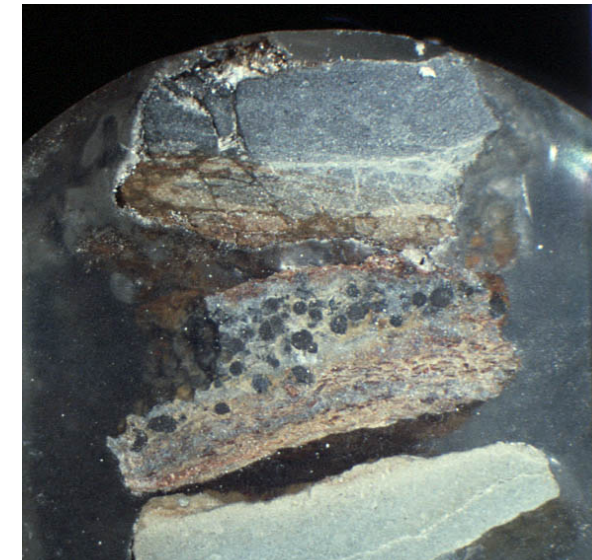
verspreid over de
wereld:

4.59×10^{18} gr
(800km³)

Tetri-Tskaro,
Republiek Georgie

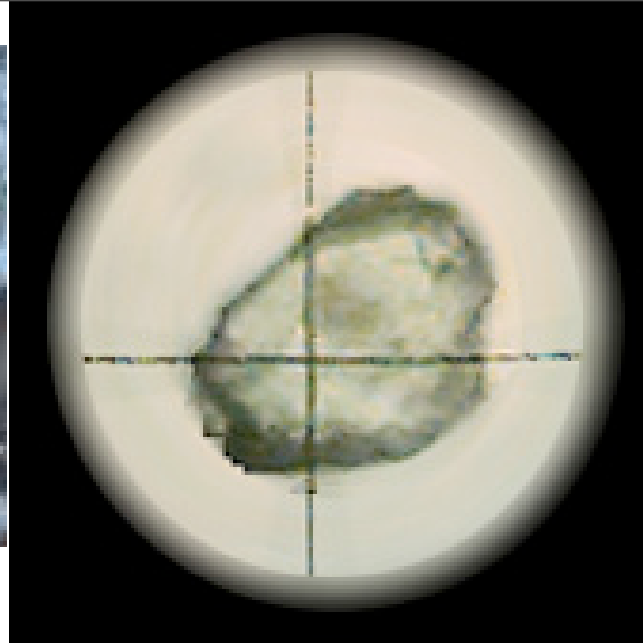


Caravaca, Spain



Zumaya, Spain

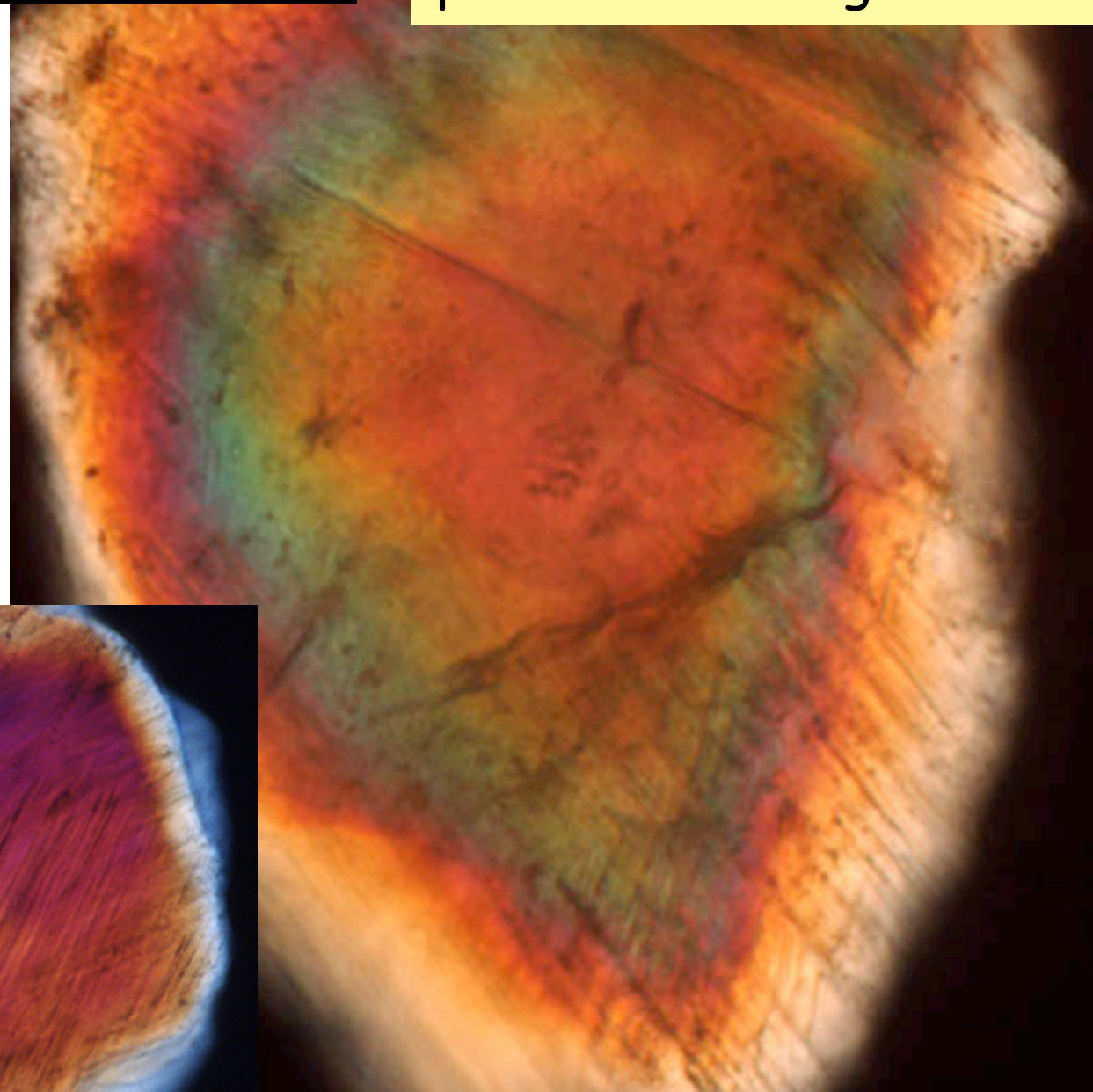
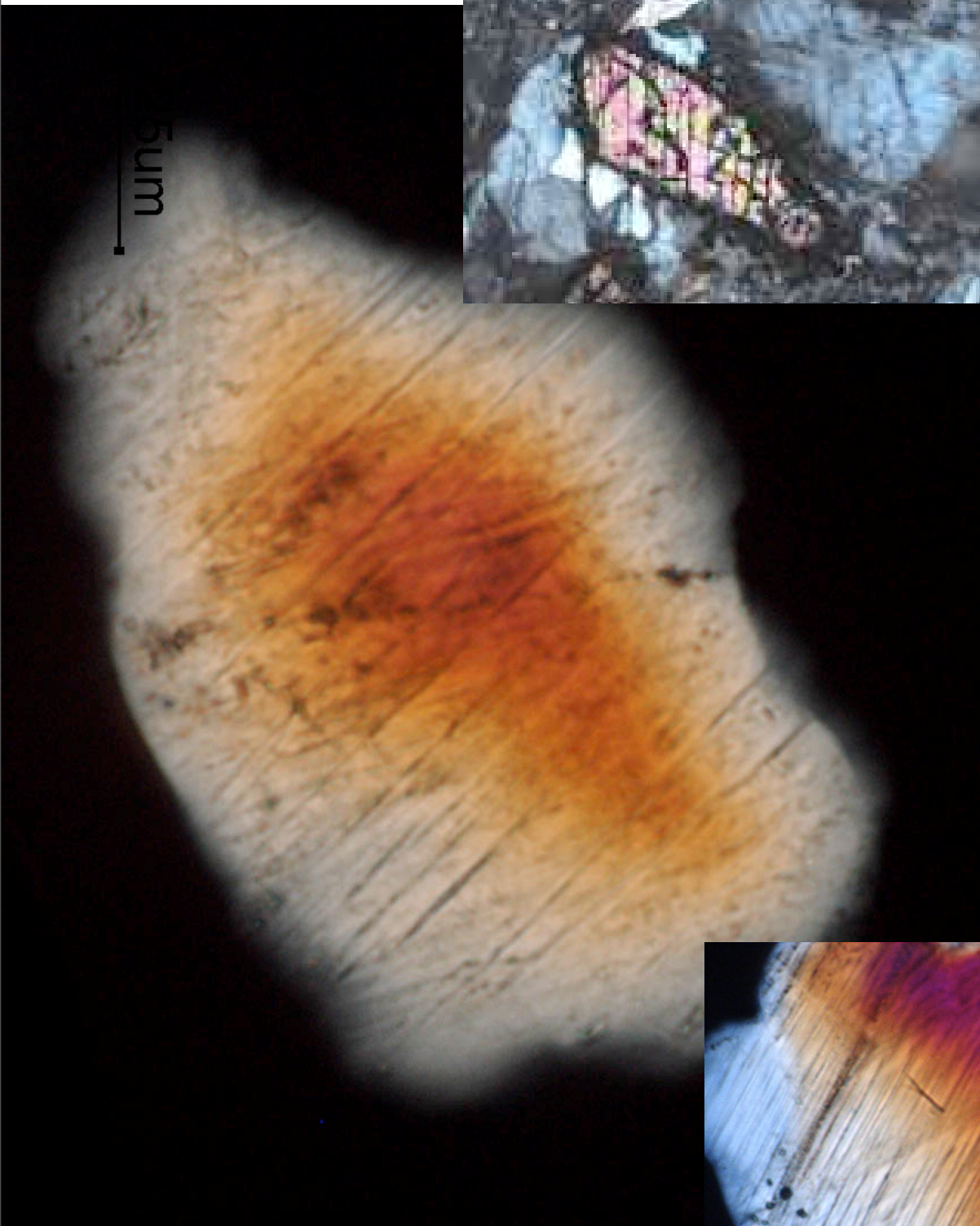
geschokte mineralen



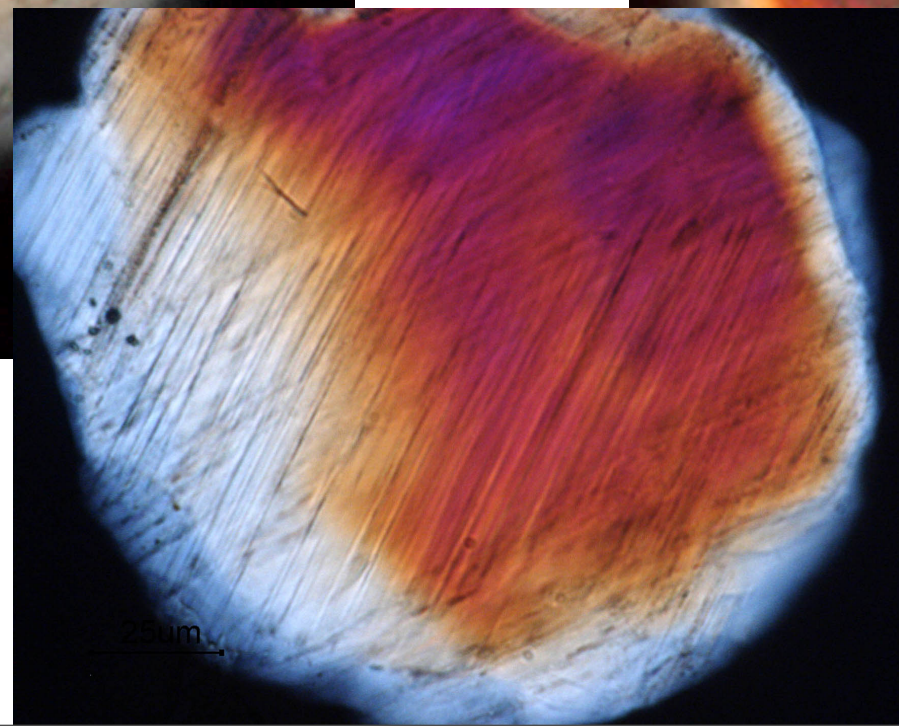
geschokte Zirconen
2 ouderdommen:

65Ma 'schok ouderdom'

400Ma ouderdom van de
plaats van Inslag



Geschokte kwarts
(from Brownie Butte
Montana)

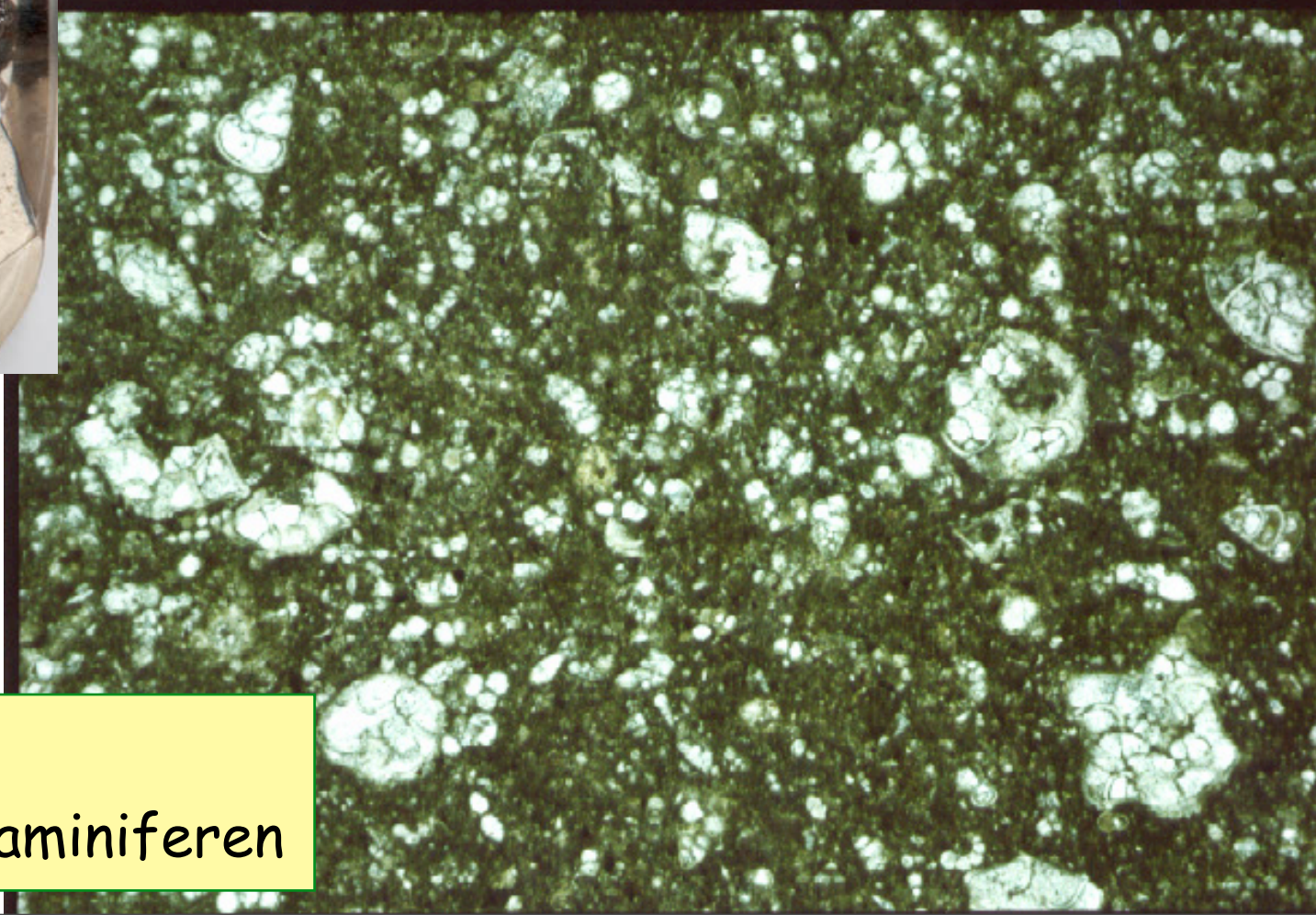
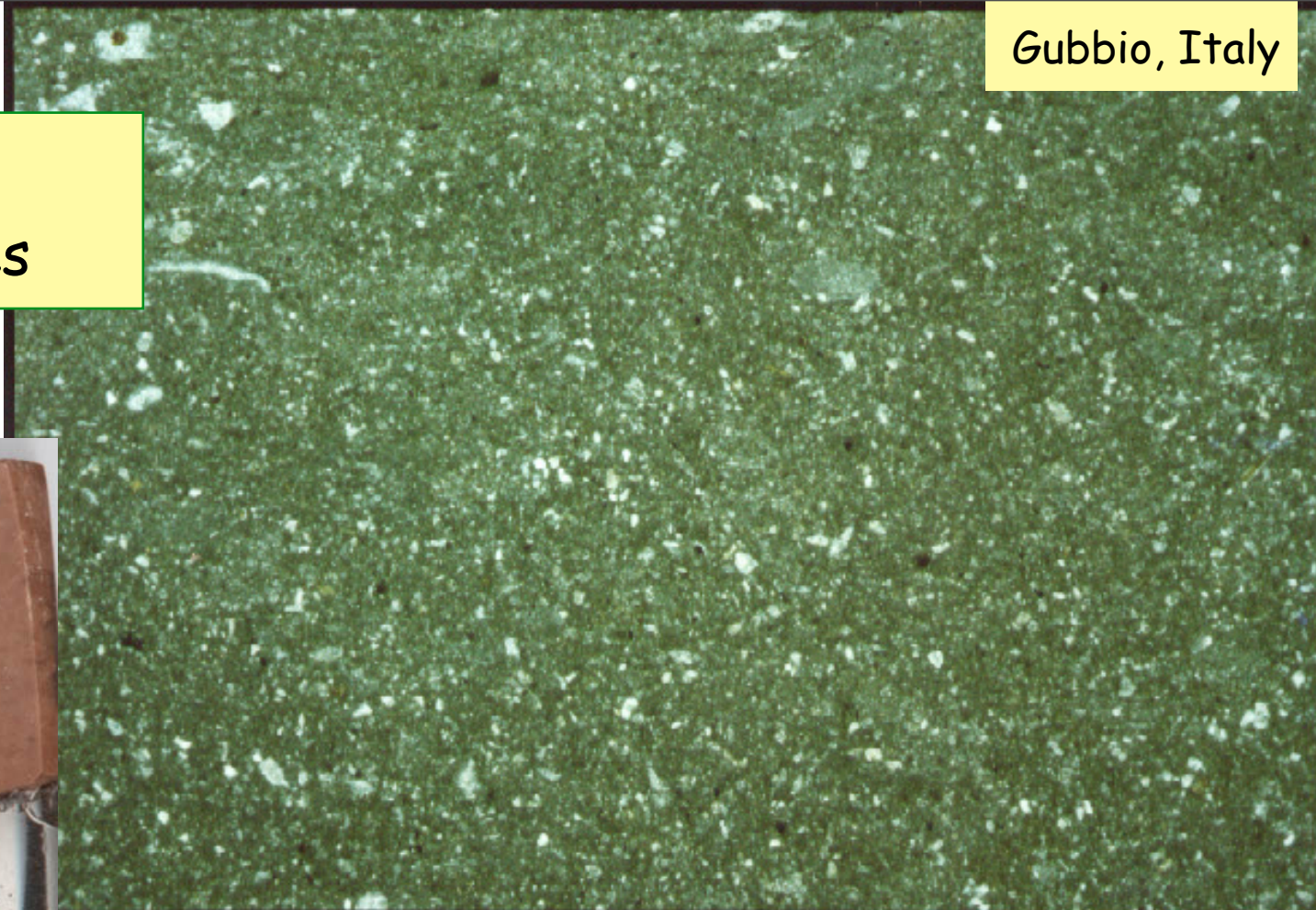


Onderste Tertiair:
slechts uiterst kleine foraminifeertjes

Lowermost Danian

Topmost Maastrichtian

Bovenste Krijt:
Overvloedige grote gespecialiseerde foraminiferen



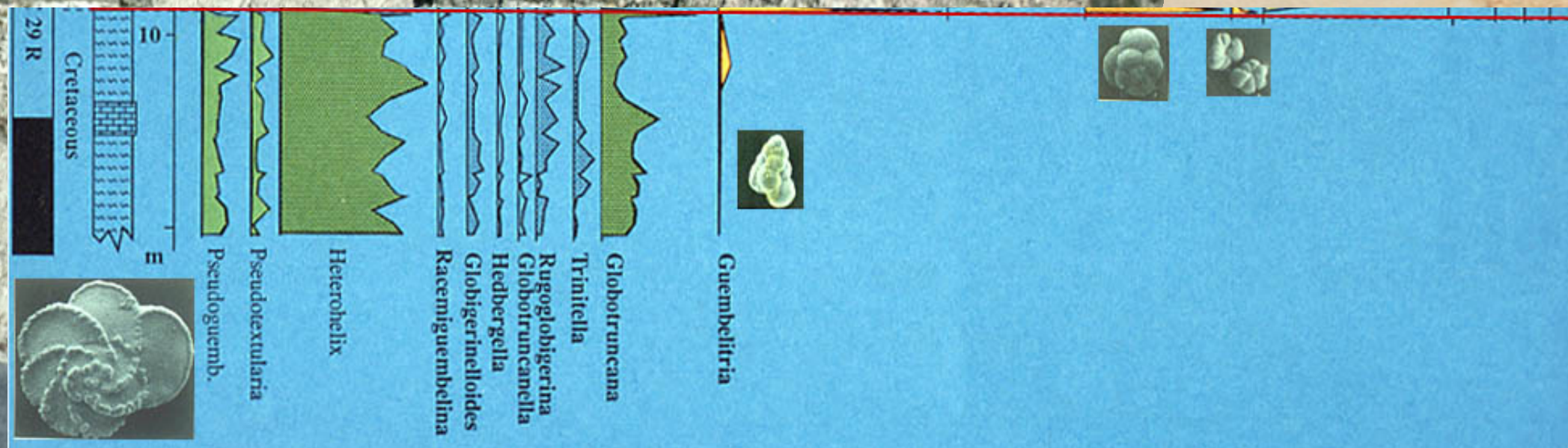
Agost Spain:
Uitsterven en
opnieuw evolueren
van
Foraminiferen



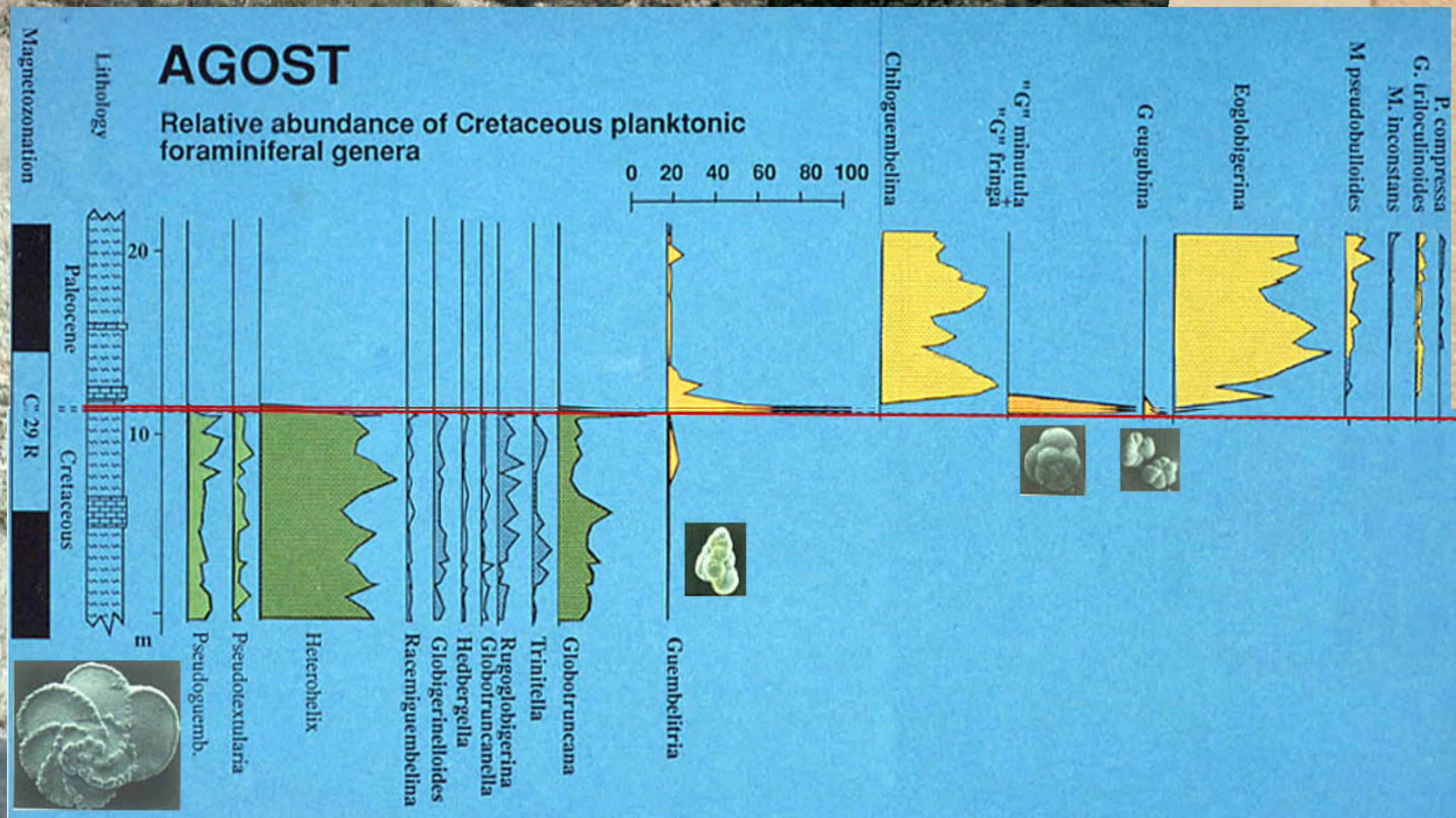
Agost Spain:
Uitsterven en
opnieuw evolueren
van
Foraminiferen



Agost Spain:
Uitsterven en
opnieuw evolueren
van
Foraminiferen



Agost Spain: Uitsterven en opnieuw evolueren van Foraminiferen



Chronology
(years from K/T)

Stratigraphy
Lithology

Carbonate

17000

15000

13000

11000

9000

6000

3000

0

1000

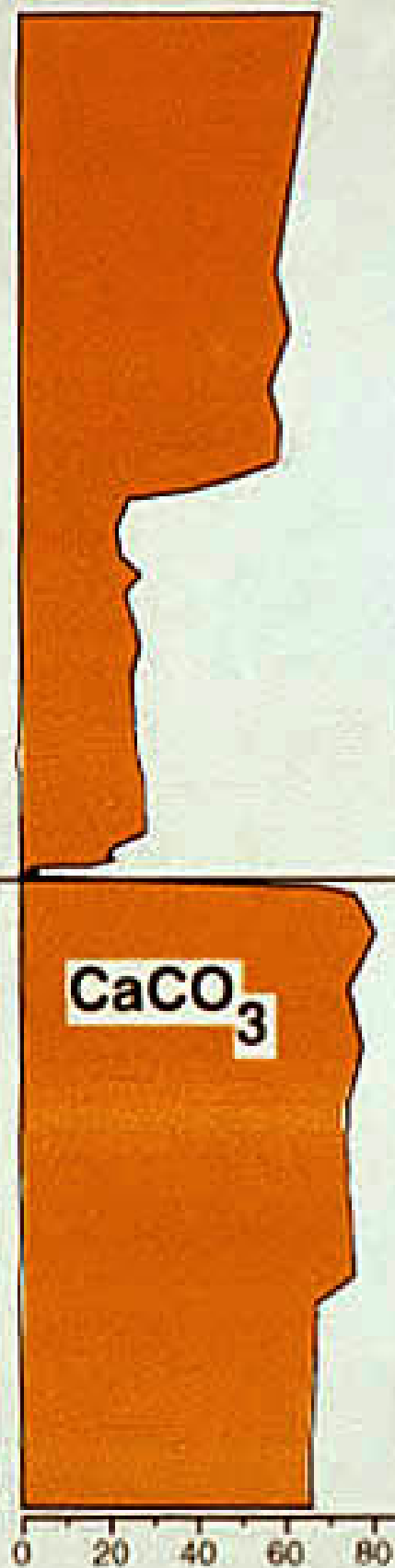
2000

3000

4000

5000

15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
Cm



AGOST

Chronology
(years from K/T)

Stratigraphy
Lithology

Carbonate

iridium (ppb)

17000

15000

13000

11000

9000

6000

3000

0

1000

2000

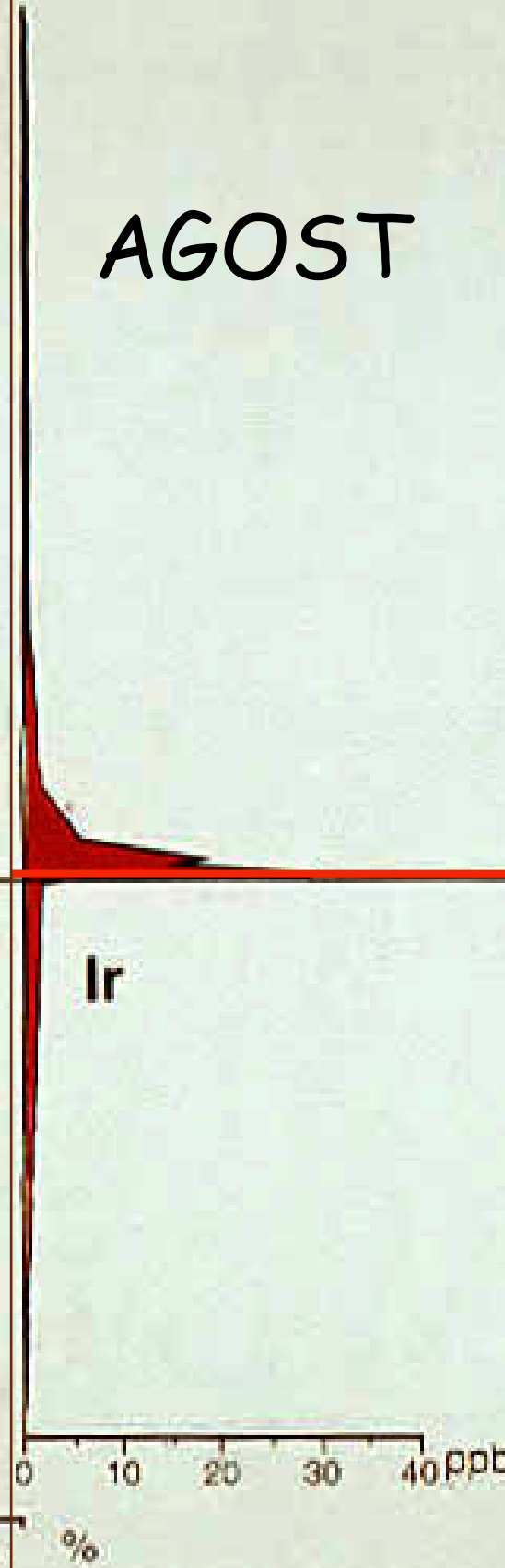
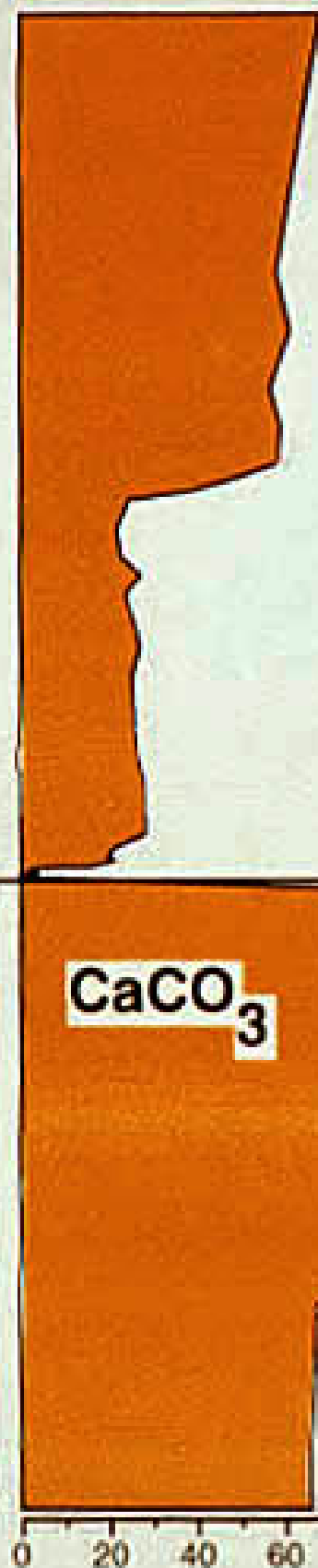
3000

4000

5000

15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10

Cm



Chronology
(years from K/T)

Stratigraphy
Lithology

Carbonate

iridium (ppb)

Oxygen and
Carbon
Isotopes

17000

15000

13000

11000

9000

6000

3000

0

1000

2000

3000

4000

5000

Cm

15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10

CaCO_3

AGOST

Ir

0 10 20 30 40 ppb

%

$\delta^{18}\text{O}$

‰ PDB

$\delta^{13}\text{C}$

-4 -3 -2 -1 0 1 2 3

Chronology
(years from K/T)

Stratigraphy
Lithology

Carbonate

iridium (ppb)

Oxygen and
Carbon
Isotopes

AGOST

‰ PDB

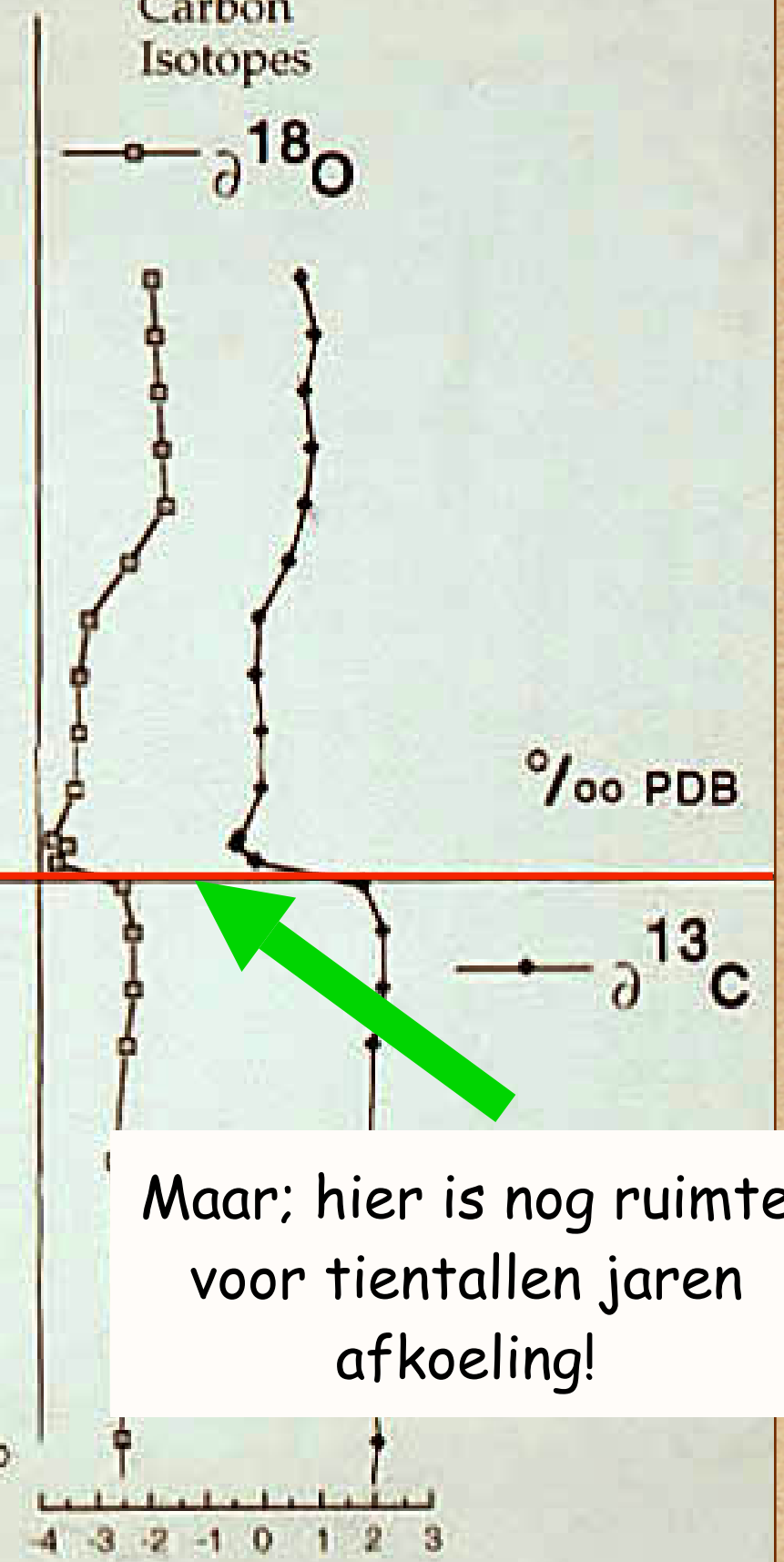
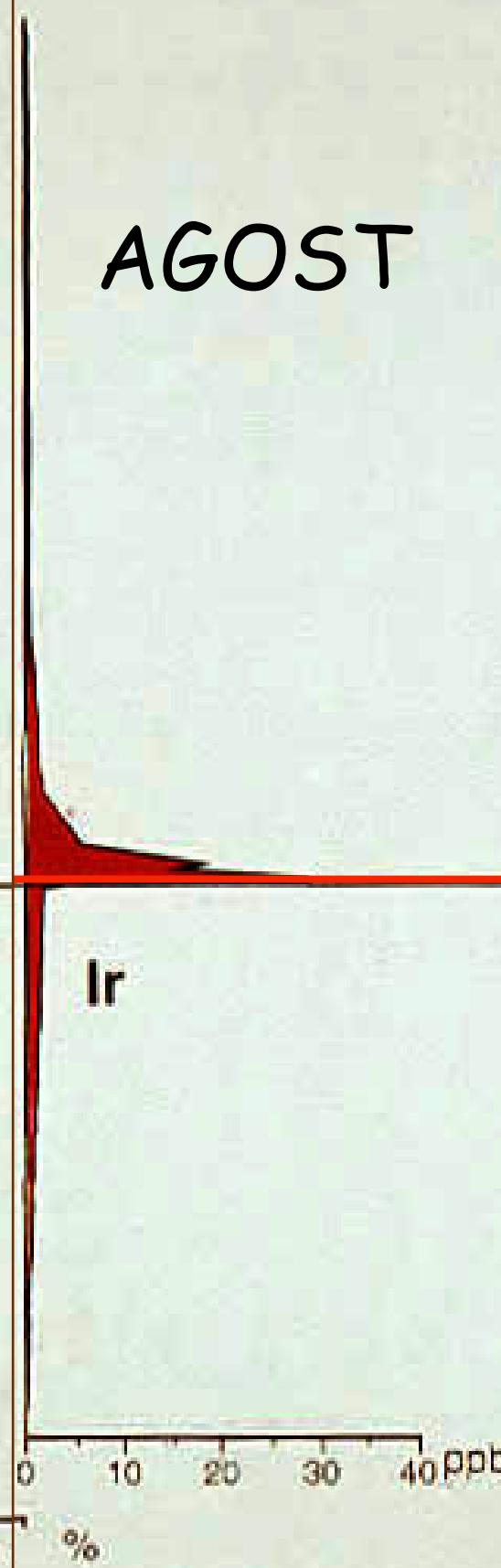
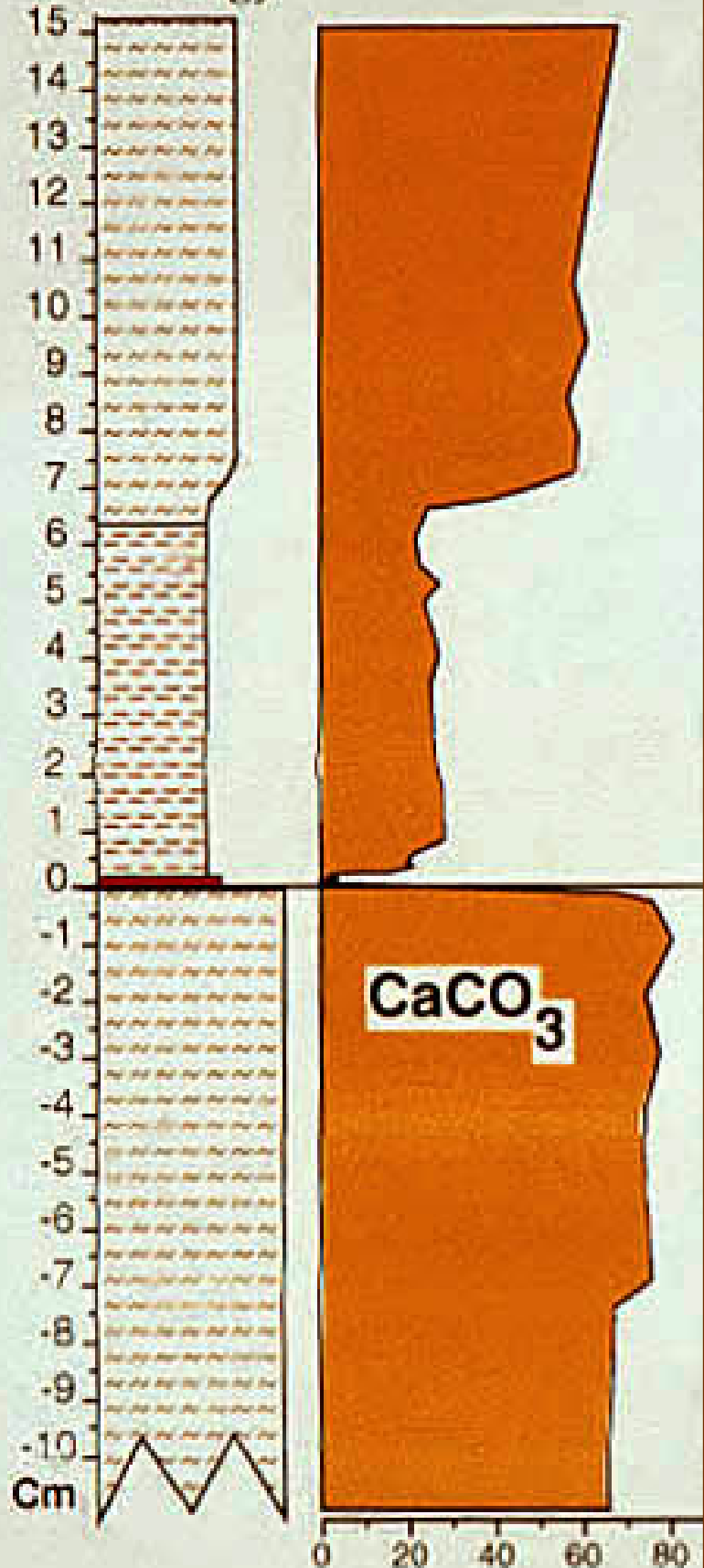
CaCO_3

Ir

$\delta^{18}\text{O}$

$\delta^{13}\text{C}$

Maar; hier is nog ruimte
voor tientallen jaren
afkoeling!



BEWIJS: DINOFLAGELLATEN MIGRATIES OVER THE KRIJTT TERTIAIR GRENS

Equator

El Kef

Geulhem

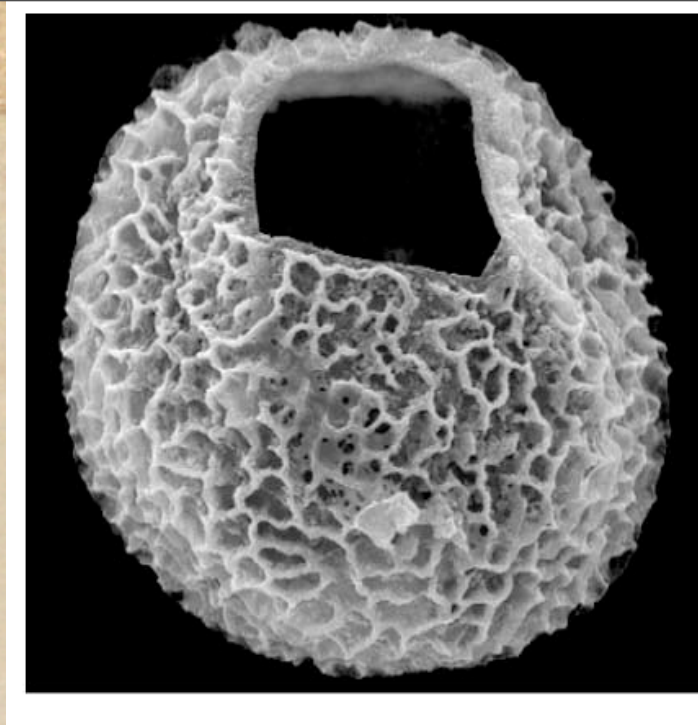
Nigeria

Tunisia

Spain

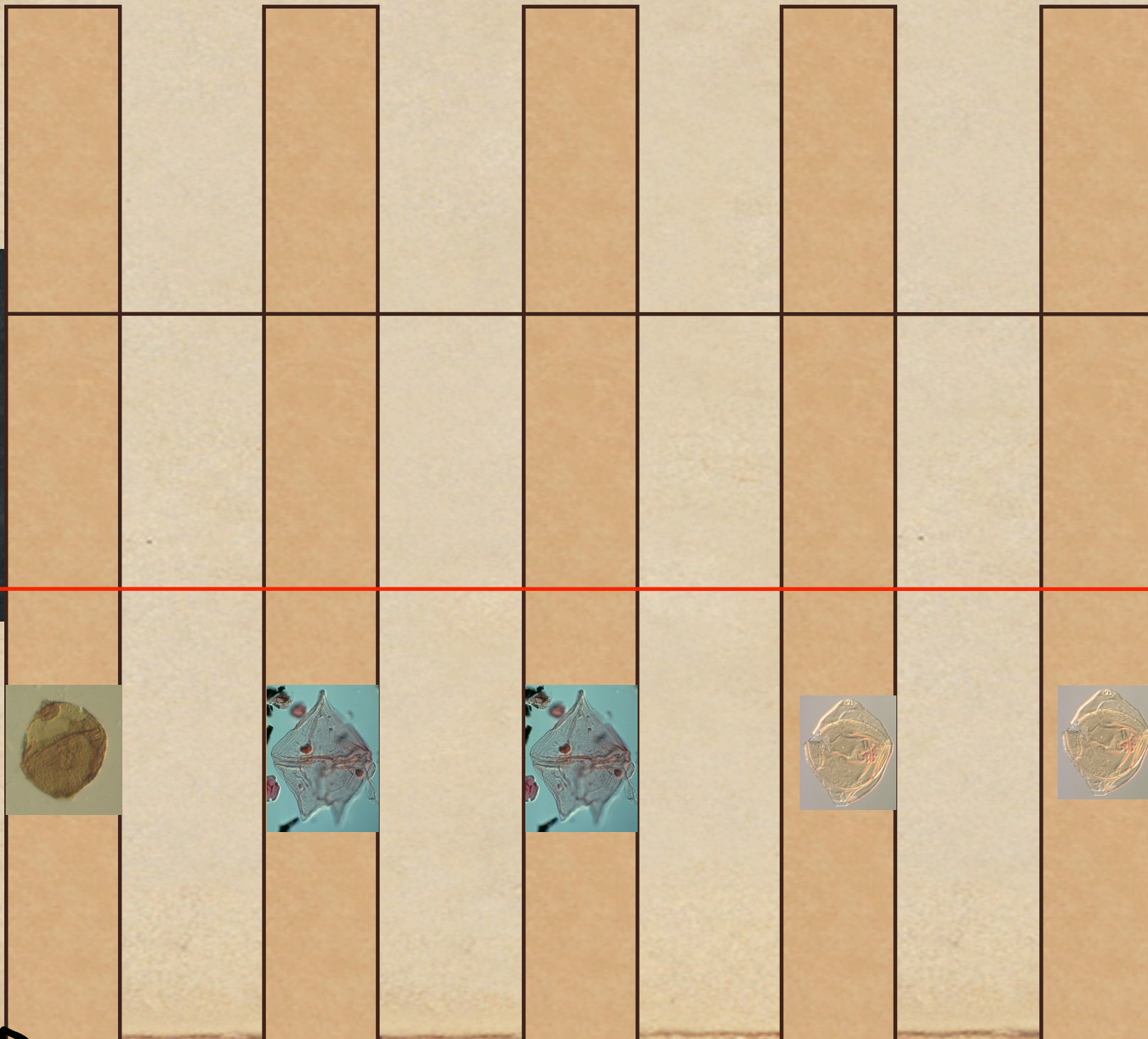
Holland

Denmark



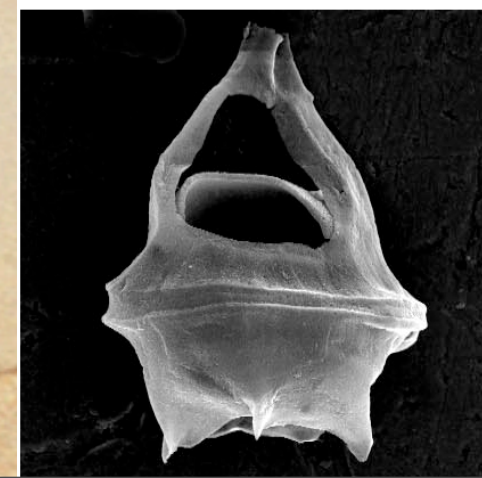
K

5000yrs



Warm
>1Ma

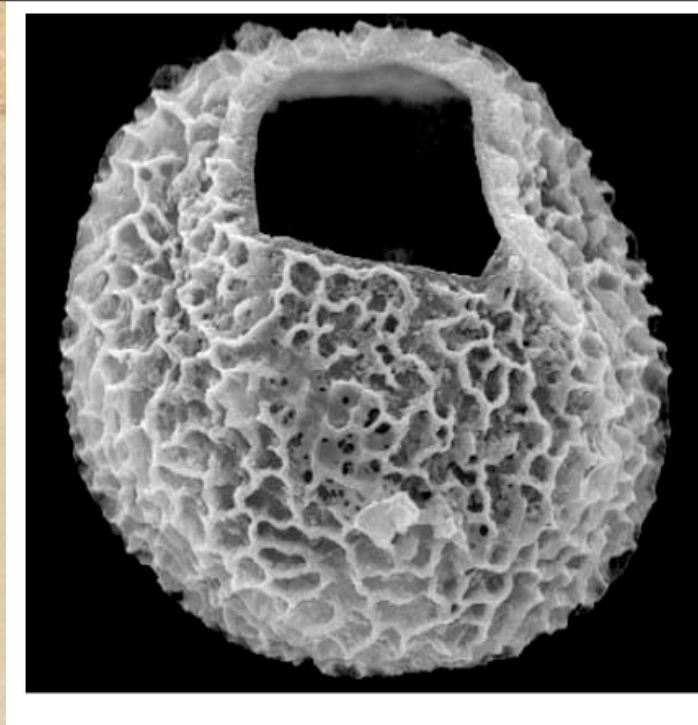
(Brinkhuis et al
1998 Paleo3x)



ZUID

NOORD

BEWIJS: DINOFLAGELLATEN MIGRATIES OVER THE KRIJTT TERTIAIR GRENS



Equator

El Kef

Geulhem

Nigeria

Tunisia

Spain

Holland

Denmark



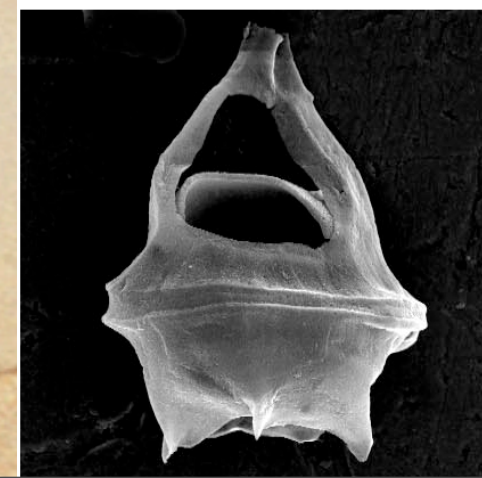
K

5000yrs

Afkoeling (?<50yr)

Warm
>1Ma

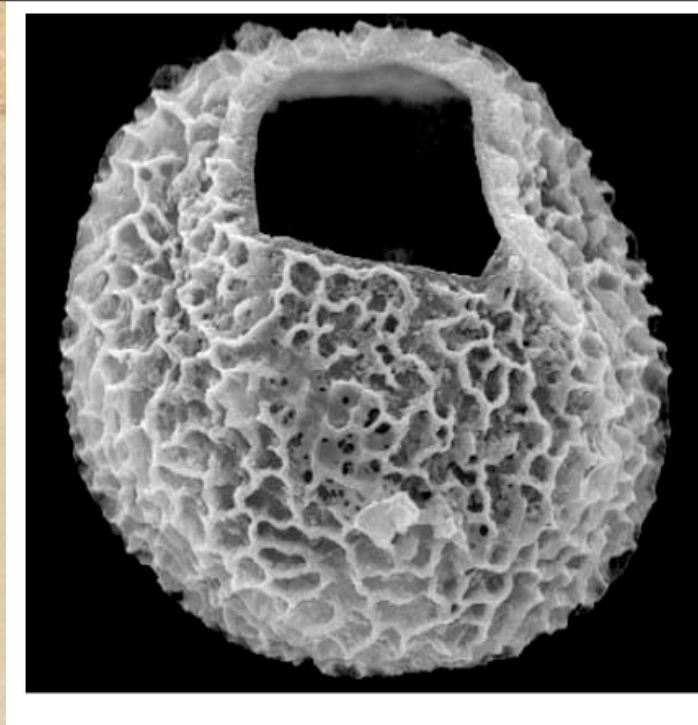
(Brinkhuis et al
1998 Paleo3x)



ZUID

NOORD

BEWIJS: DINOFLAGELLATEN MIGRATIES OVER THE KRIJTT TERTIAIR GRENS



Equator

El Kef

Geulhem

Nigeria

Tunisia

Spain

Holland

Denmark



K

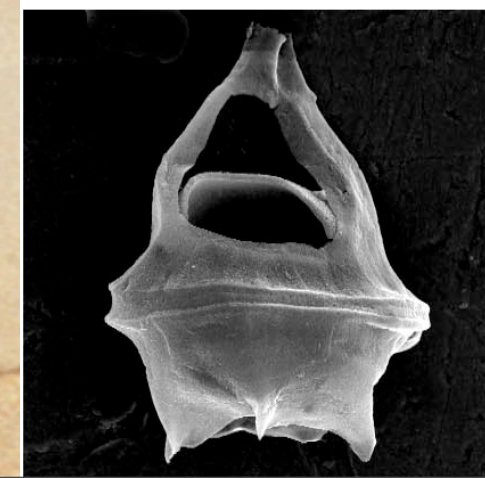
5000yrs

Opwarming 2500yr

Afkoeling (?<50yr)

Warm
>1Ma

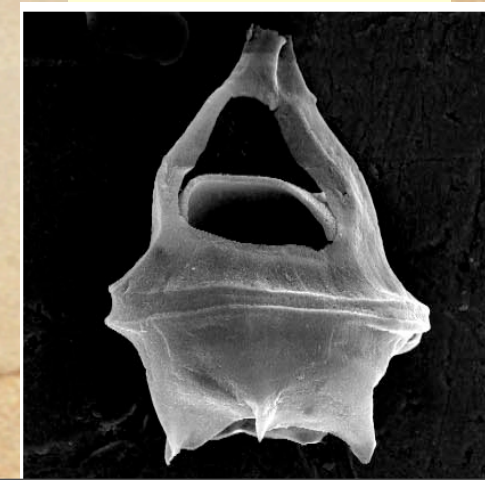
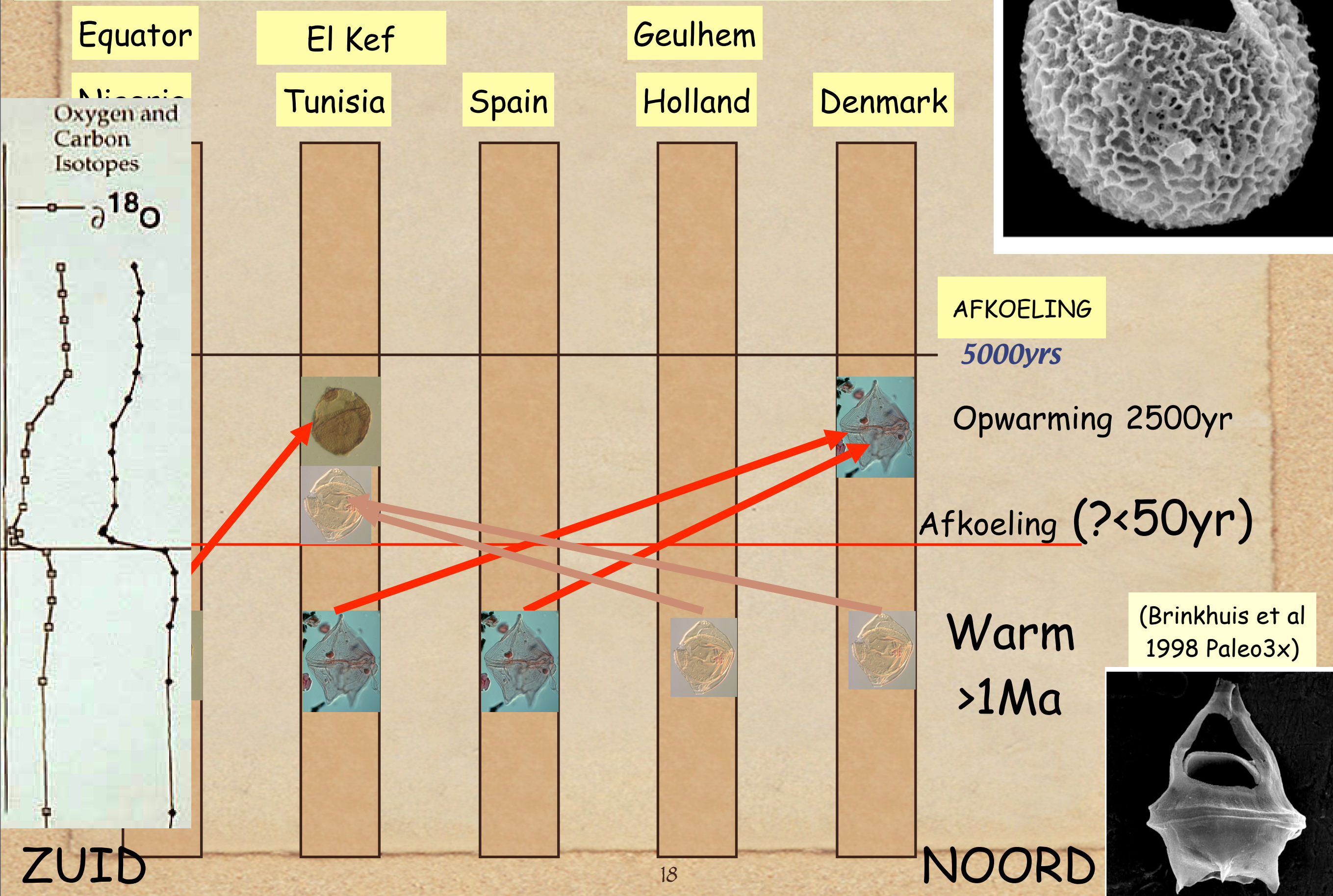
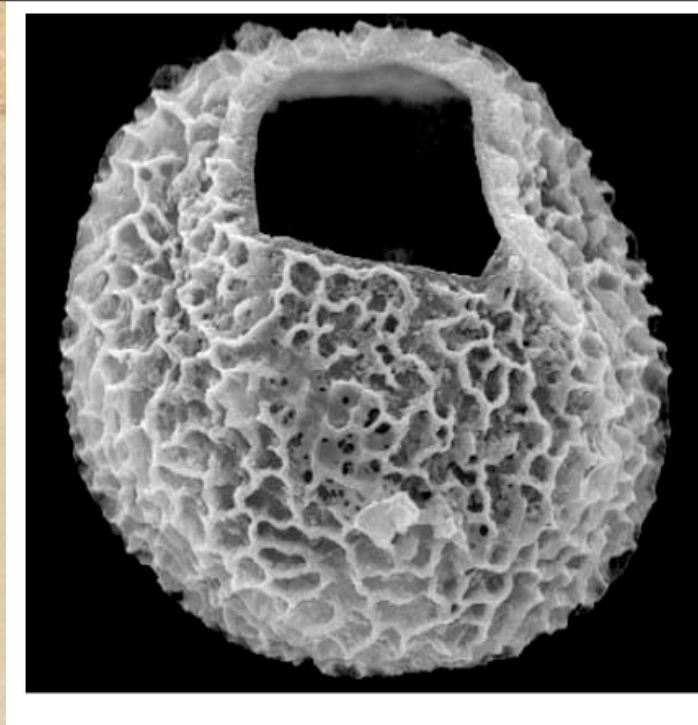
(Brinkhuis et al
1998 Paleo3x)



ZUID

NOORD

BEWIJS: DINOFLAGELLATEN MIGRATIES OVER THE KRIJTT TERTIAIR GRENS

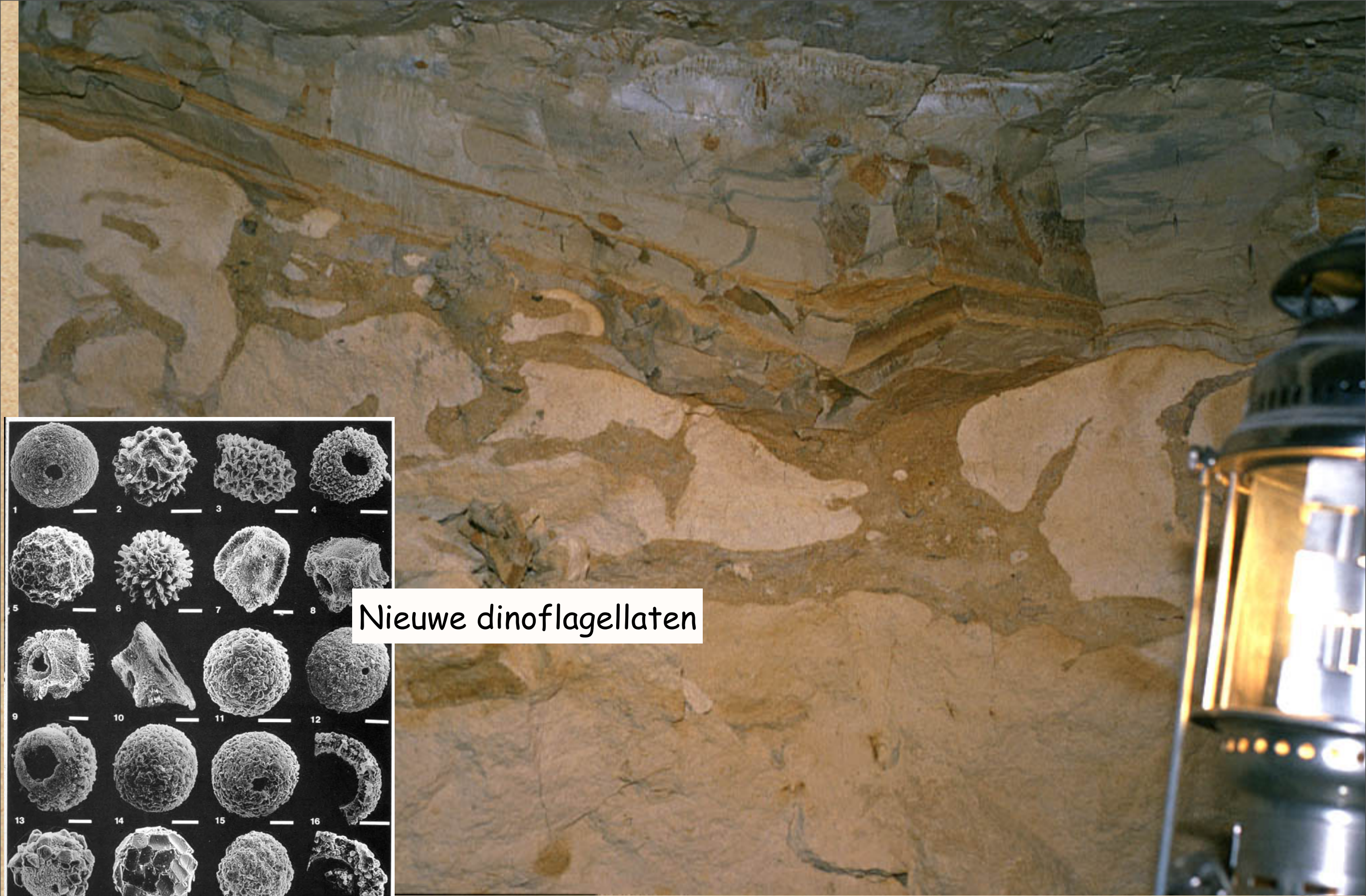




Geulhemmerberg Grotten, Limburg



Geulhemmerberg Grotten, Limburg



Nieuwe dinoflagellaten

Geulhemmerberg Grotten, Limburg

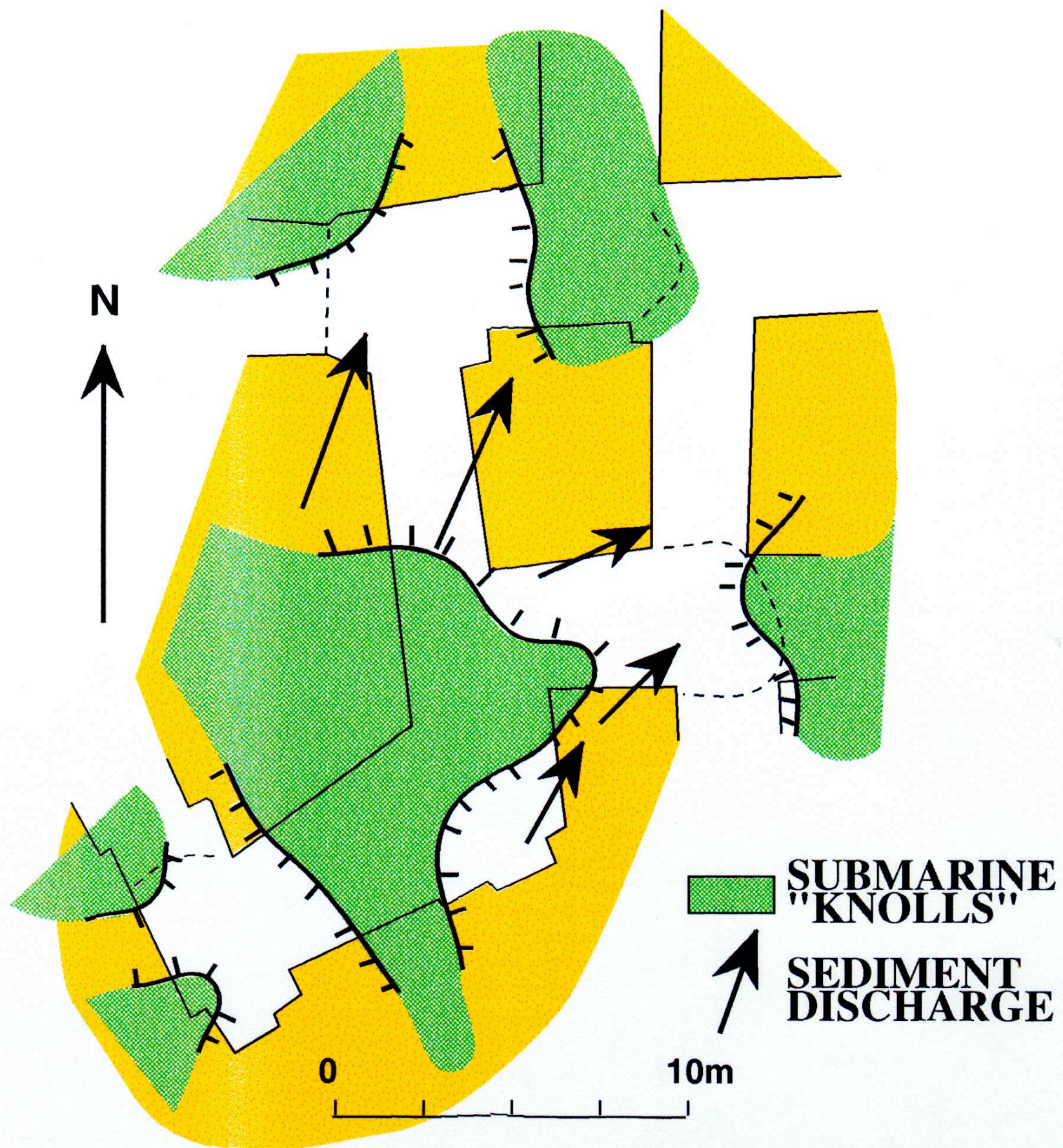
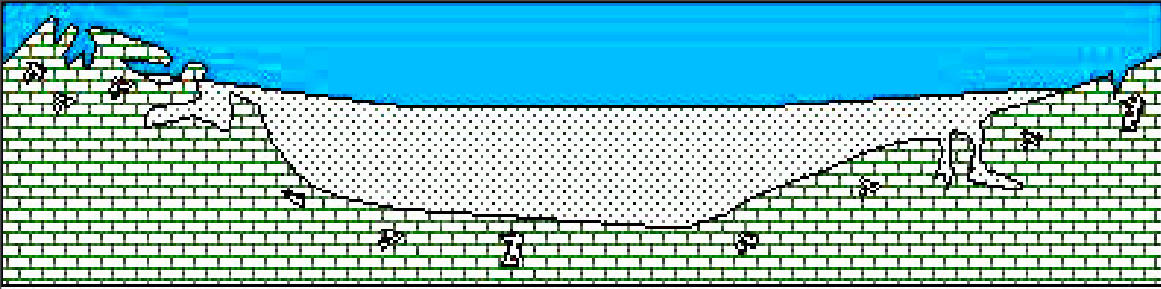
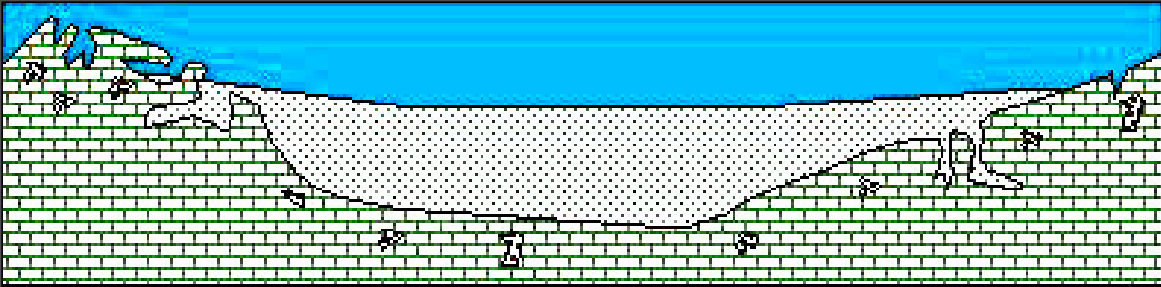


Fig. 12 (Roep&Smit)



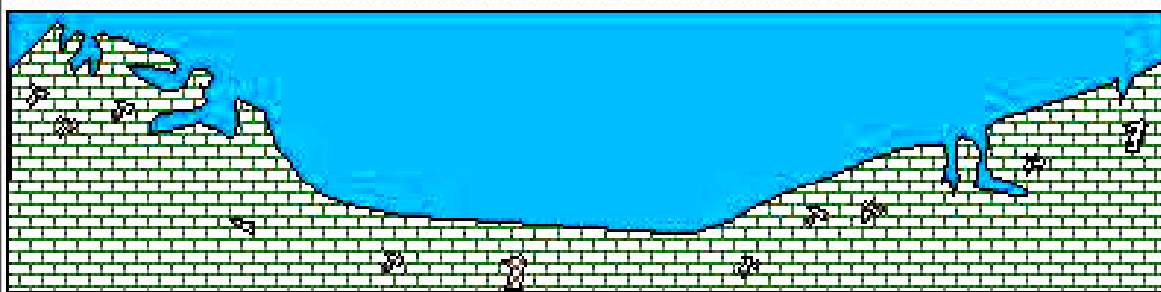
Latest Maastrichtian
Highstand tract deposits
Submarine relief,





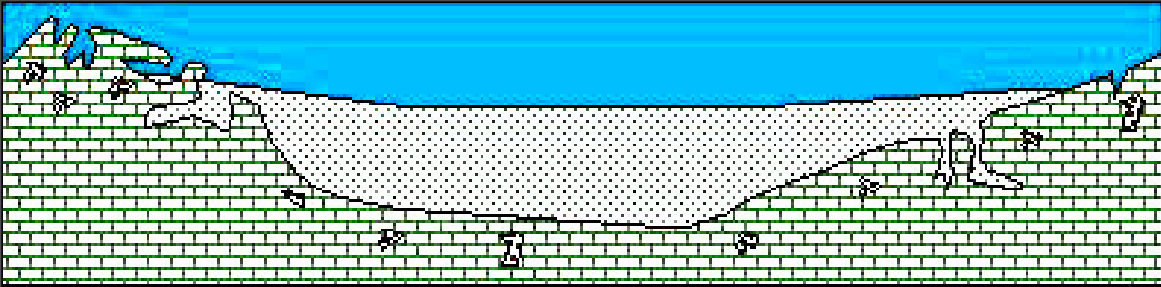
Latest Maastrichtian

Highstand tract deposits
Submarine relief,



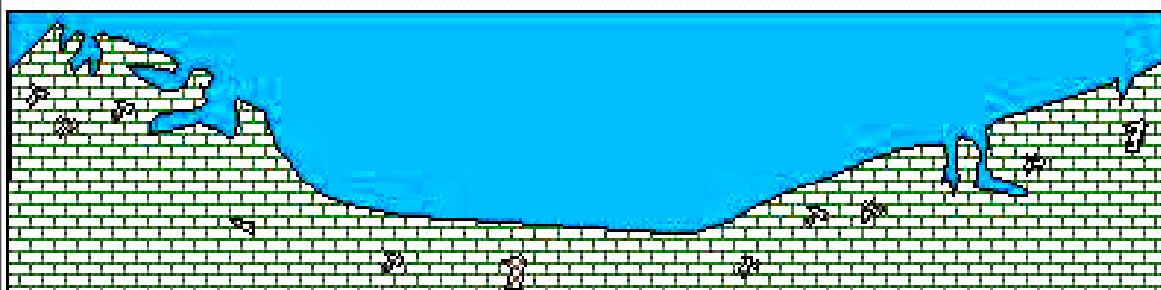
Impact

Hypercanes, removal of
sediment including ejecta
layer (iridium)
fermentation.
Cooling, followed by sealevel
drop. (1-10 years)



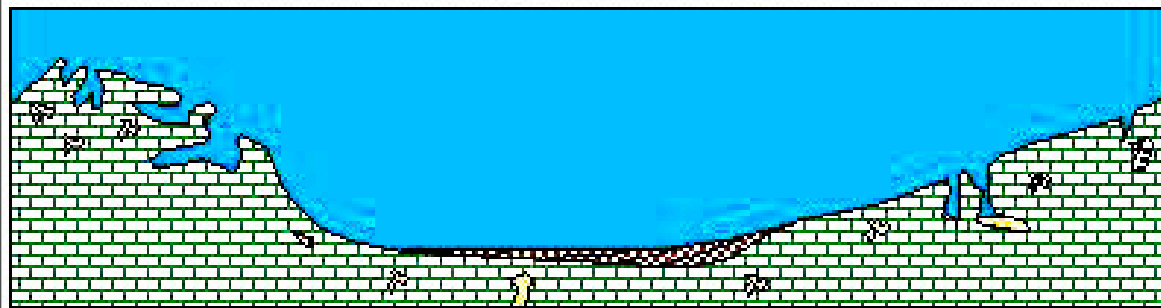
Latest Maastrichtian

Highstand tract deposits
Submarine relief,



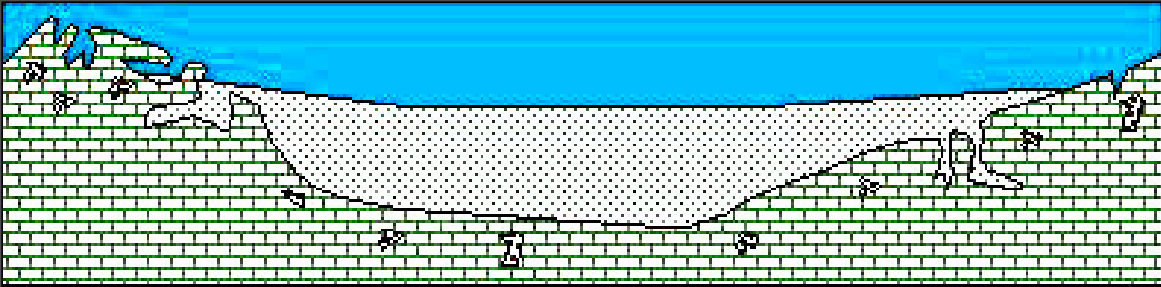
Impact

Hypercanes, removal of
sediment including ejecta
layer (iridium)
fermentation.
Cooling, followed by sealevel
drop, (1-10 years)



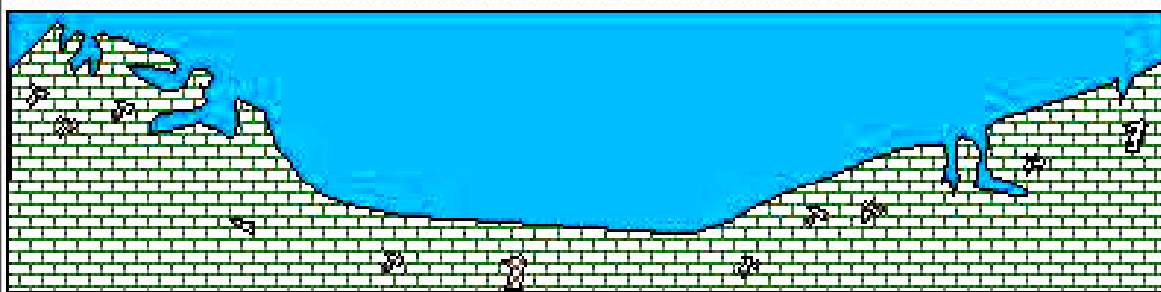
Lowermost Danian

Sealevel rise, first coarse
Hypercane deposits?
rip currents
(>10 years)



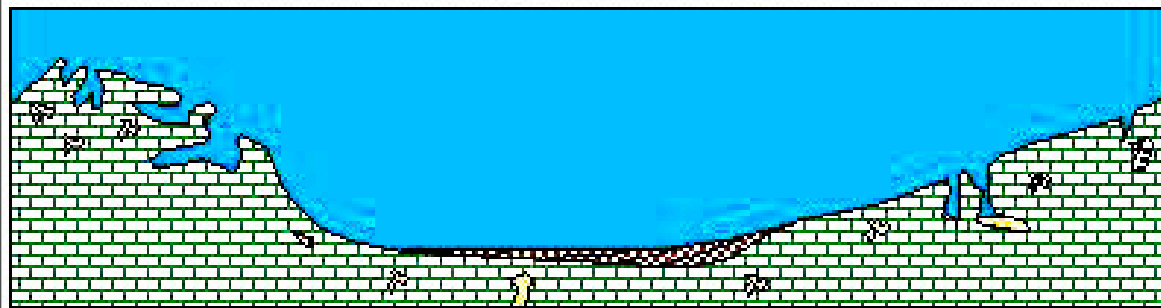
Latest Maastrichtian

Highstand tract deposits
Submarine relief,



Impact

Hypercanes, removal of
sediment including ejecta
layer (iridium)
fermentation.
Cooling, followed by sealevel
drop, (1-10 years)



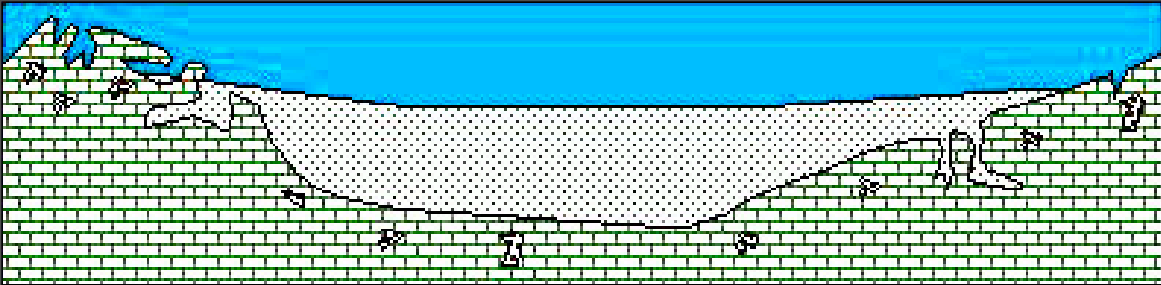
Lowermost Danian

Sealevel rise, first coarse
Hypercane deposits?
rip currents
(>10 years)



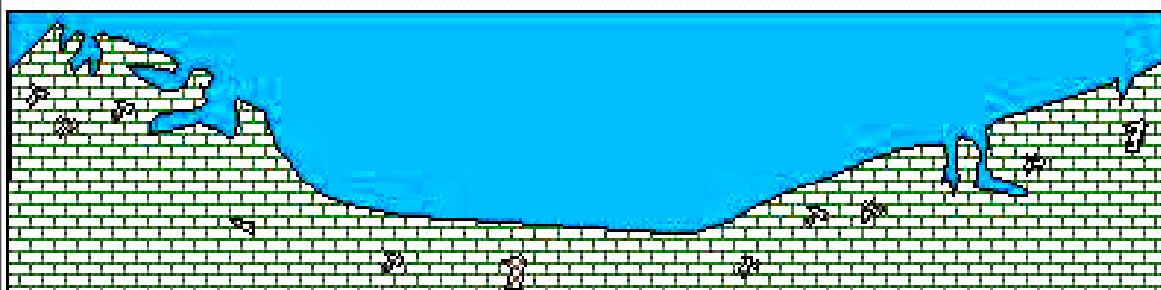
Episodic infilling:

Periods of deposition of coarse
material (storms) and fine
material clays, (quiescence)
(10-100yrs)



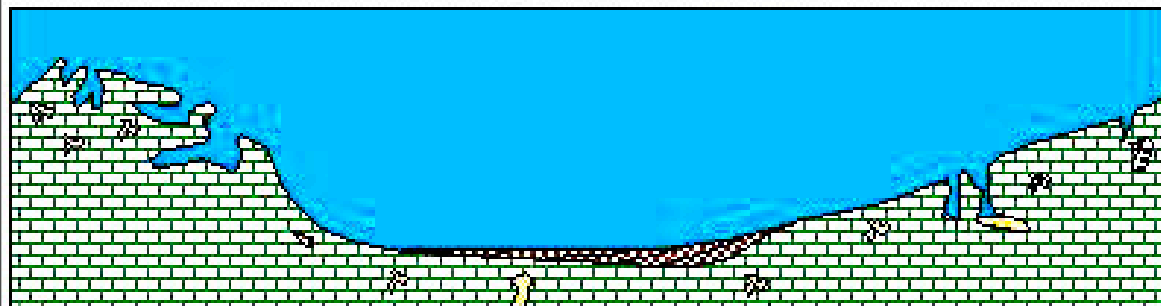
Latest Maastrichtian

Highstand tract deposits
Submarine relief,



Impact

Hypercanes, removal of
sediment including ejecta
layer (iridium)
fermentation.
Cooling, followed by sealevel
drop, (1-10 years)



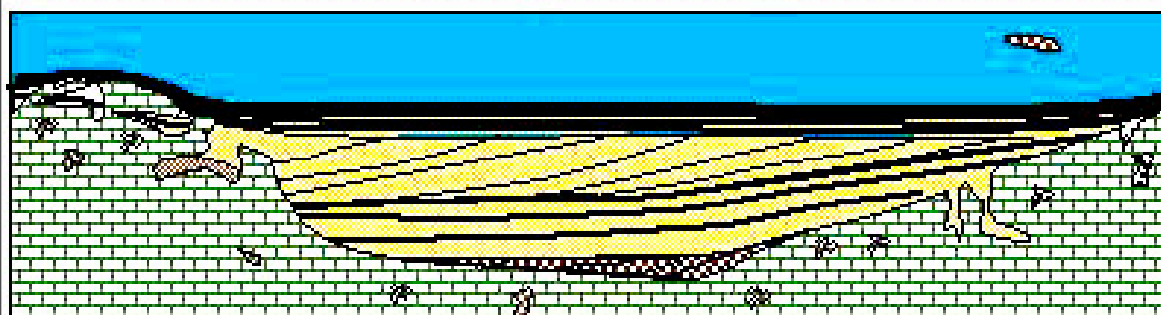
Lowermost Danian

Sealevel rise, first coarse
Hypercane deposits?
rip currents
(>10 years)



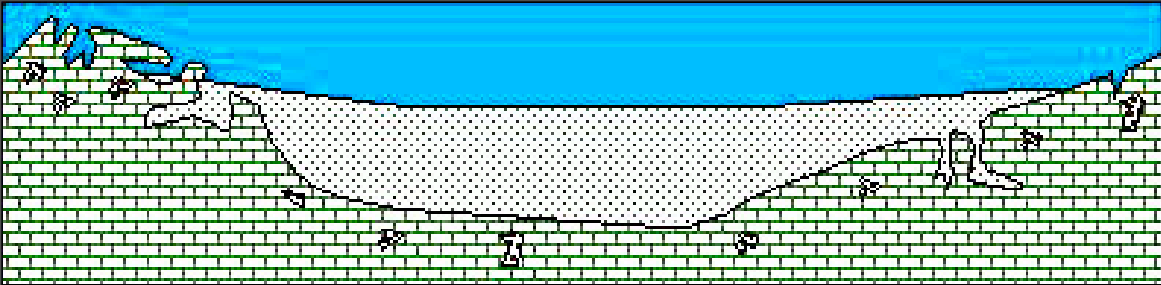
Episodic infilling:

Periods of deposition of coarse
material (storms) and fine
material clays, (quiescence)
(10-100yrs)



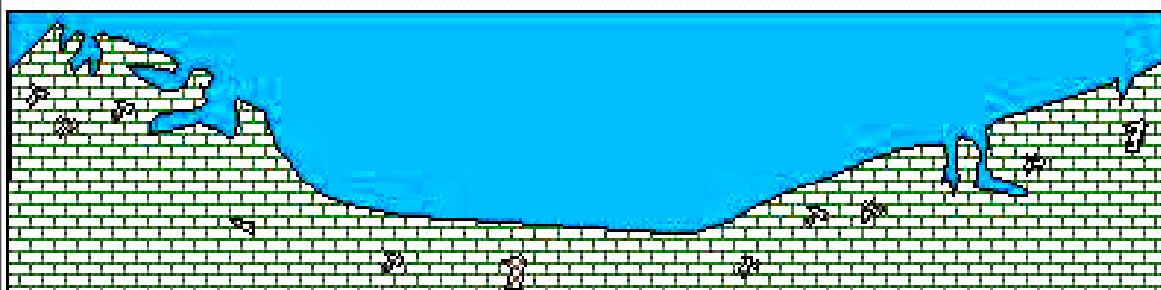
D + E clay infills

increasing water depth
to 20-40 m
(100yrs.)



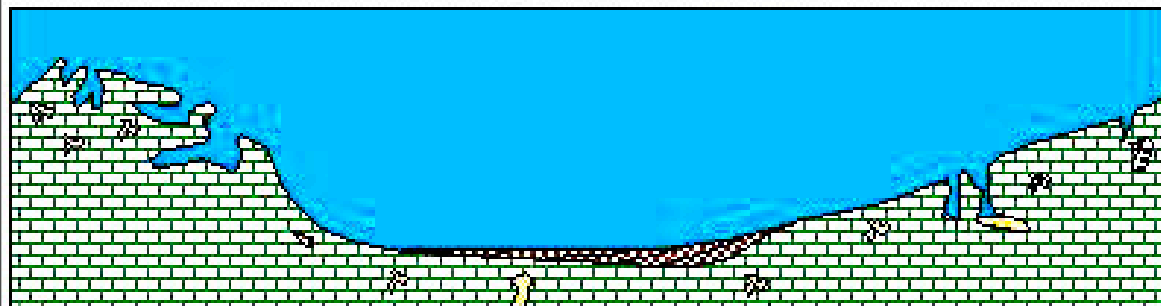
Latest Maastrichtian

Highstand tract deposits
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Hypercanes, removal of
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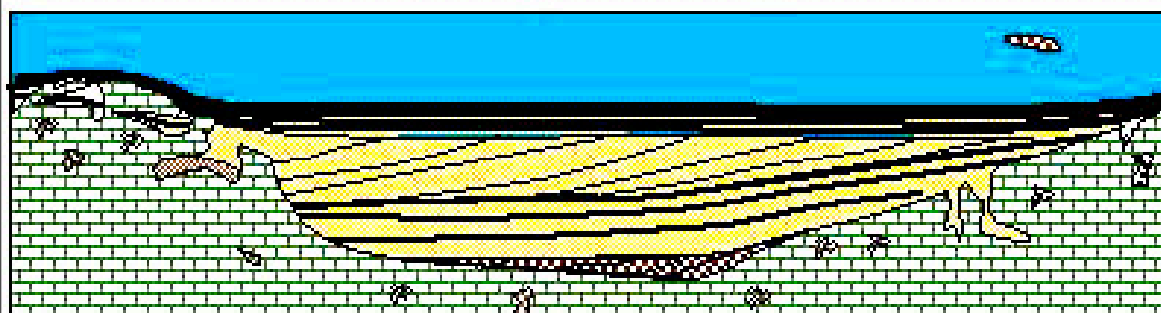
Lowermost Danian

Sealevel rise, first coarse
Hypercane deposits?
rip currents
(>10 years)



Episodic infilling

Periods of deposition of coarse
material (storms) and fine
material clays, (quiescence)
(10-100yrs)



D + E clay infills

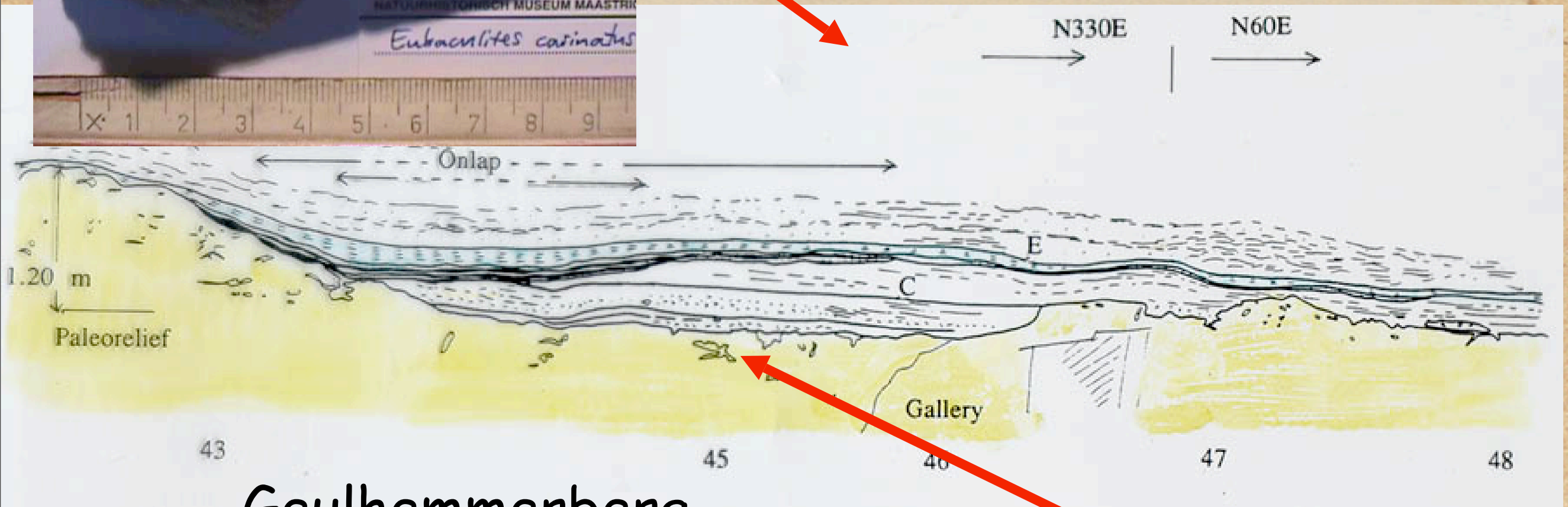
increasing water depth
to 20-40 m
(100yrs.)



Survivors? (>300 kyrs)

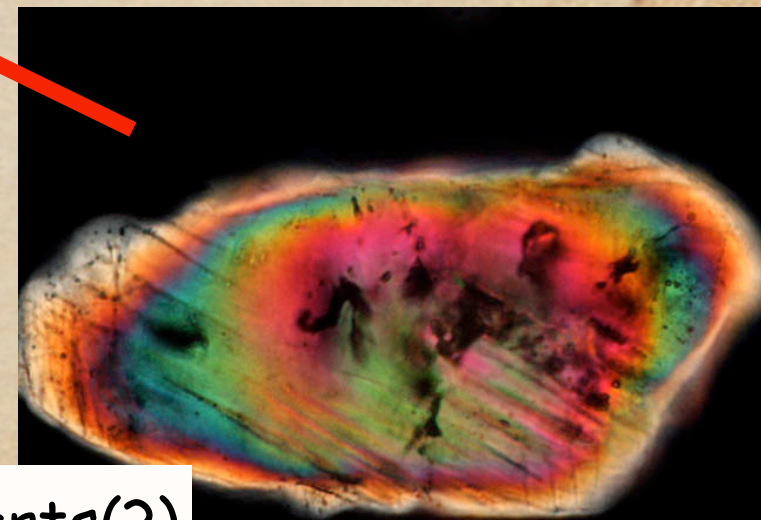
(Vroenhoven hard ground)

Ammoniet die het overleefd heeft



Geulhemmerberg.

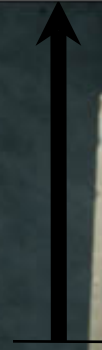
Reconstructie van lokale depressie door Tom Roep



geschokte kwarts(?)

GEBEURTENISSEN OP DE K/T GRENS

Incoming
Paleocene
foraminifers



Agost

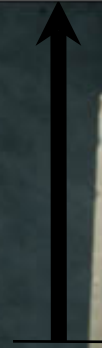
Boundary
clay

Ejecta
layer



GEBEURTENISSEN OP DE K/T GRENS

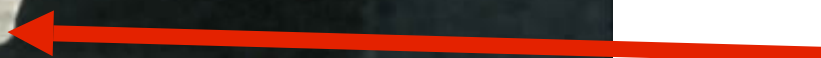
Incoming
Paleocene
foraminifers



Agost

Boundary
clay

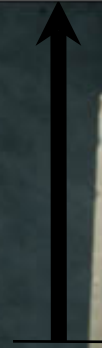
Ejecta
layer



Boven Krijt sediment,
GREENHOUSE CLIMATE

GEBEURTENISSEN OP DE K/T GRENS

Incoming
Paleocene
foraminifers



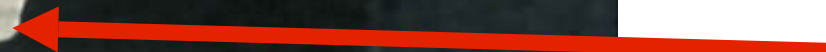
Agost

Boundary
clay

Ejecta
layer

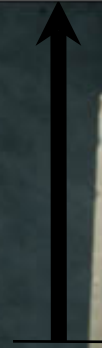
Ejecta laag

Boven Krijt sediment,
GREENHOUSE CLIMATE



GEBEURTENISSEN OP DE K/T GRENS

Incoming
Paleocene
foraminifers



Agost

Boundary
clay

Ejecta
layer

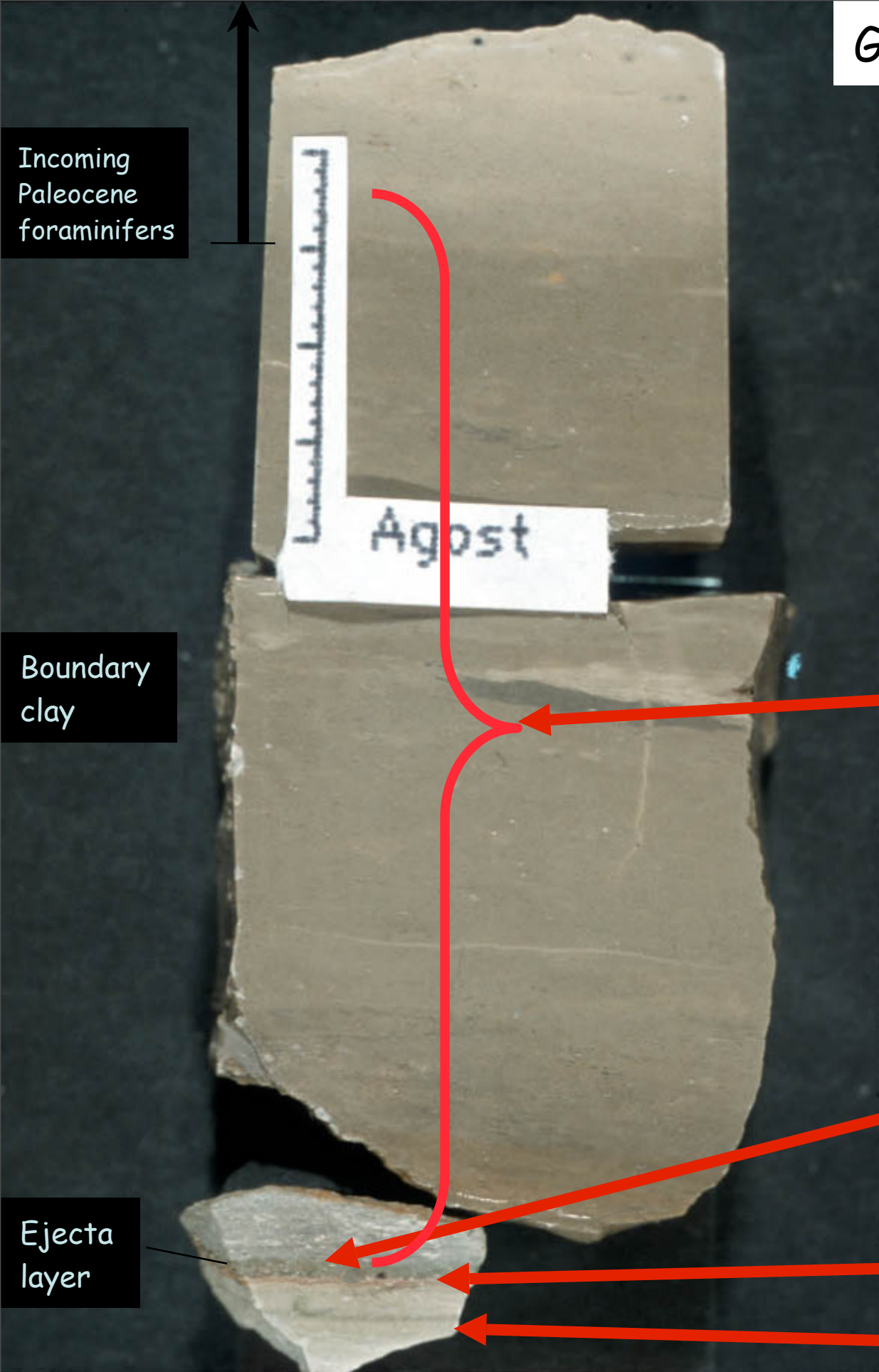
Massa-extinctie van Krijt plankton

Ejecta laag

Boven Krijt sediment,
GREENHOUSE CLIMATE



GEBEURTENISSEN OP DE K/T GRENS



Donkere kleilaag "Strangelove ocean"
(minimale fotosynthese) gedurende
~5000 jaar

Massa-extinctie van Krijt plankton

Ejecta laag

Boven Krijt sediment,
GREENHOUSE CLIMATE

GEBEURTENISSEN OP DE K/T GRENS

Incoming
Paleocene
foraminifers

immigratie nieuw plankton

Agost

Boundary
clay

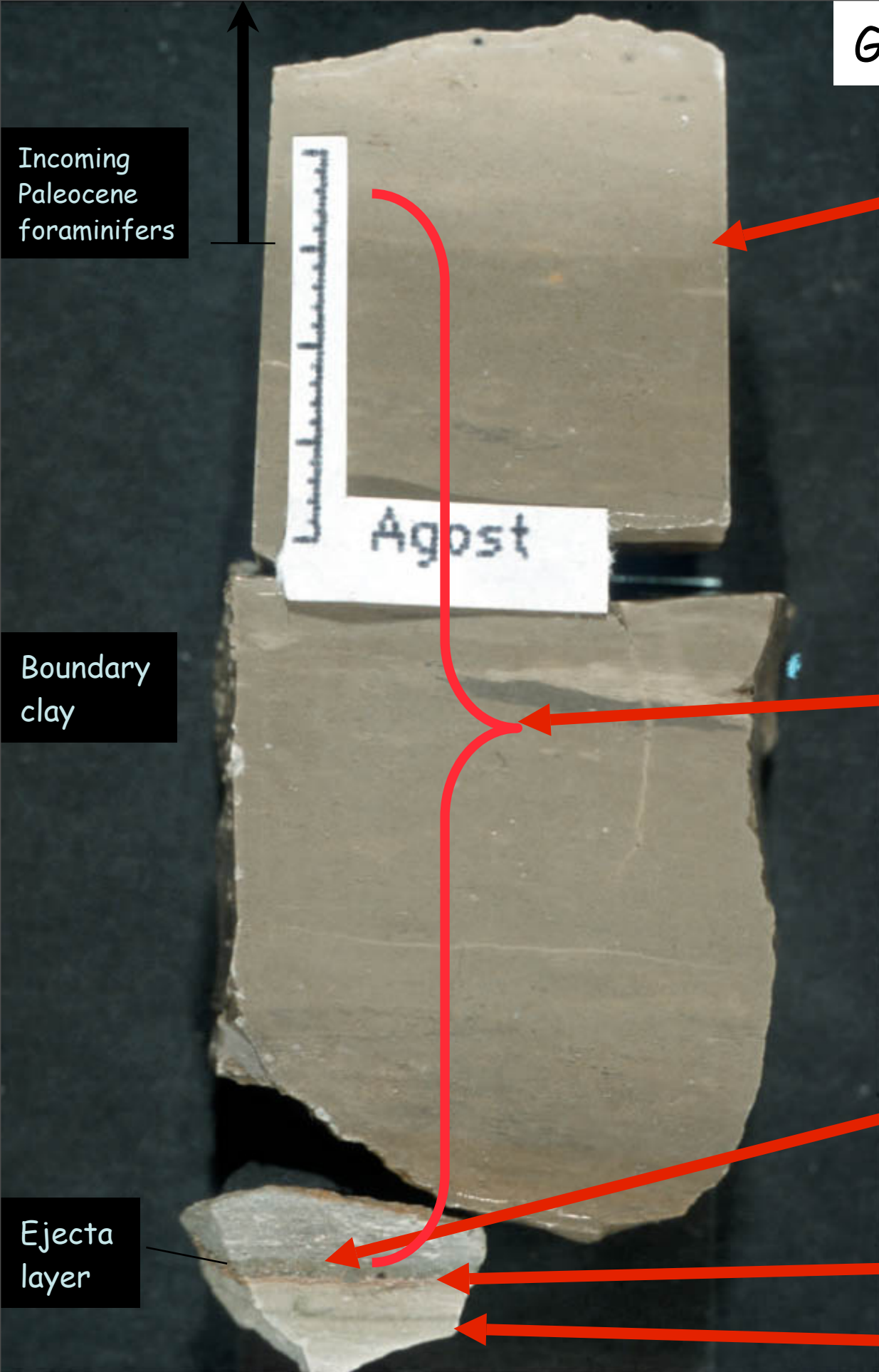
Donkere kleilaag "Strangelove ocean"
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~5000 jaar

Massa-extinctie van Krijt plankton

Ejecta
layer

Ejecta laag

Boven Krijt sediment,
GREENHOUSE CLIMATE



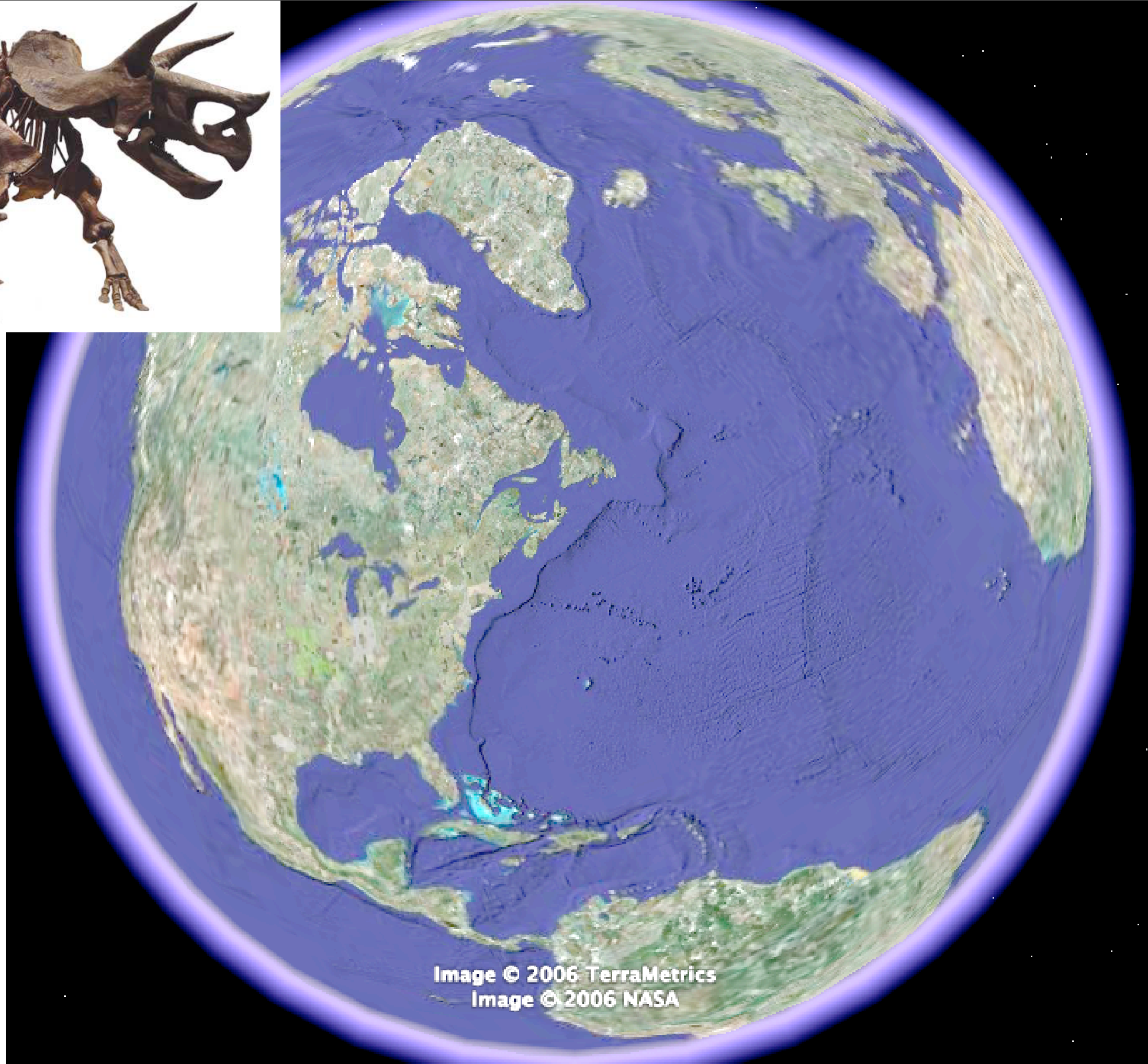


Image © 2006 TerraMetrics
Image © 2006 NASA

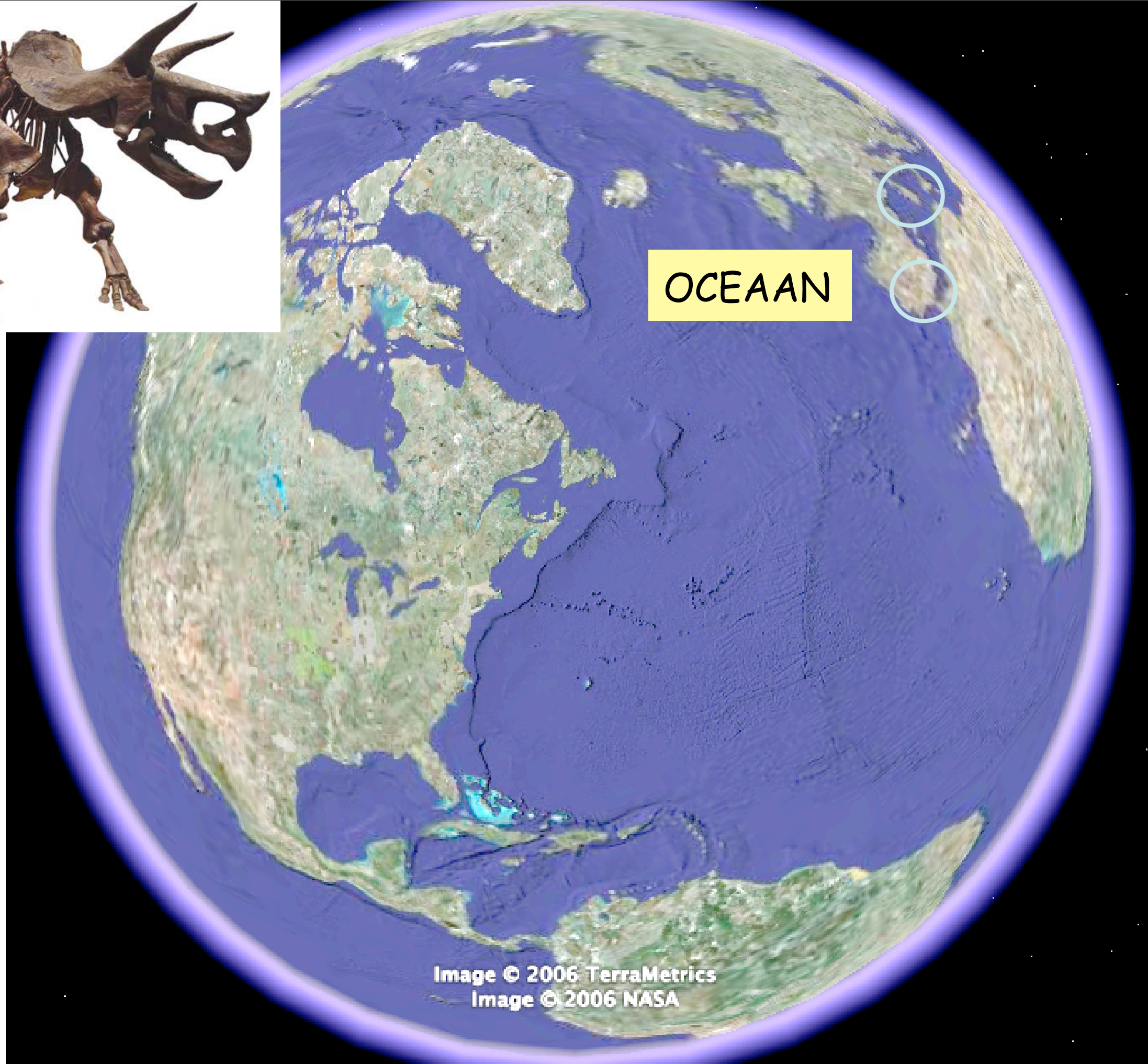
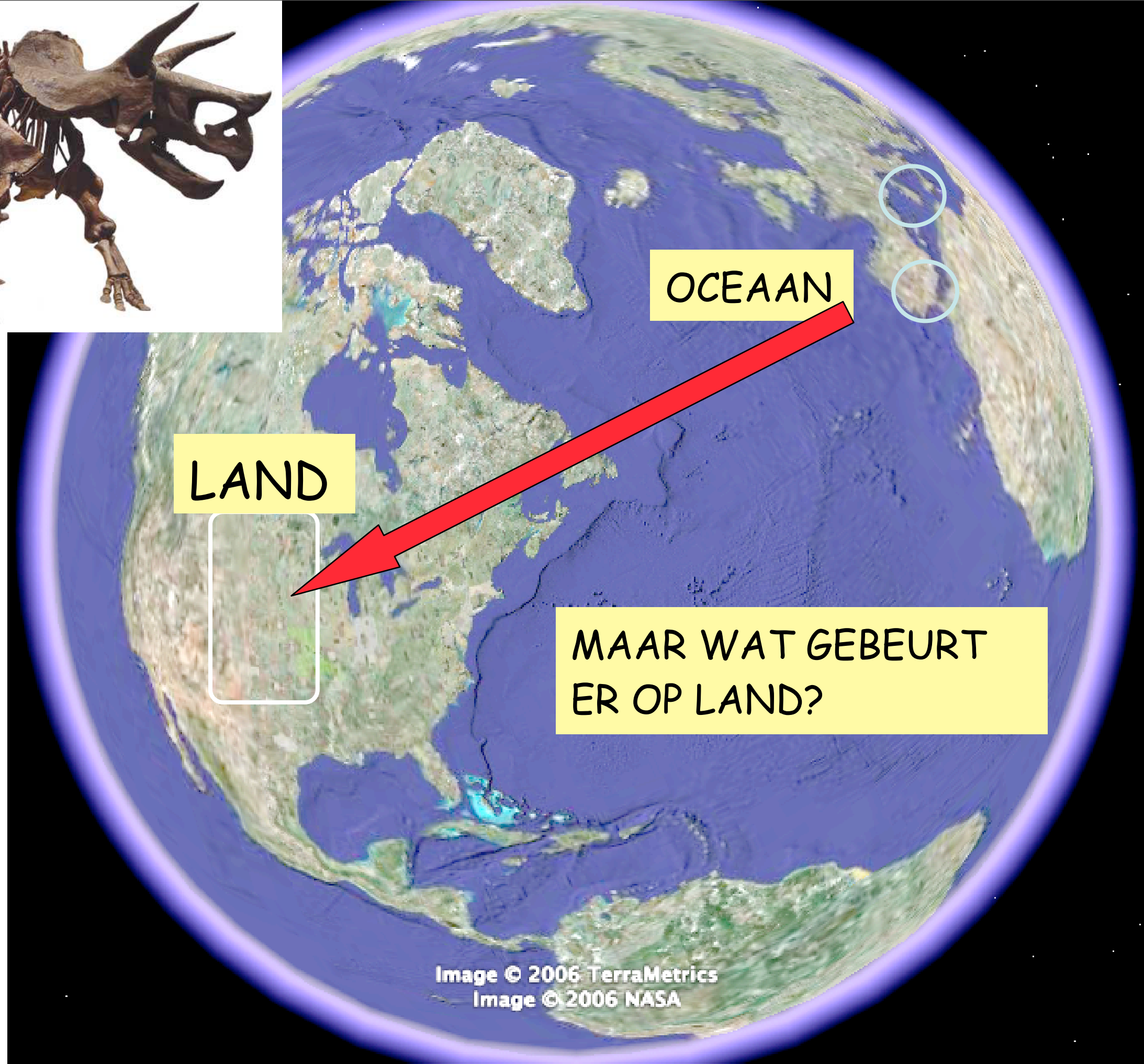


Image © 2006 TerraMetrics
Image © 2006 NASA



LAND

OCEAAN

MAAR WAT GEBEURT
ER OP LAND?

Image © 2006 TerraMetrics
Image © 2006 NASA

Een ondiepe
zee met ● dinosaurus
vindplaatsen



CHICXULUB
Krater



Raton Basin, New Mexico





Een ondiepe
zee met ● dinosaurus
vindplaatsen

Dinosauriers lopen bij de
kust van de Zee



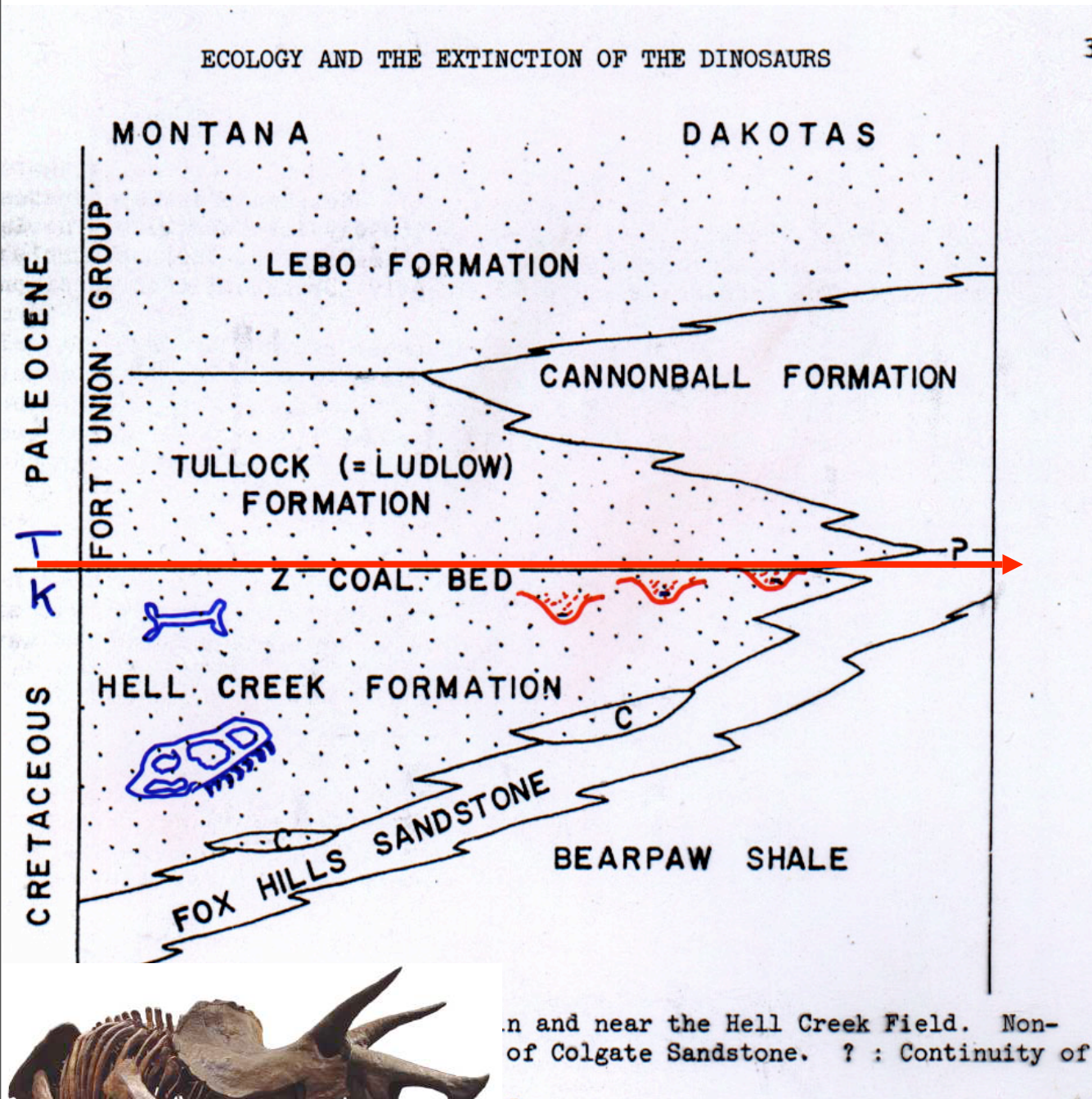
CHICXULUB
Krater



Raton Basin, New Mexico

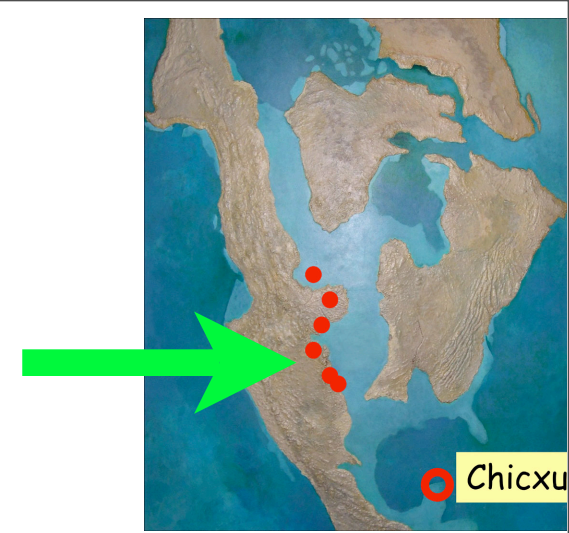


De Zee stijgt en daalt in de loop van de tijd....
Dus moeten de dinosauriers meeverhuizen



Chicxu

Overall is de ejectalaaag terug te vinden, vooral
in voormalige steenkoolmoerassen



Madrid Railroad Colorado

Missouri breaks, Montana



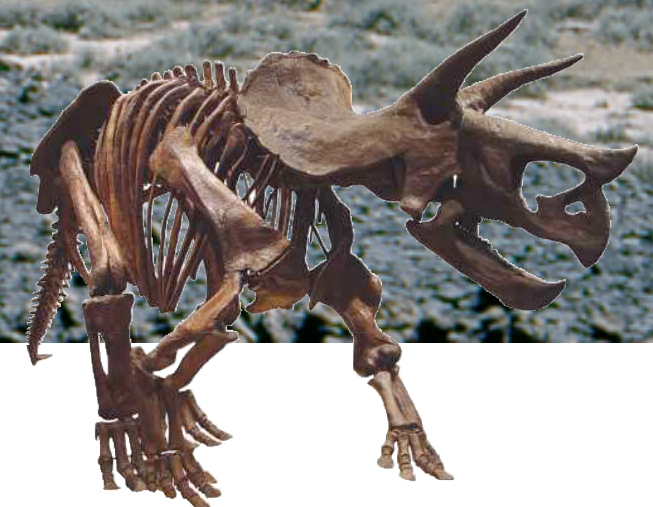
Het uitsterven van dinosauriers

Missouri breaks, Montana



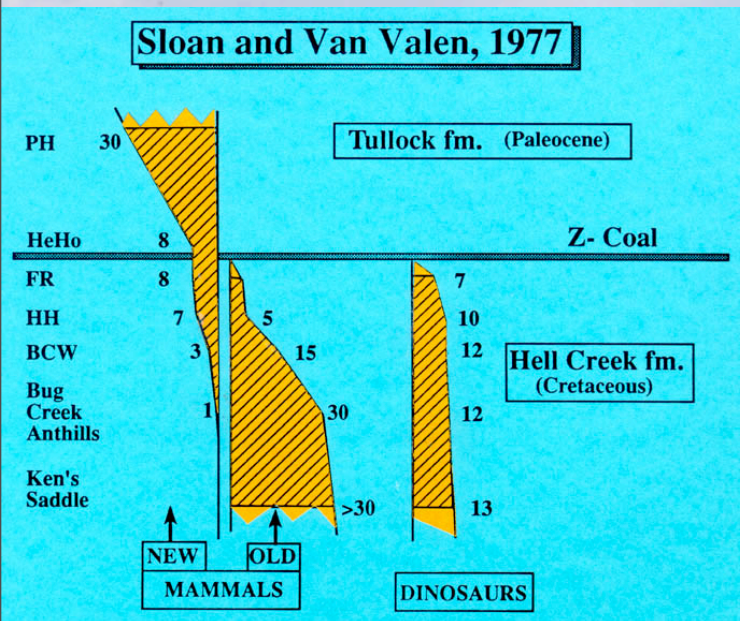
Het uitsterven van dinosauriers en de opkomst van
zoogdieren in de Badlands van Bug Creek, Montana

Missouri breaks, Montana



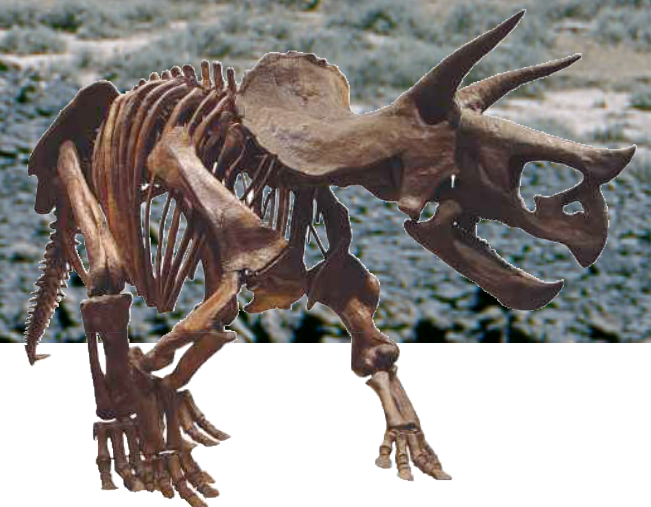
Het uitsterven van dinosauriers en de opkomst van
zoogdieren in de Badlands van Bug Creek, Montana

Missouri breaks, Montana



W- coal

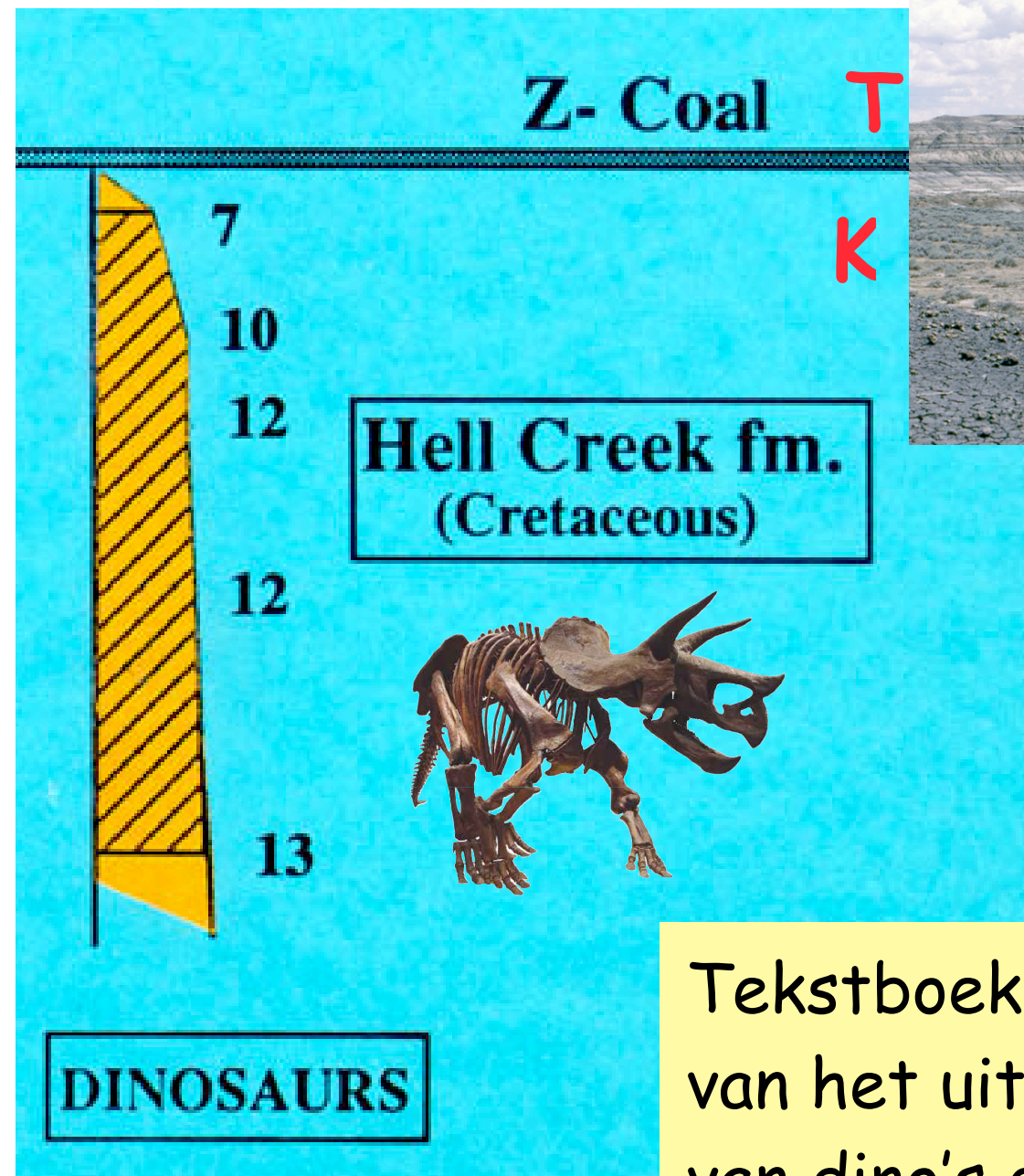
Z-coal



T
K



Tekstboek voorbeeld
van het uitsterven
van dino's en evolutie
zoogdieren



Tekstboek voorbeeld
van het uitsterven
van dino's en evolutie
zoogdieren

Tullock fm. (Paleocene)

Z- Coal T

K

Hell Creek fm. (Cretaceous)



MAMMALS

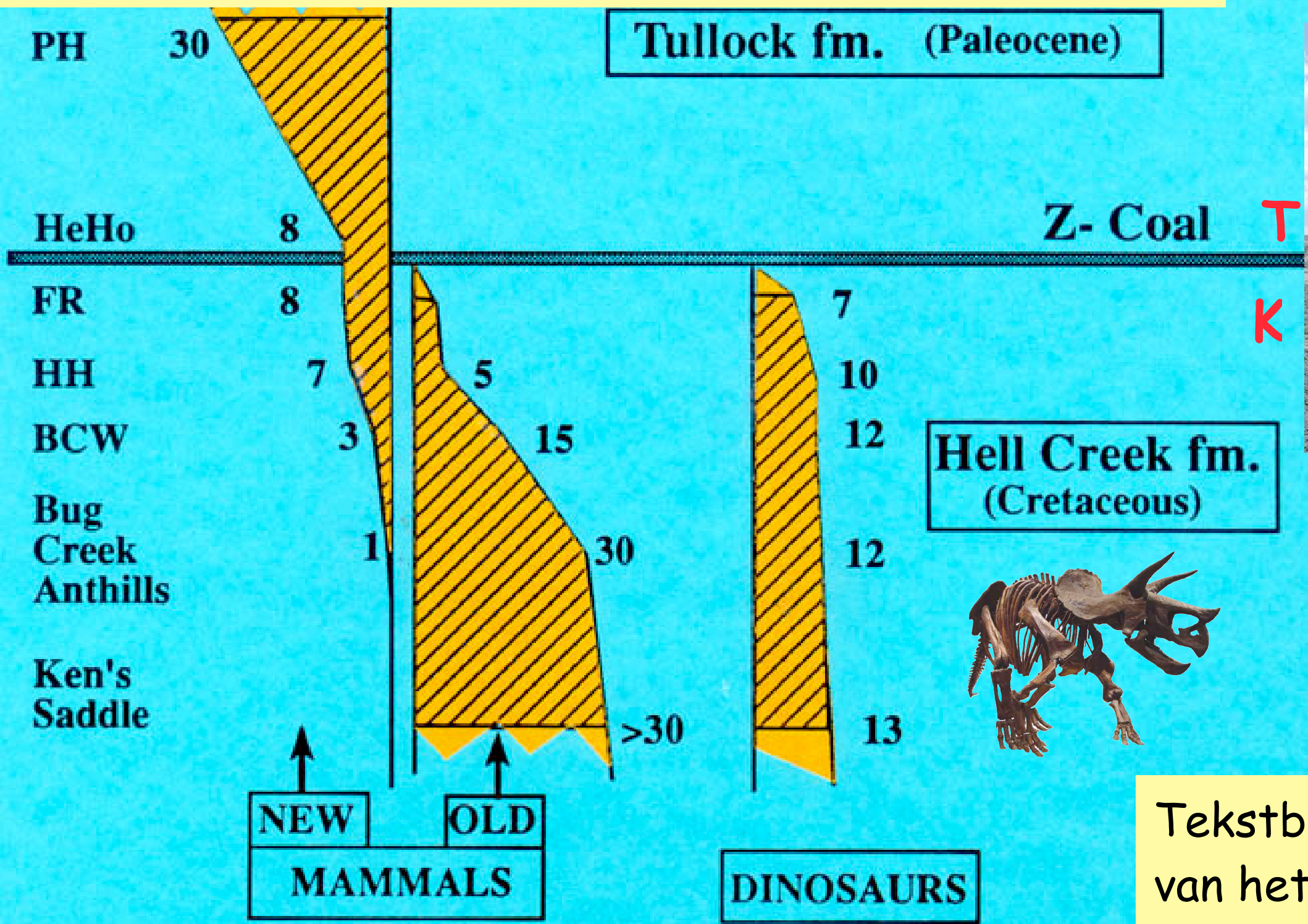
OLD

DINOSAURS

Tekstboek voorbeeld
van het uitsterven
van dino's en evolutie
zoogdieren

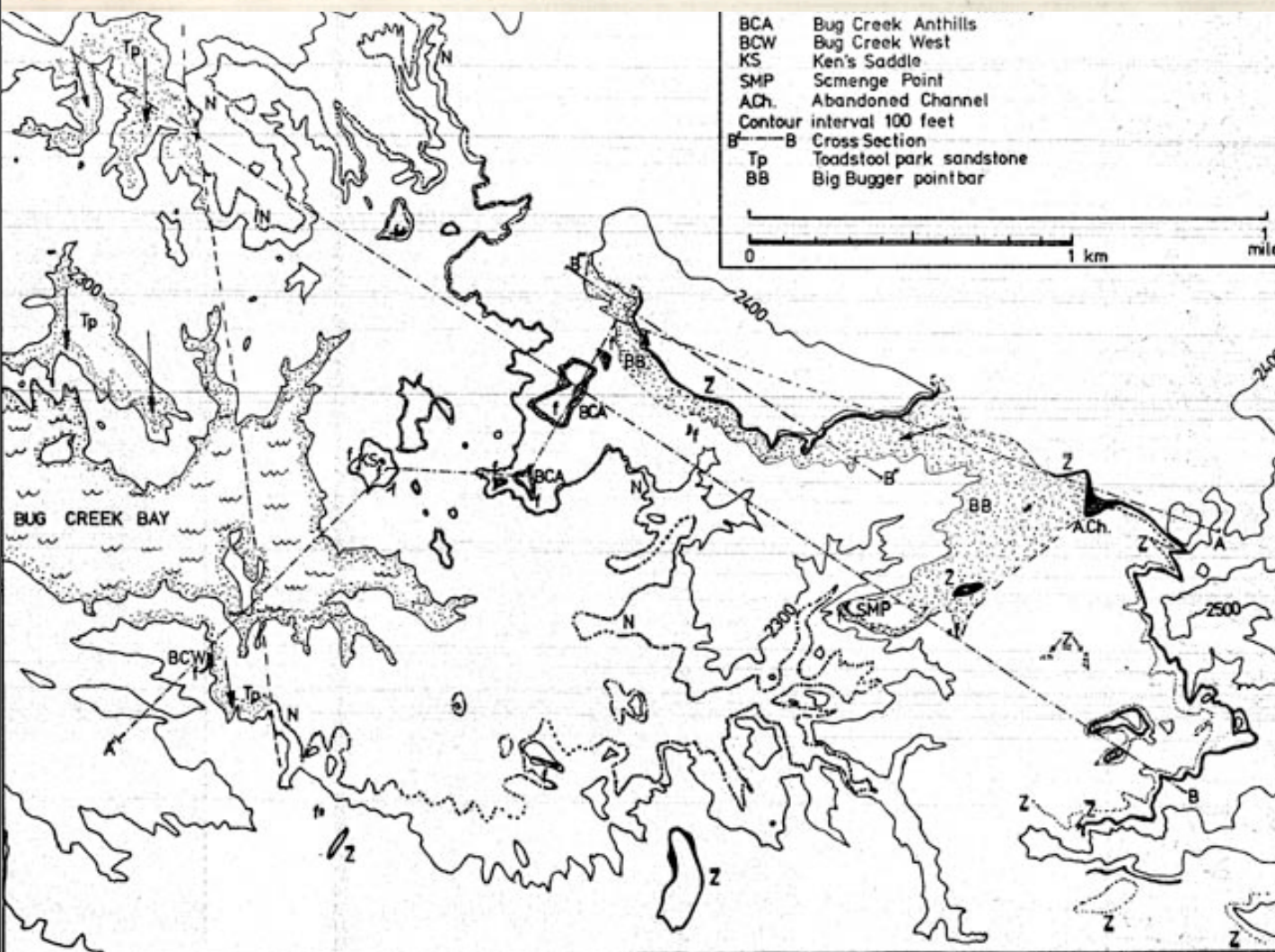
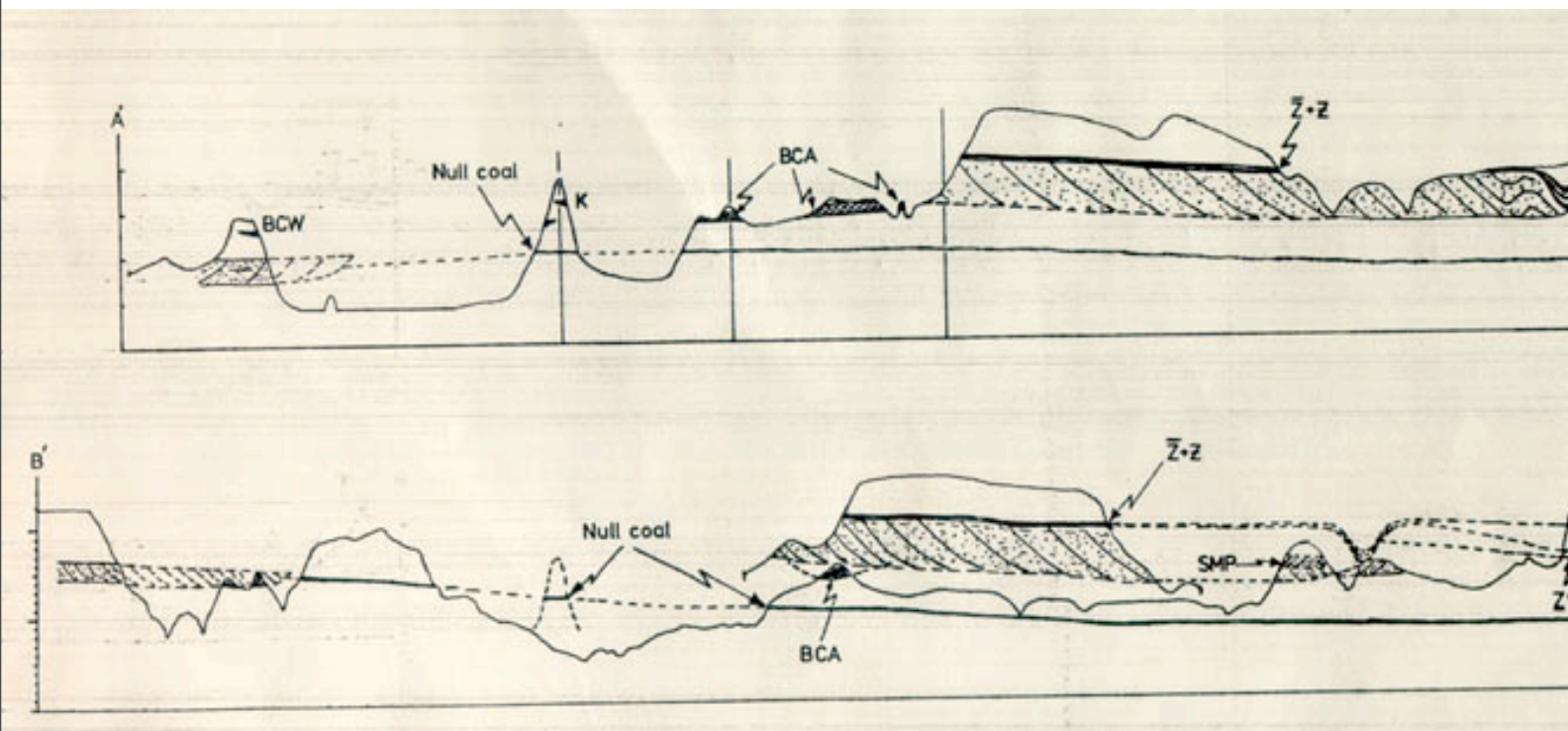


Nieuwe (placentalia) evolueren schijnbaar tegelijk met het verdwijnen van de dinosauriers, maar.....
.....Onder de K/T grens, en dus Vóór de inslag??

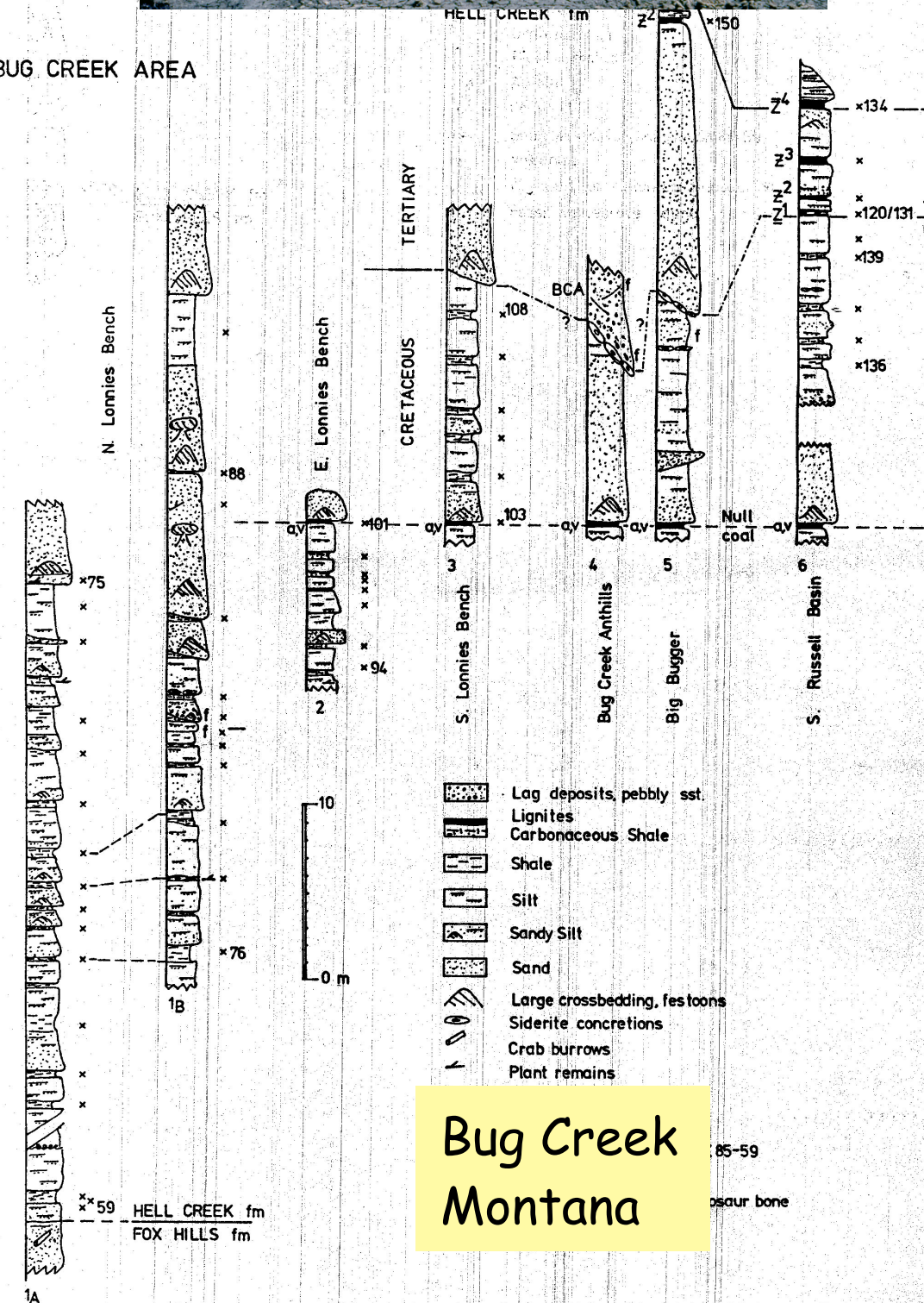


Tekstboek voorbeeld van het uitsterven van dino's en evolutie zoogdieren

Maar in het veld is niet alles simpel.....

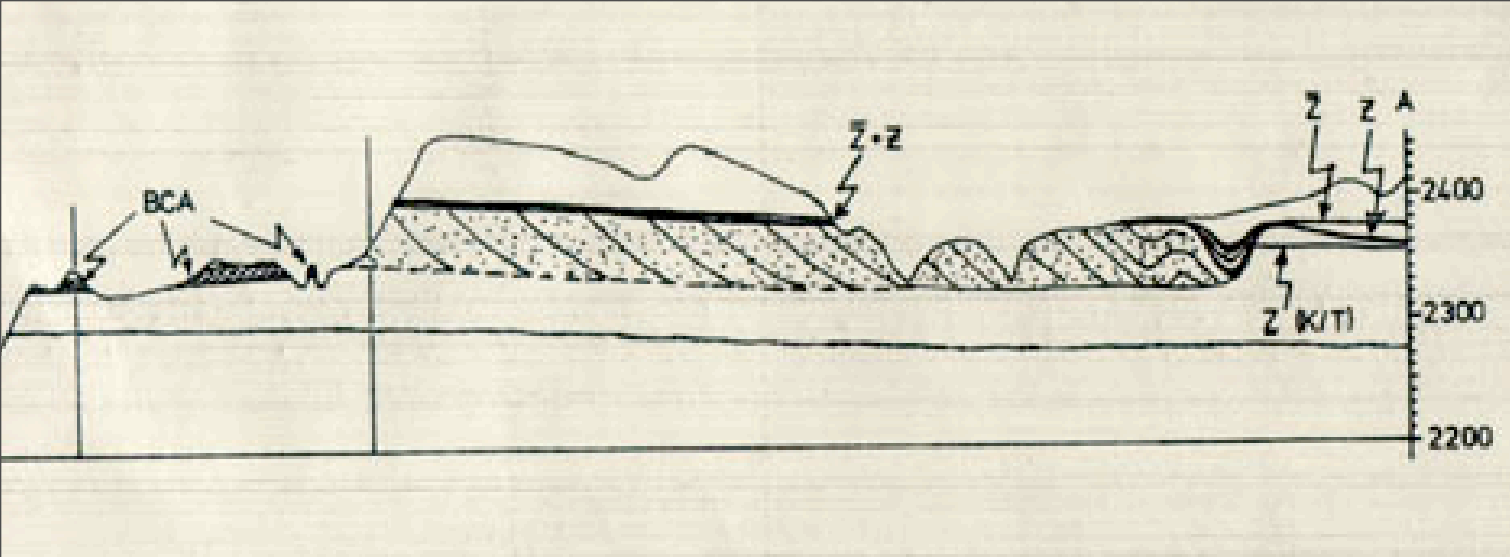


BUG CREEK AREA



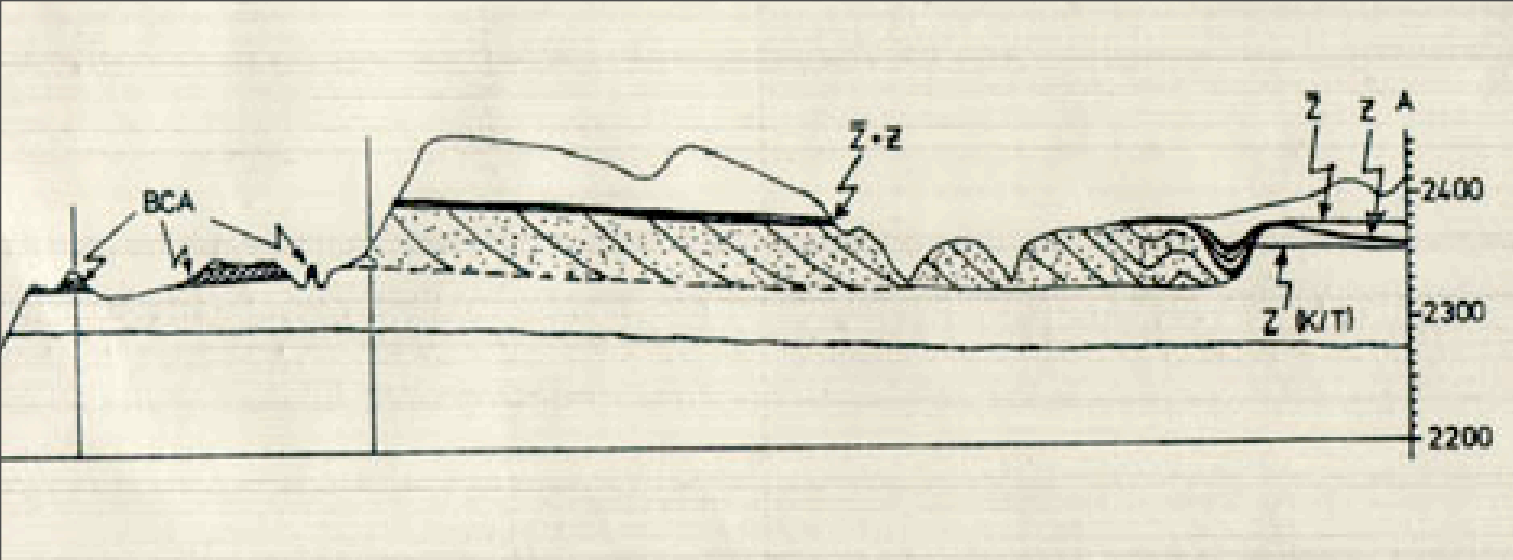
Bug Creek
Montana

85-59
Dinosaur bone



Bug Creek
Montana

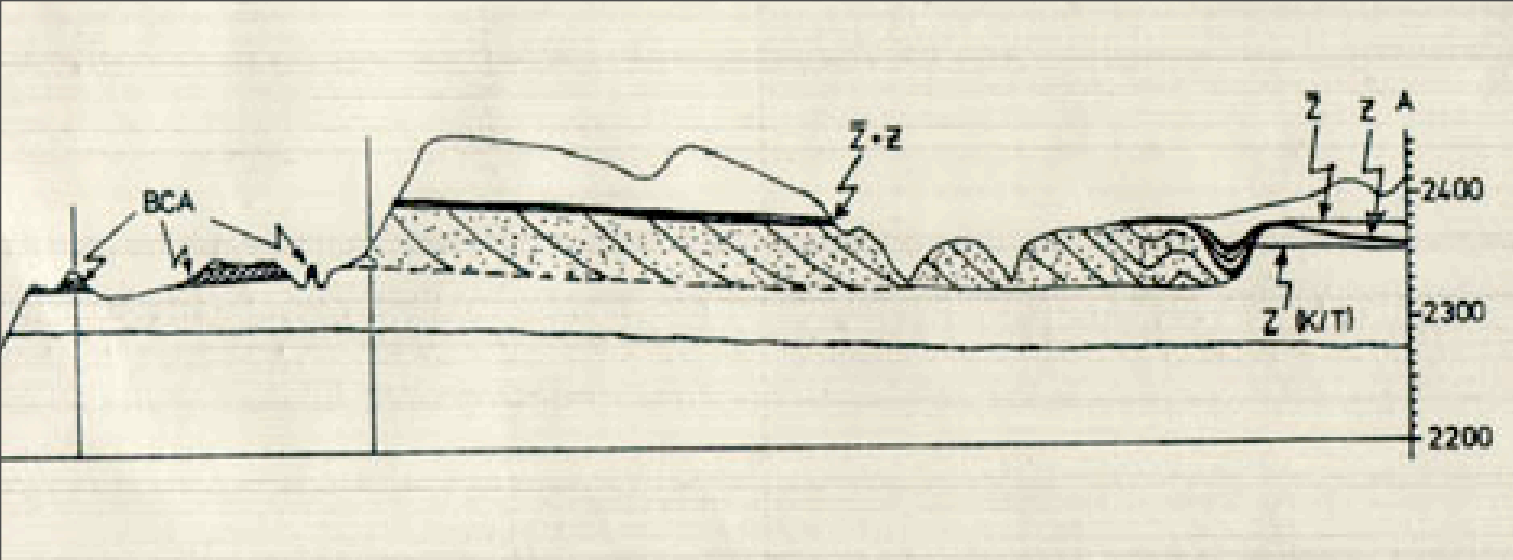




Bug Creek
Montana

A) Er blijken vier Z-coals te zijn

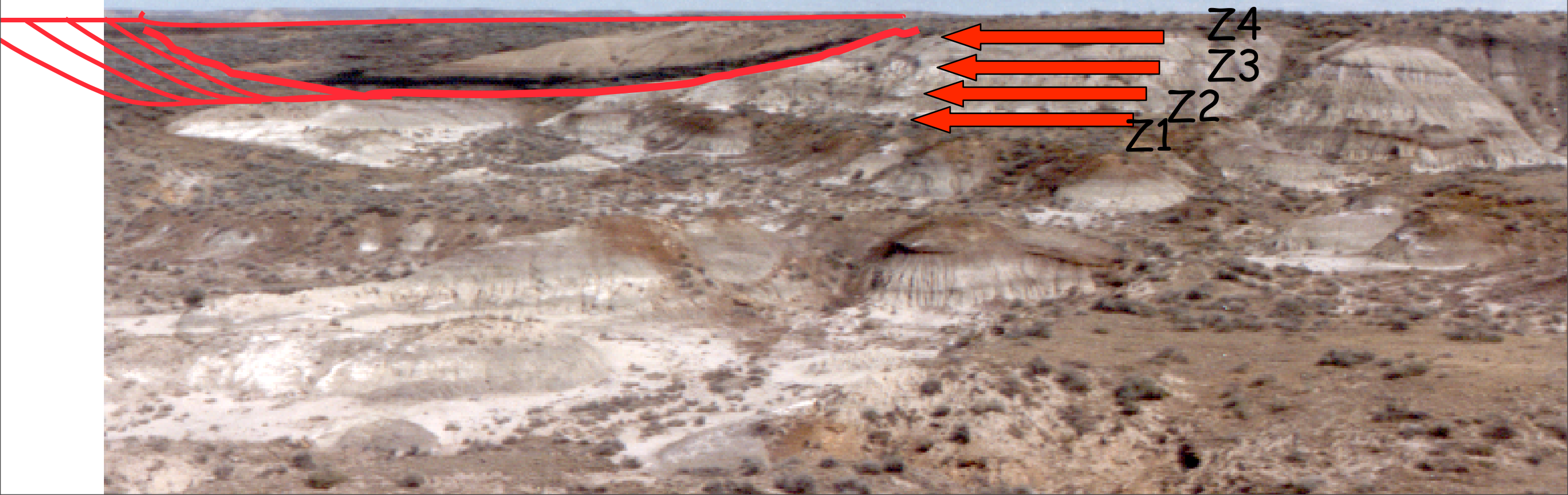


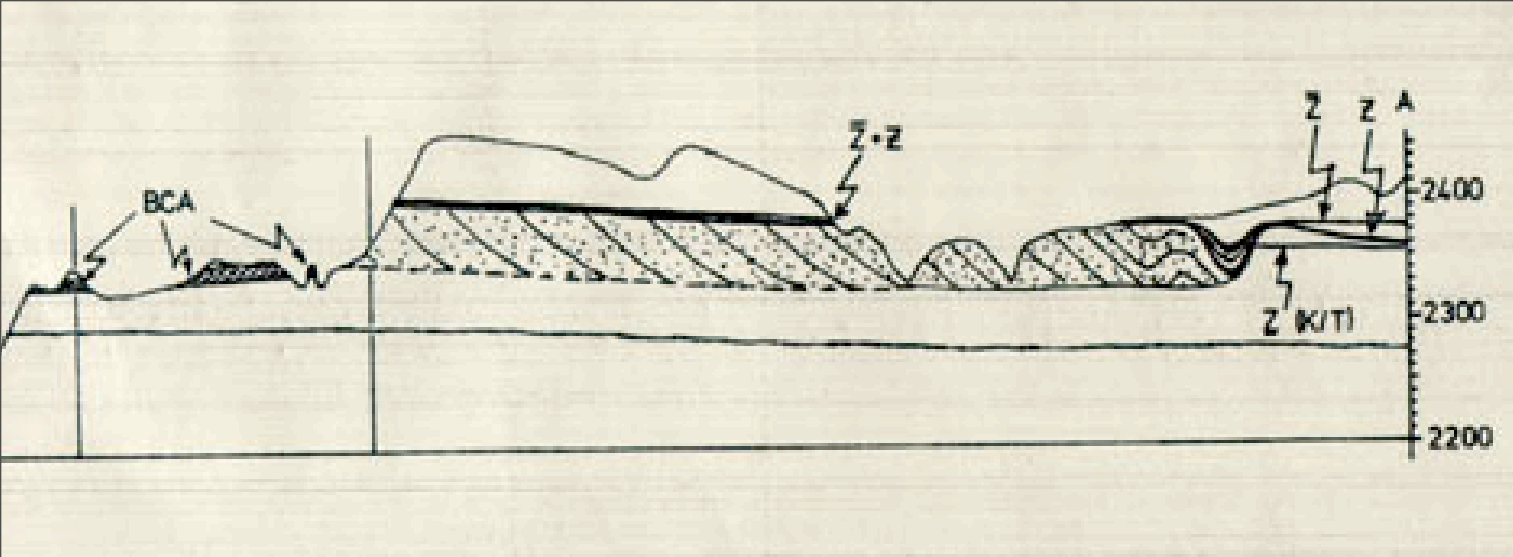


Bug Creek
Montana

A) Er blijken vier Z-coals te zijn

B) Die worden afgesneden door rivierarmen



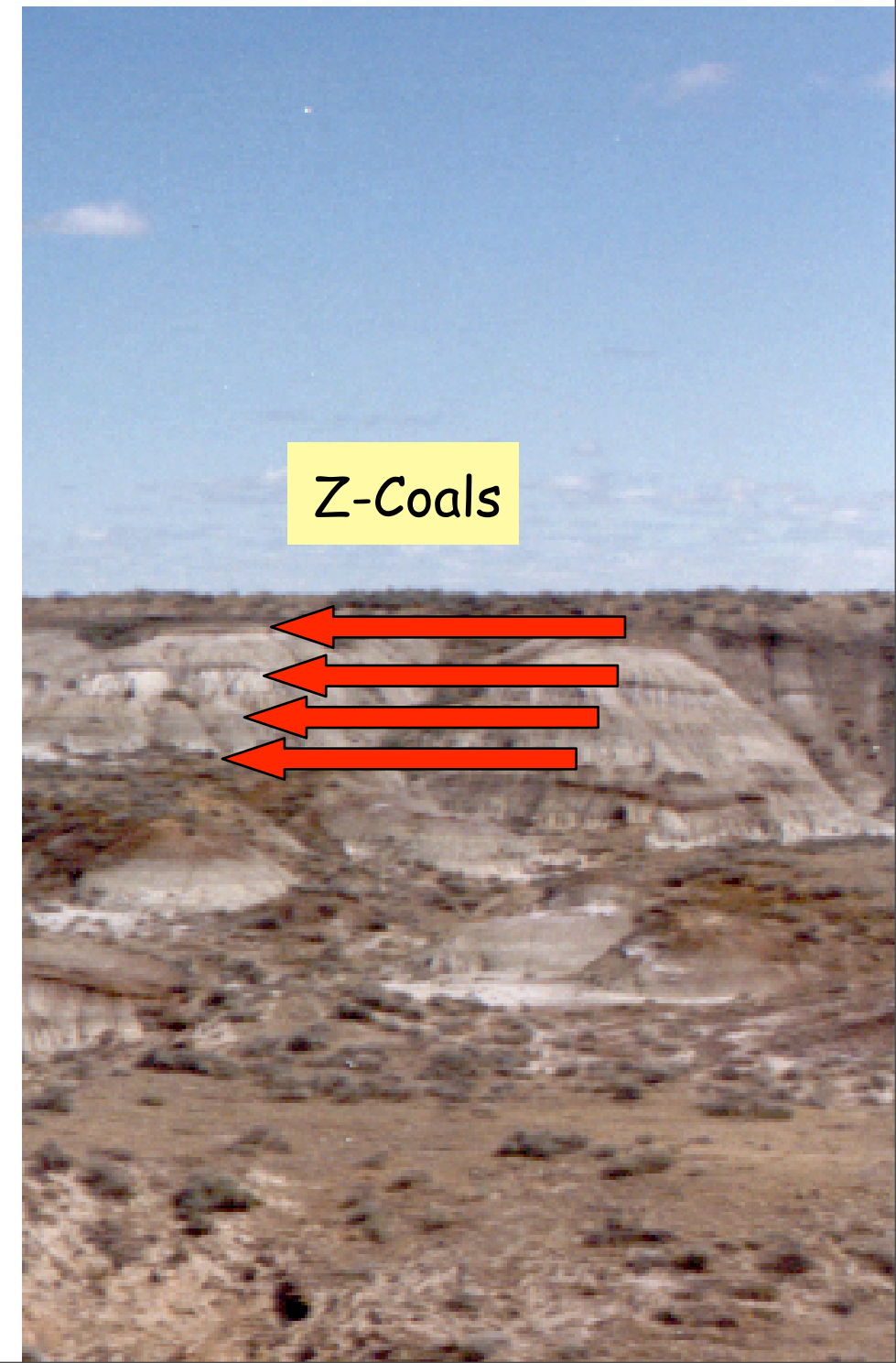
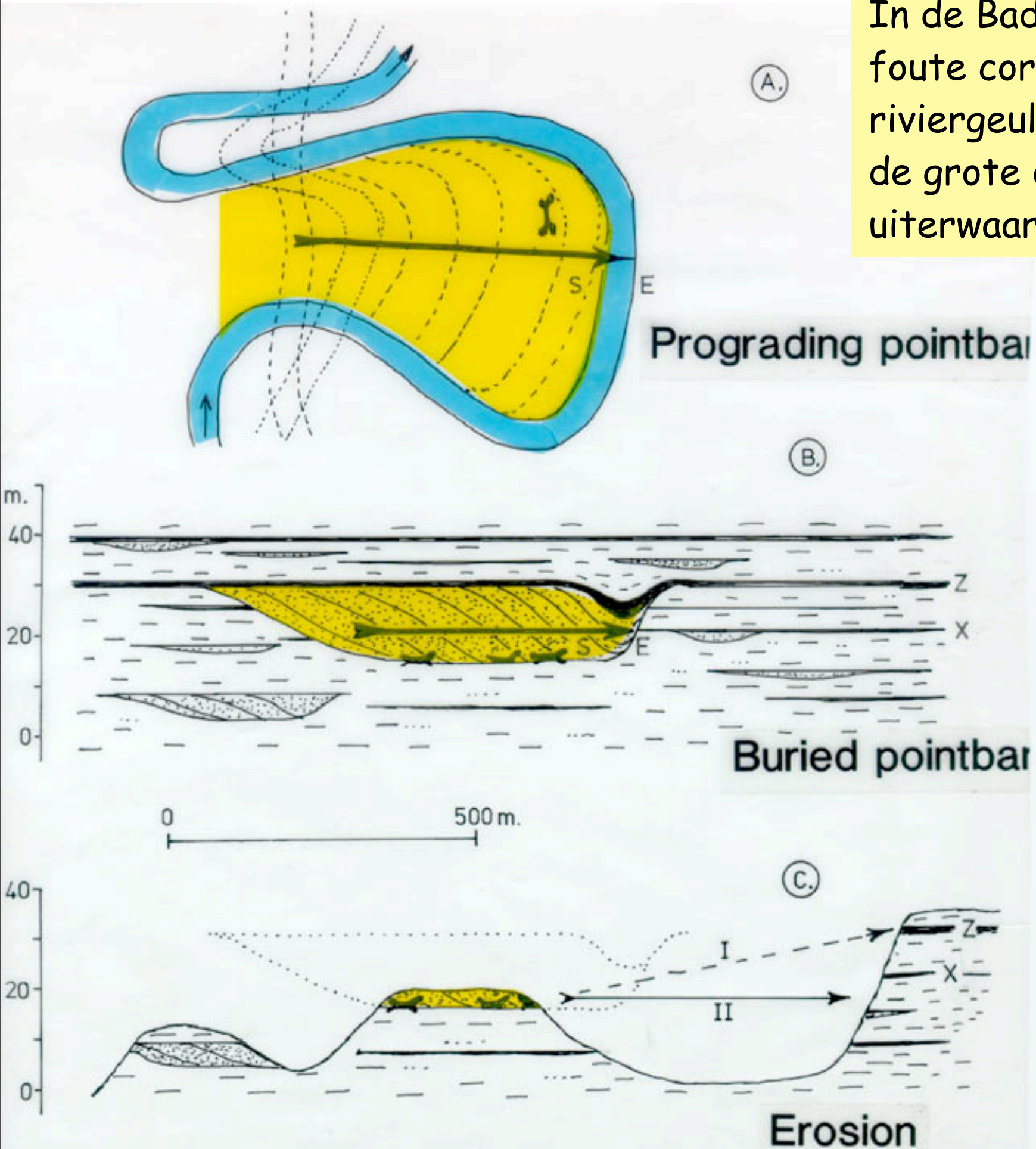


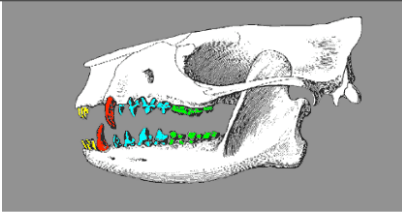
Bug Creek
Montana

A) Er blijken vier Z-coals te zijn

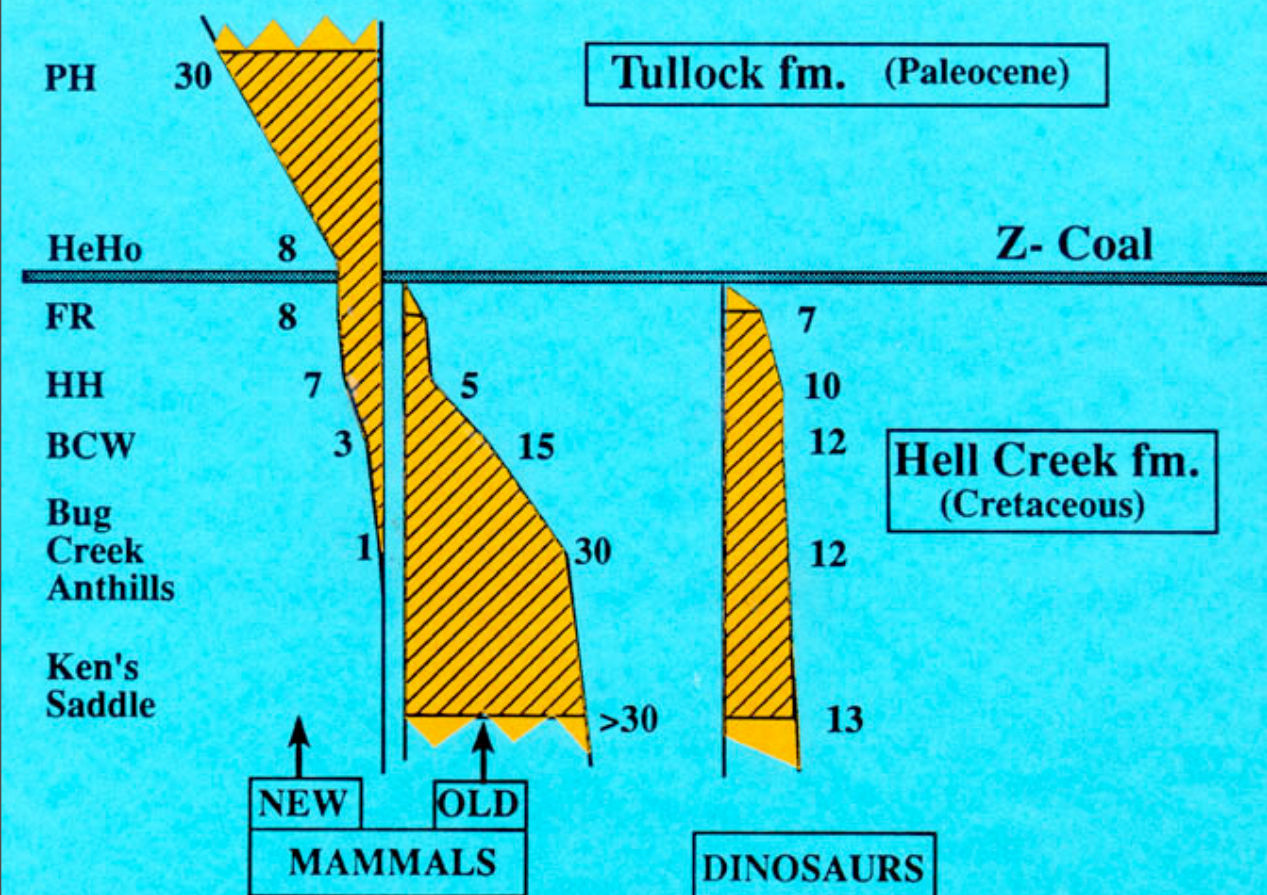


In de Badlands kan je makkelijk een foute correlatie maken tussen de riviergeulen (met de zoogdiertanden) en de grote dinosaurierskeletten in de uiterwaarden





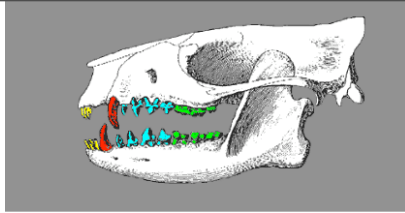
Sloan and Van Valen, 1977



14 dinosaur soorten op de uiterwaarden
In het Krijt



Upper Z-coal

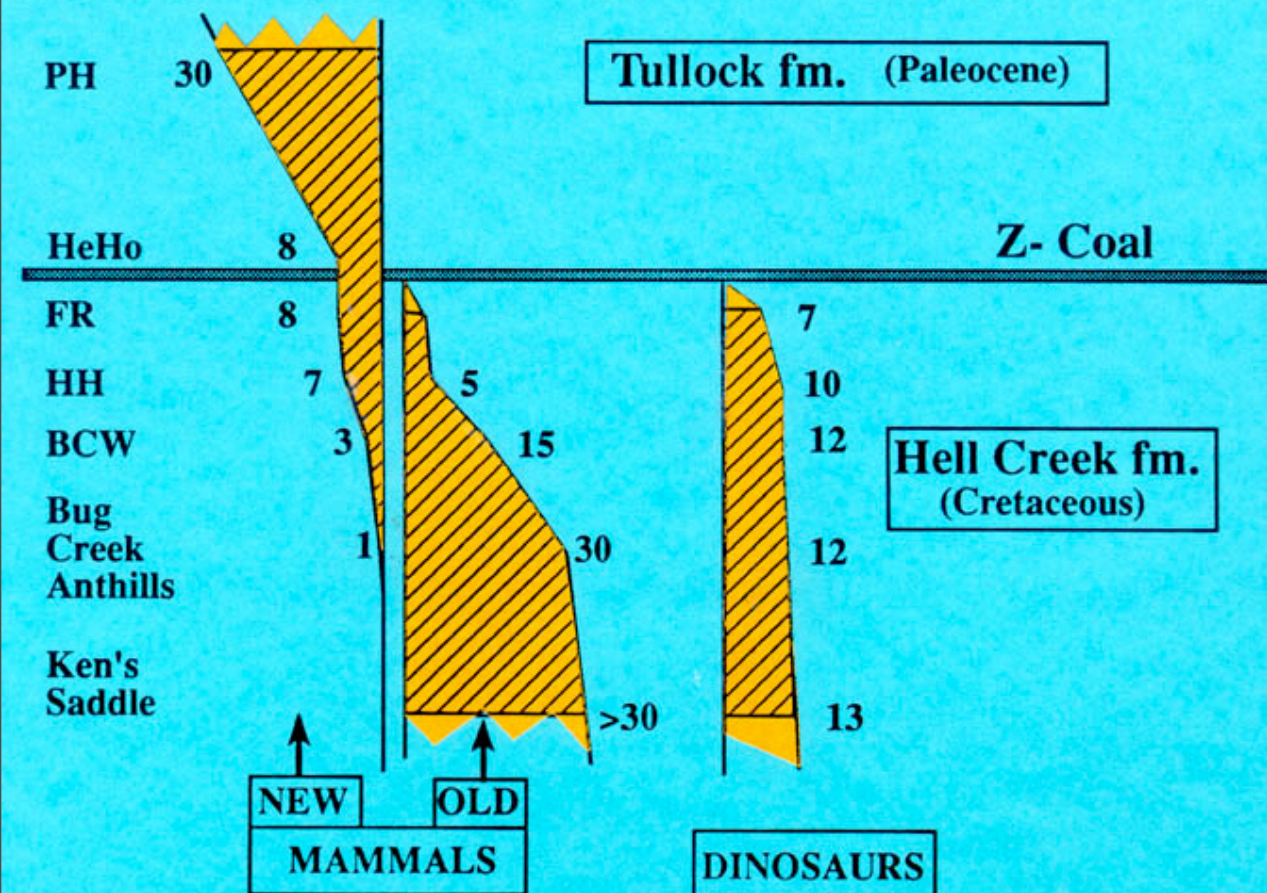


Tertiary

Cretaceous



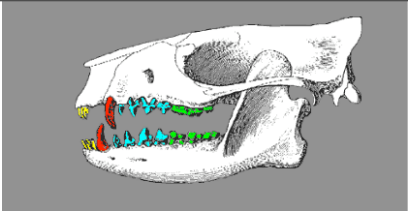
Sloan and Van Valen, 1977



14 dinosaur soorten op de uiterwaarden
In het Krijt



riviergeulen



Upper Z-coal

Tertiary

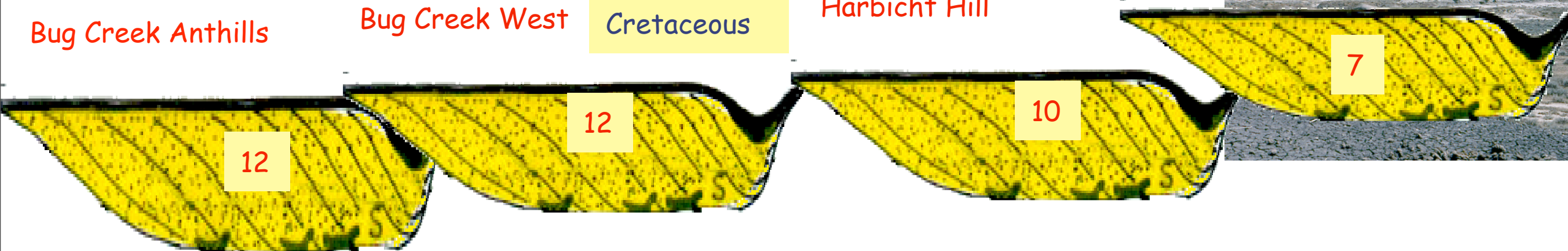
Ferguson ranch

Bug Creek Anthills

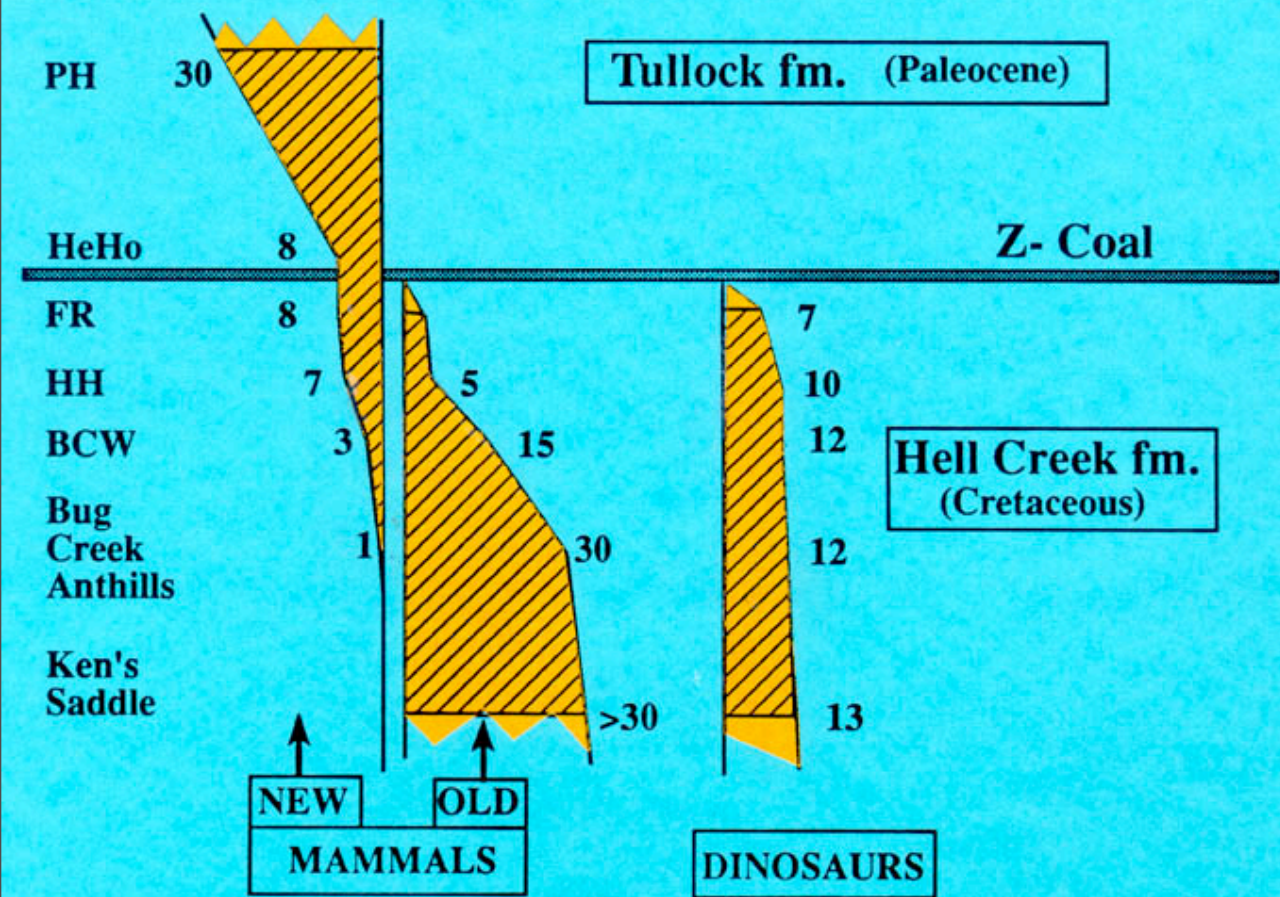
Bug Creek West

Cretaceous

Harbicht Hill

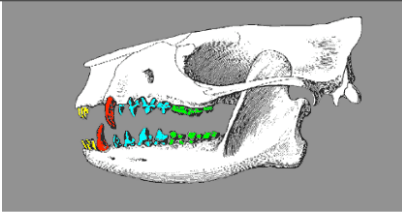


Sloan and Van Valen, 1977

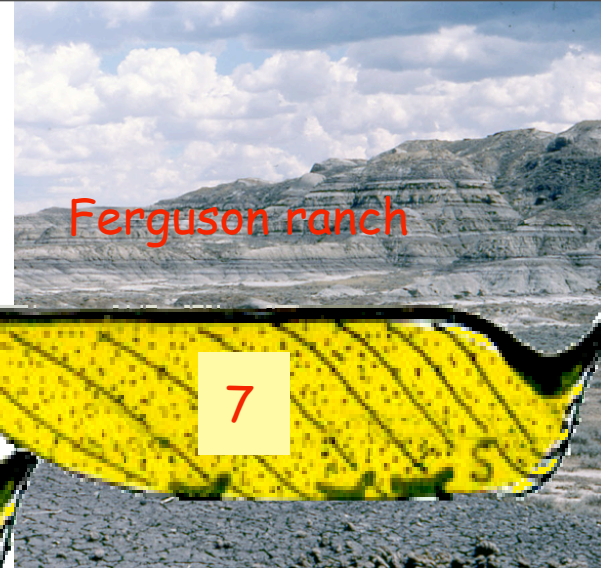


14 dinosaurus soorten op de uiterwaarden
In het Krijt





riviergeulen



Bug Creek Anthills

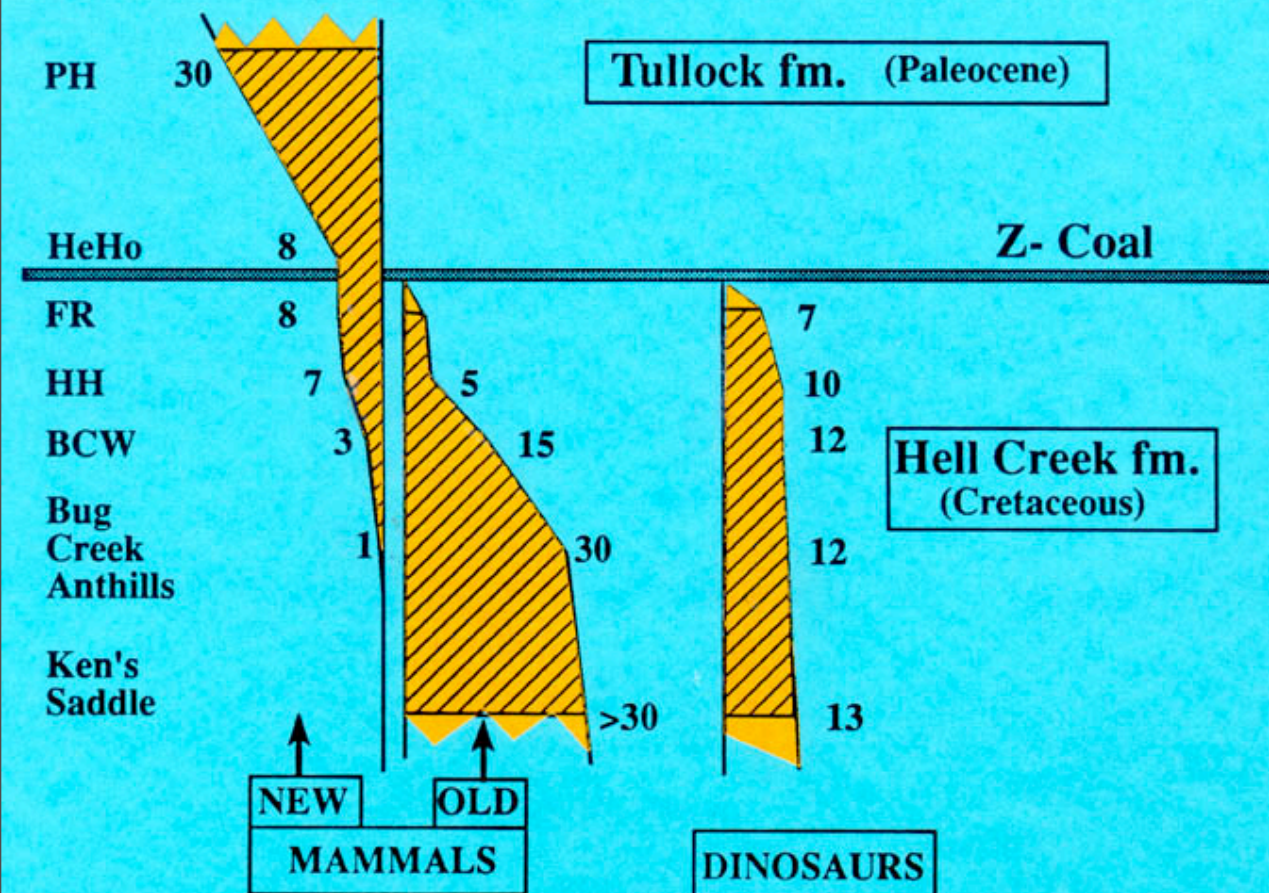
Bug Creek West

Harbicht Hill



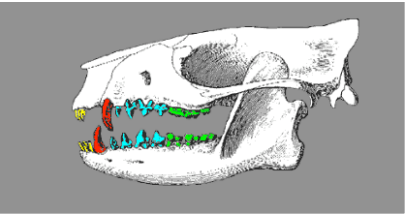
Lower Z-coal
(with Ir anomaly)

Sloan and Van Valen, 1977

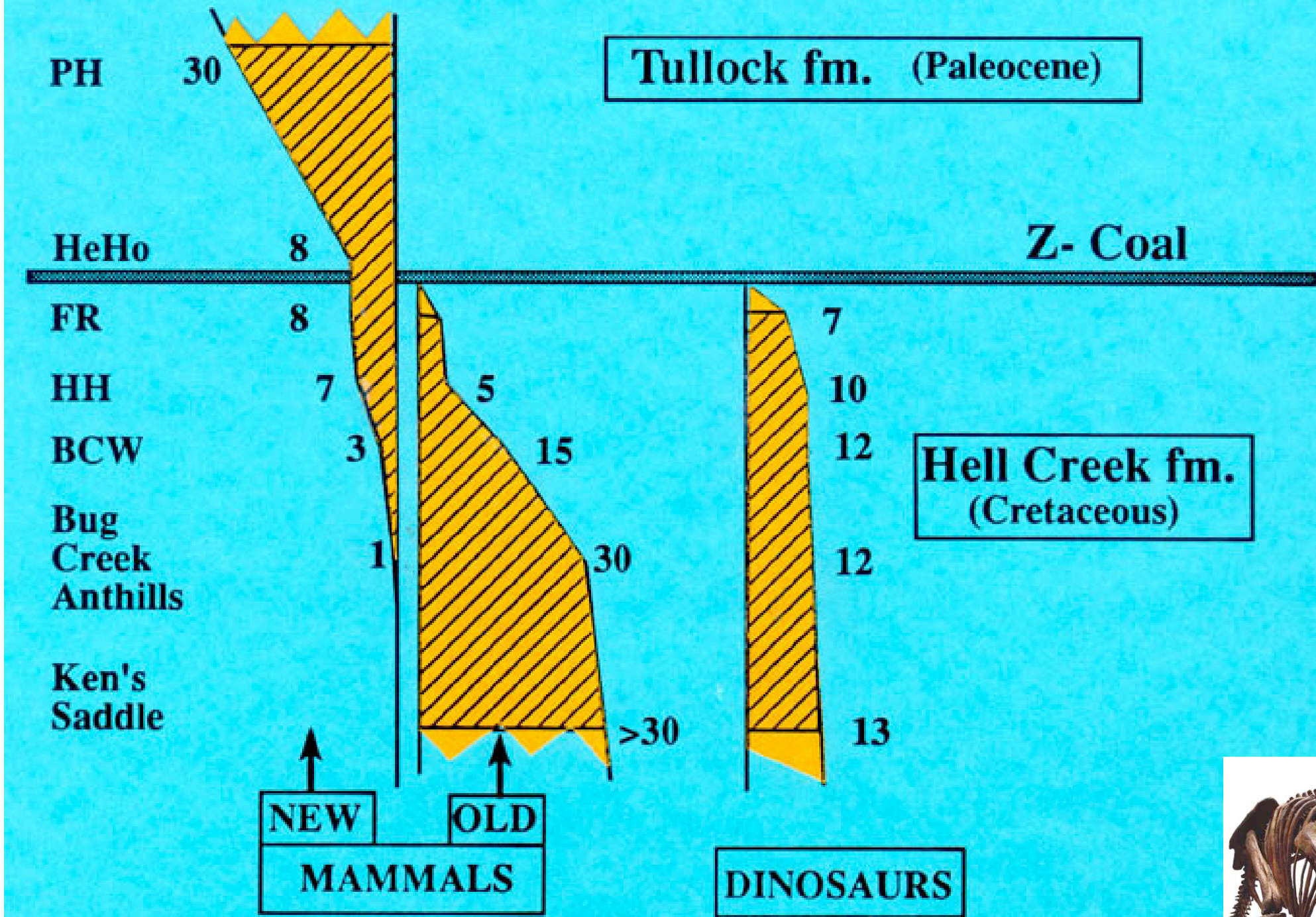


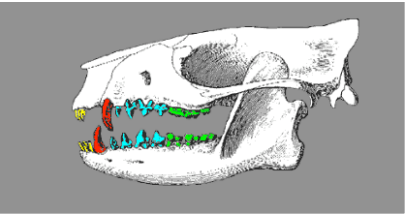
14 dinosaurus soorten op de uiterwaarden
In het Krijt



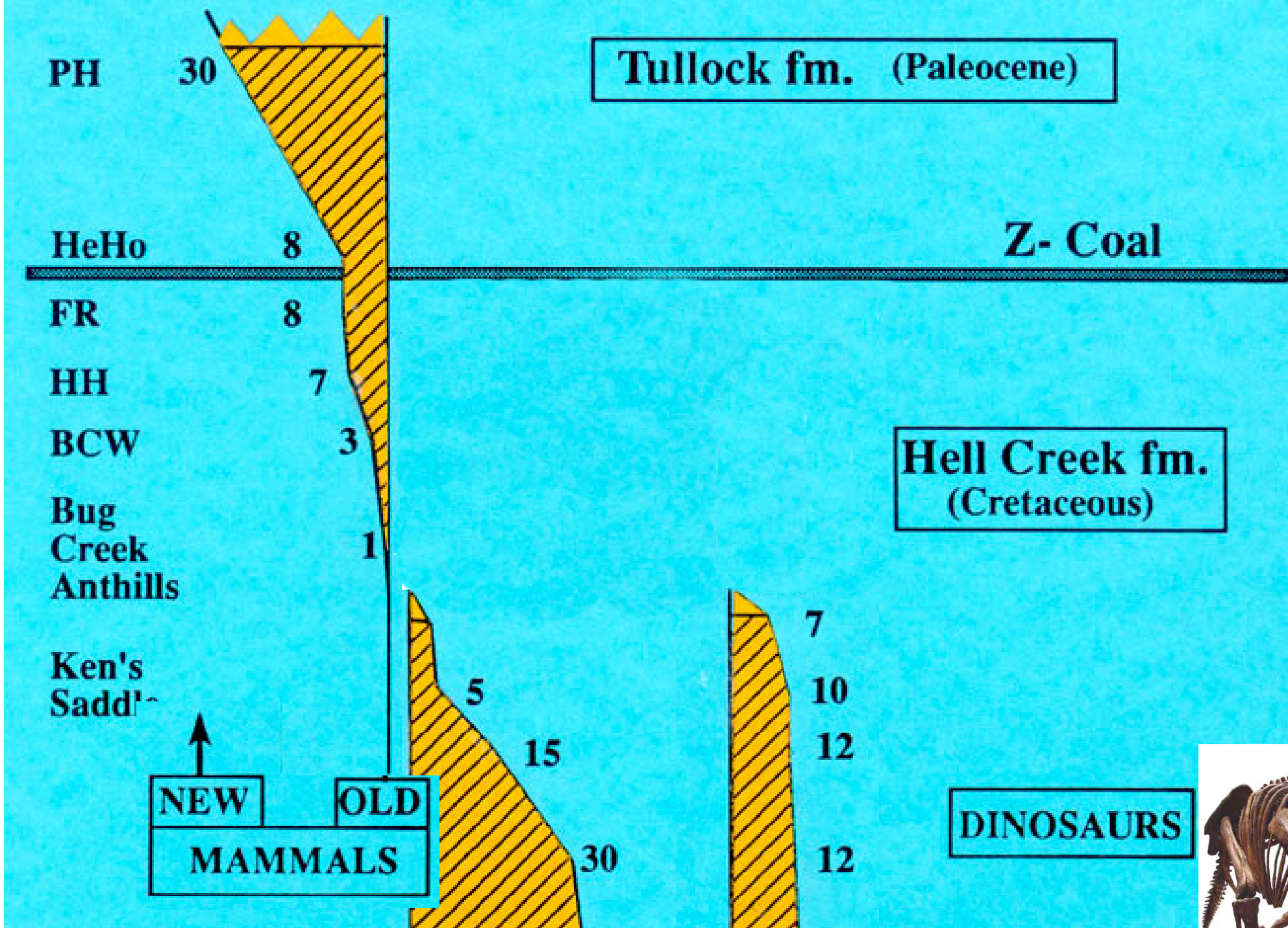


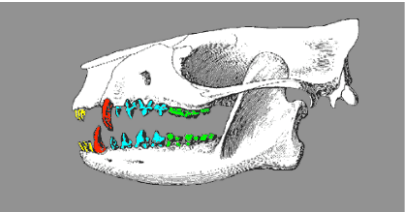
Sloan and Van Valen, 1977



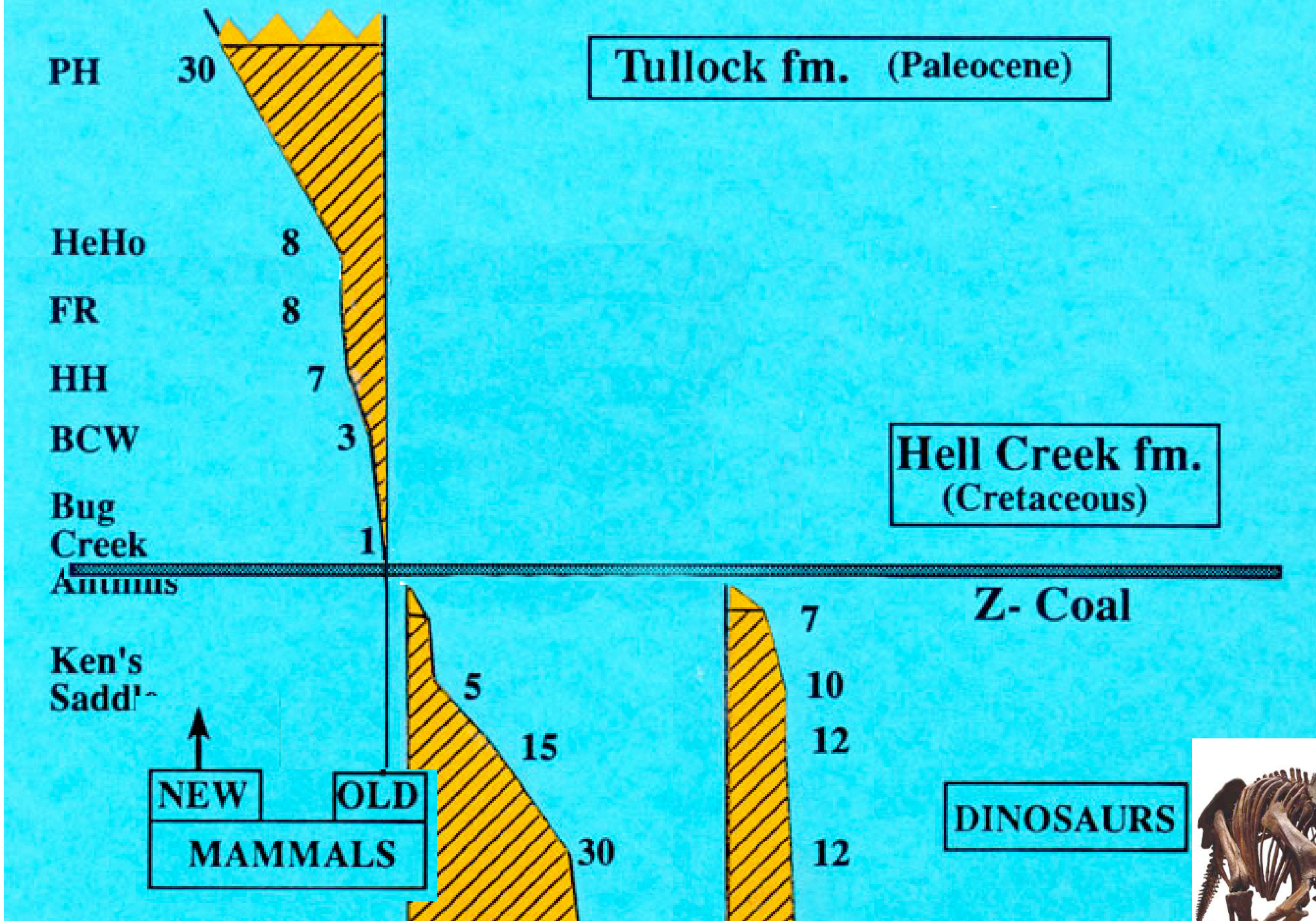


Sloan and Van Valen, 1977



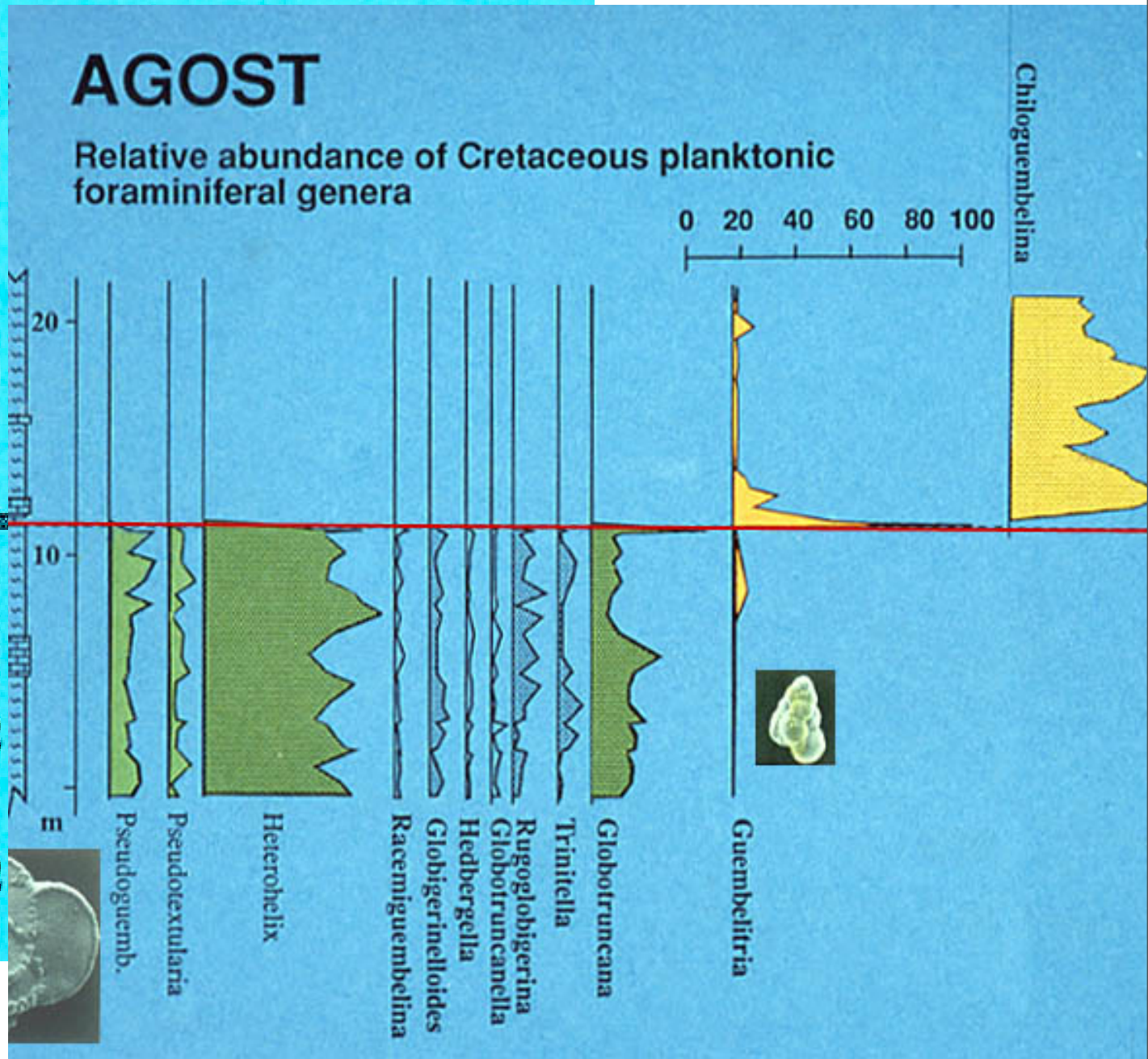
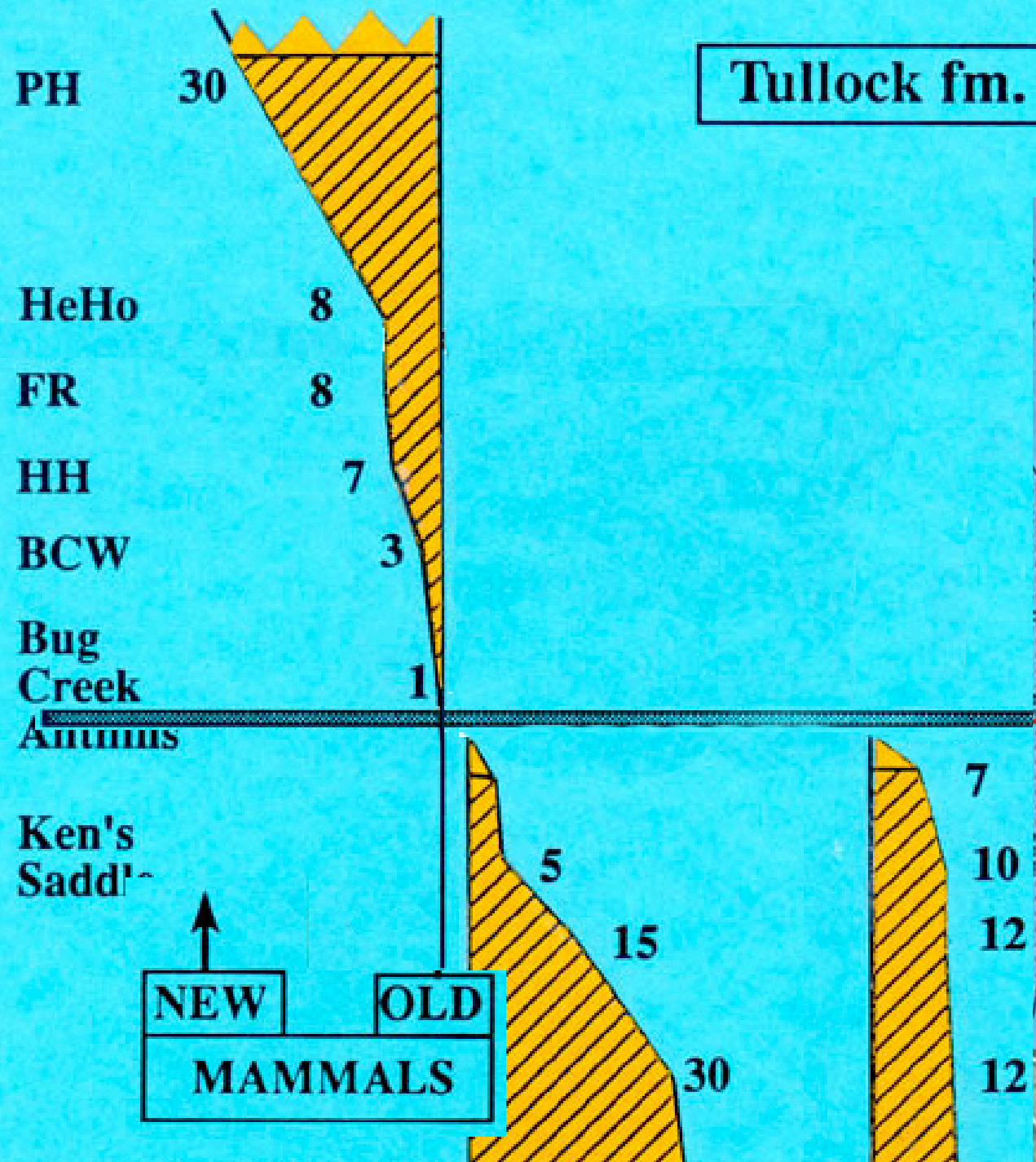


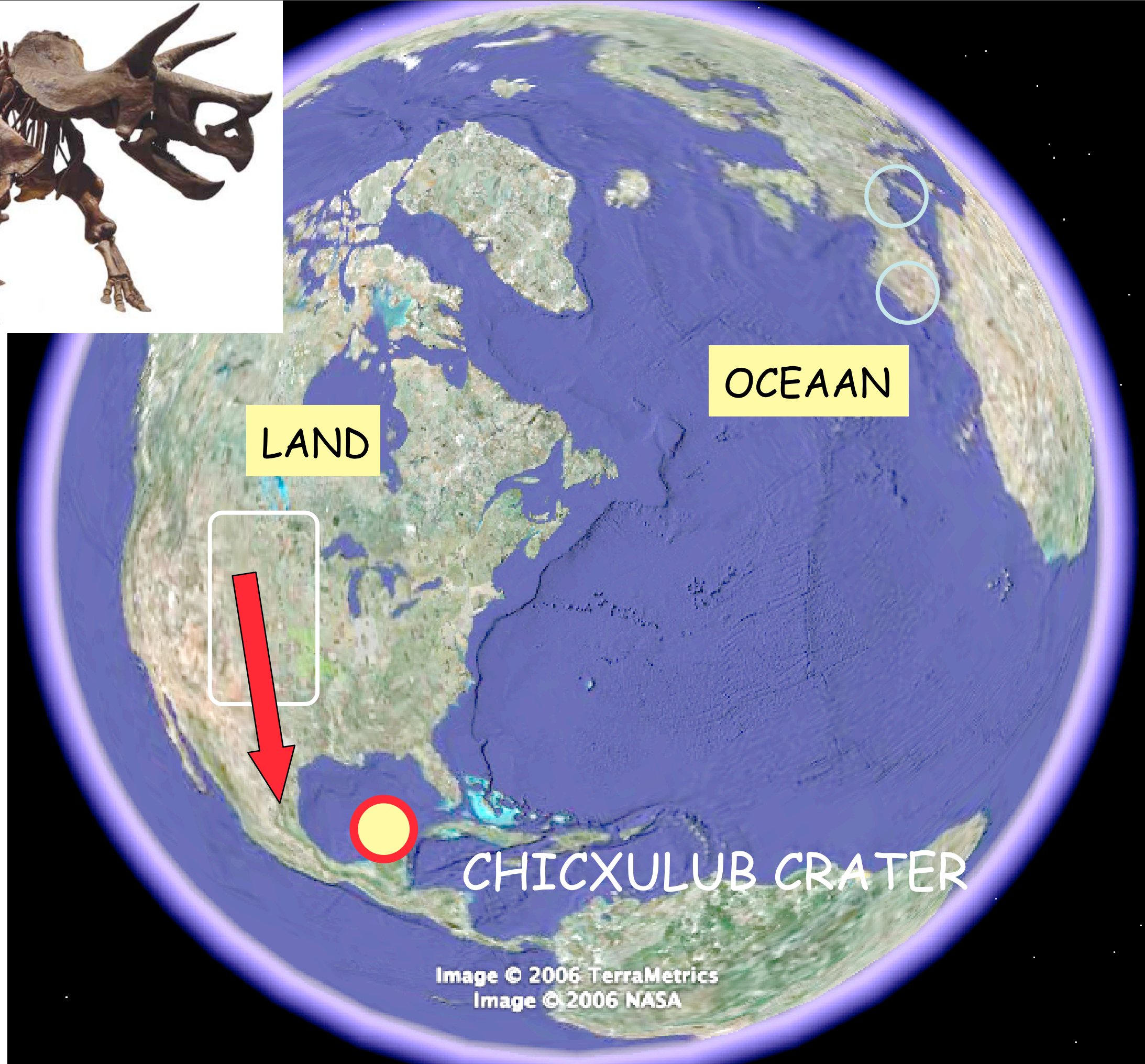
Sloan and Van Valen, 1977



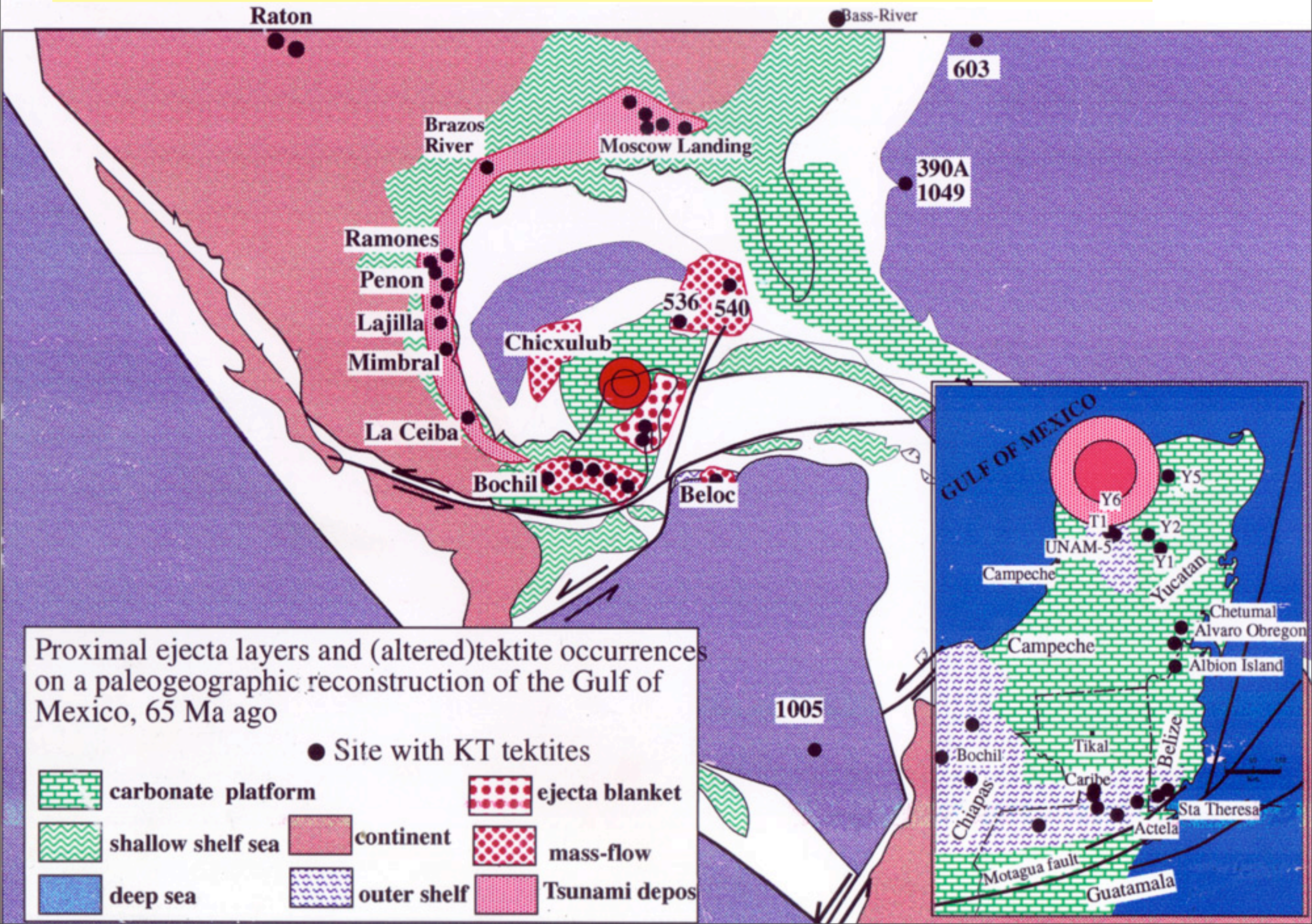
En nu is de overgang op land en in de oceaan wél goed vergelijkbaar!

Sloan and Van Valen, 1977



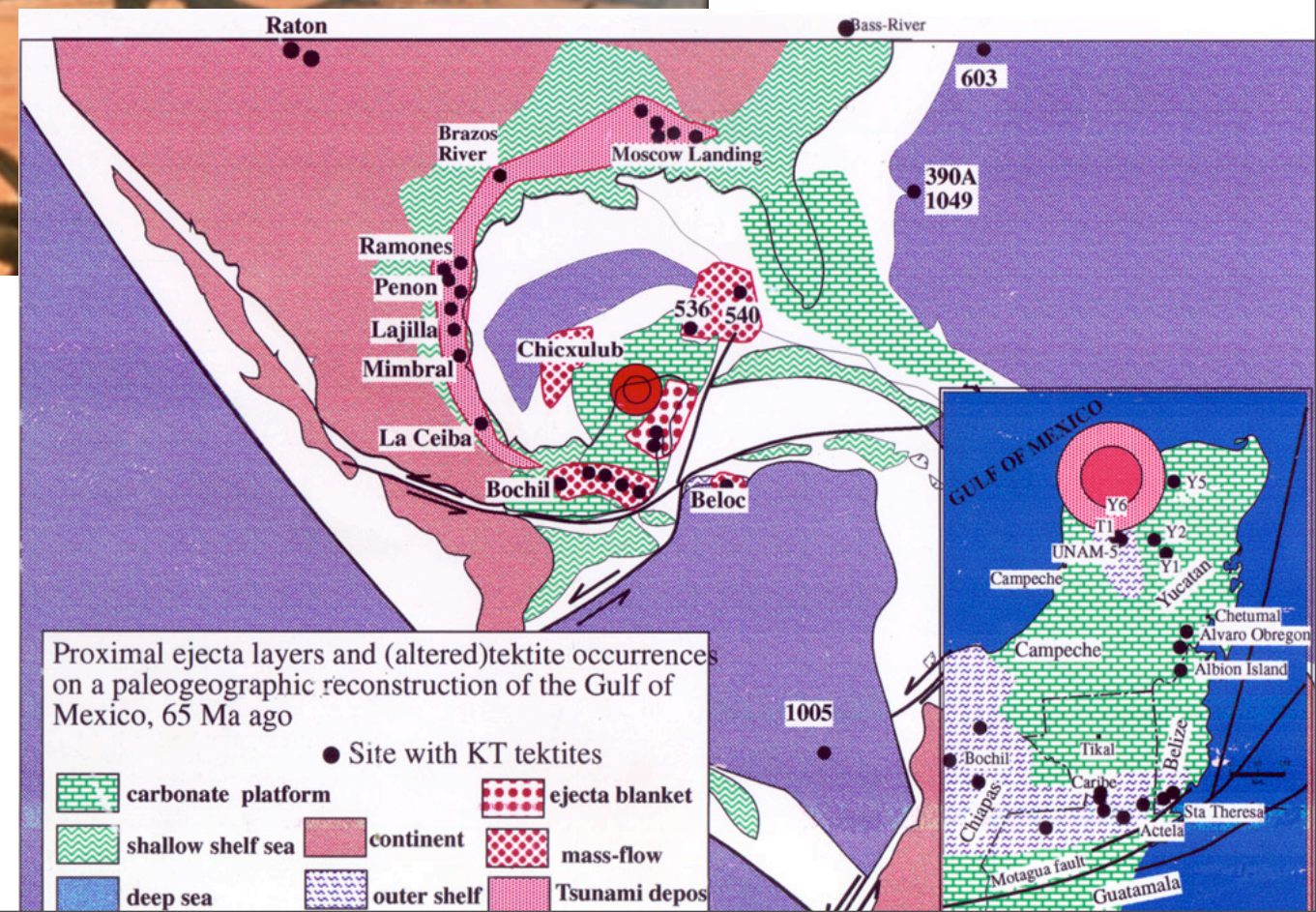


Kaartje zoals de Golf van Mexico er 65 Miljoen jaar geleden uitzag





Tsunami Golven in de Golf van Mexico
?fout plaatje?



TSUNAMI: Muur van water, sterke getijdestromingen



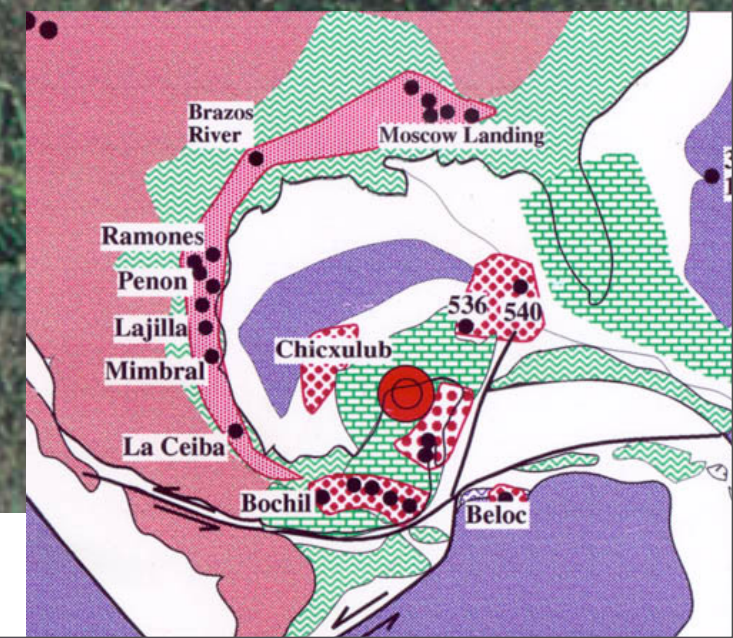
Een dikke zandsteenlaag in Mexico

El Mulato Tamaulipas Mexico

Paleocene

K/T boundary

Maastrichtian



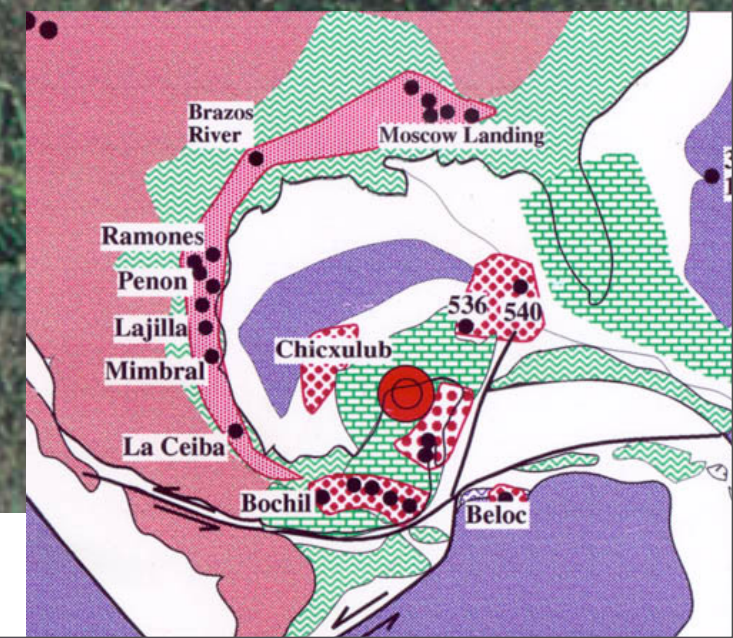
Een dikke zandsteenlaag in Mexico

El Mulato Tamaulipas Mexico

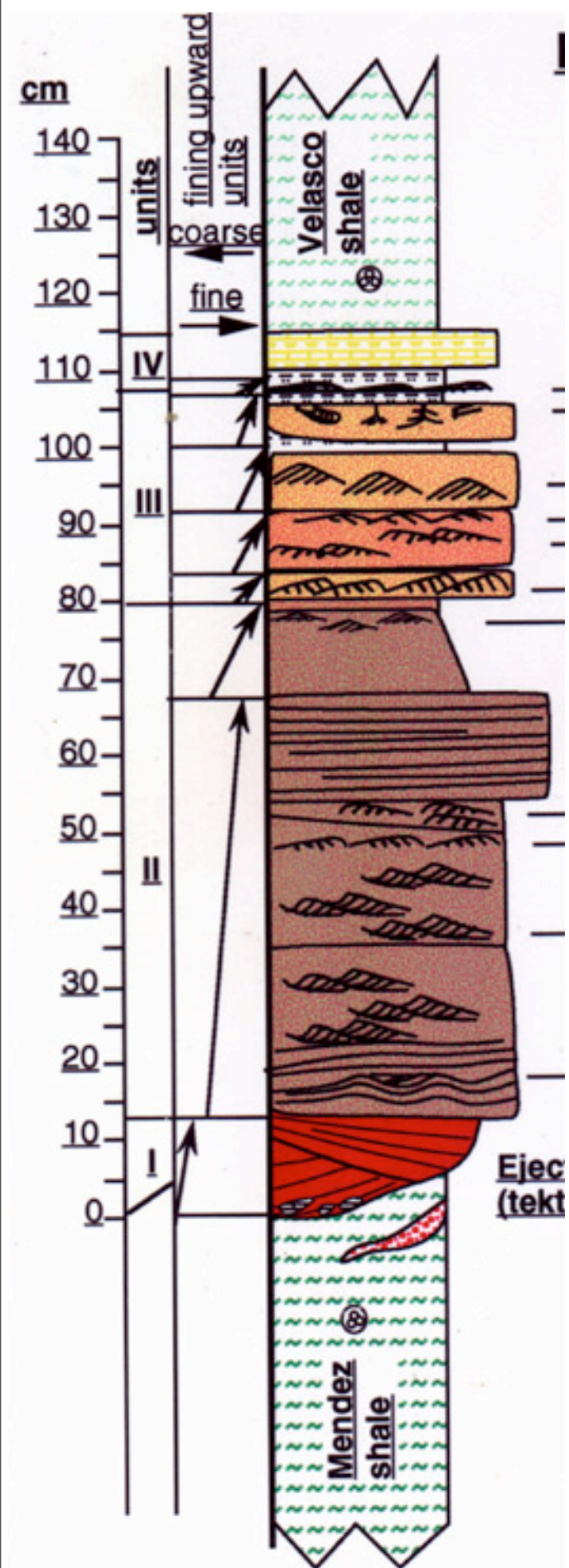
Paleocene

K/T boundary

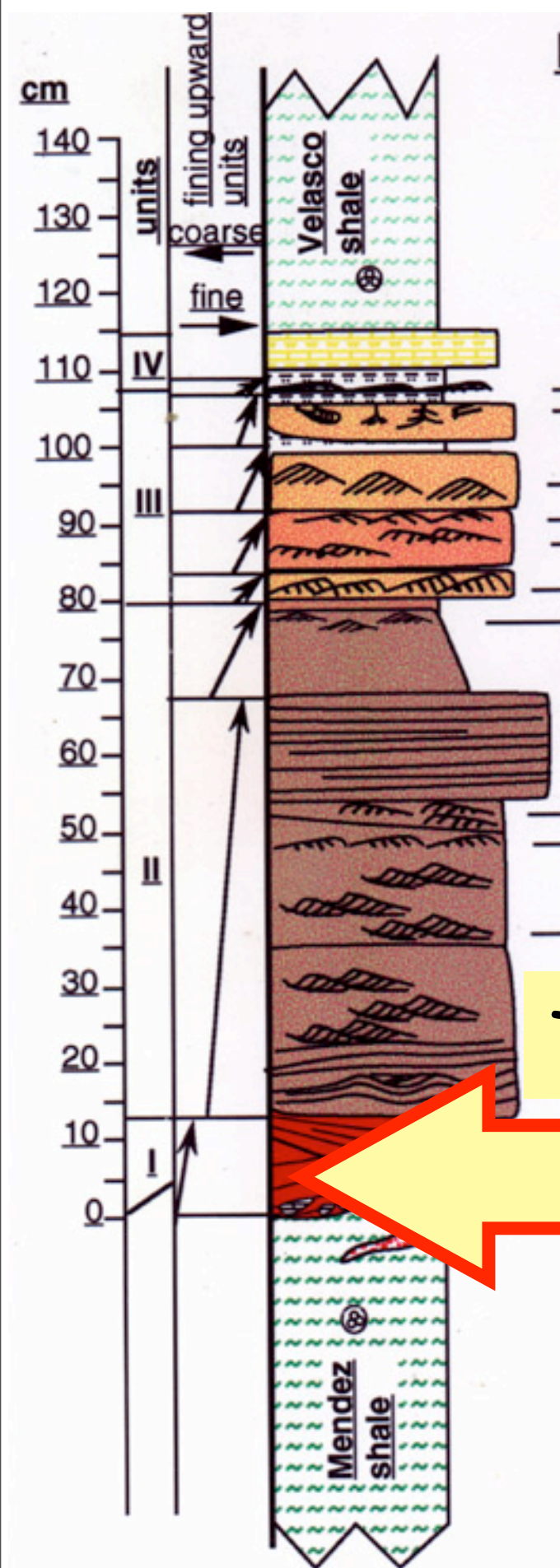
Maastrichtian



Sedimentologie van de Tsunamilaag

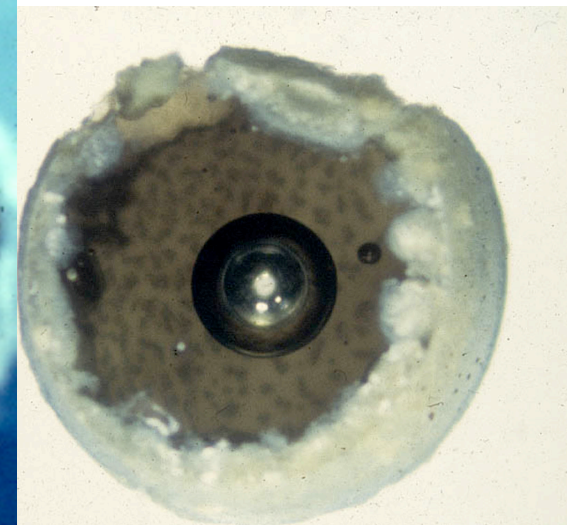
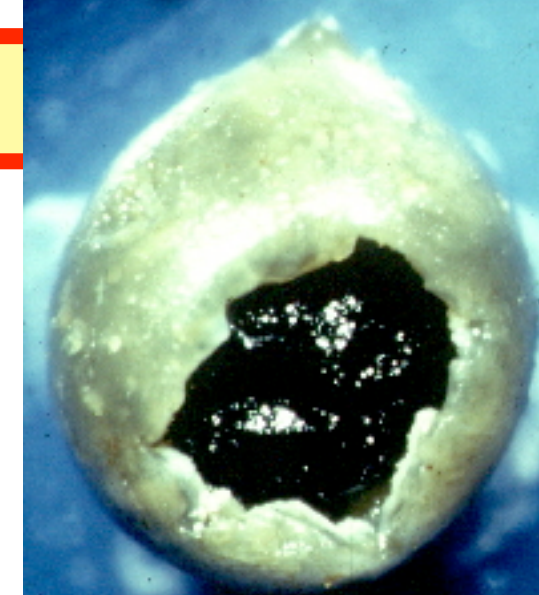


Sedimentologie van de Tsunami laag



Tektieten onderin

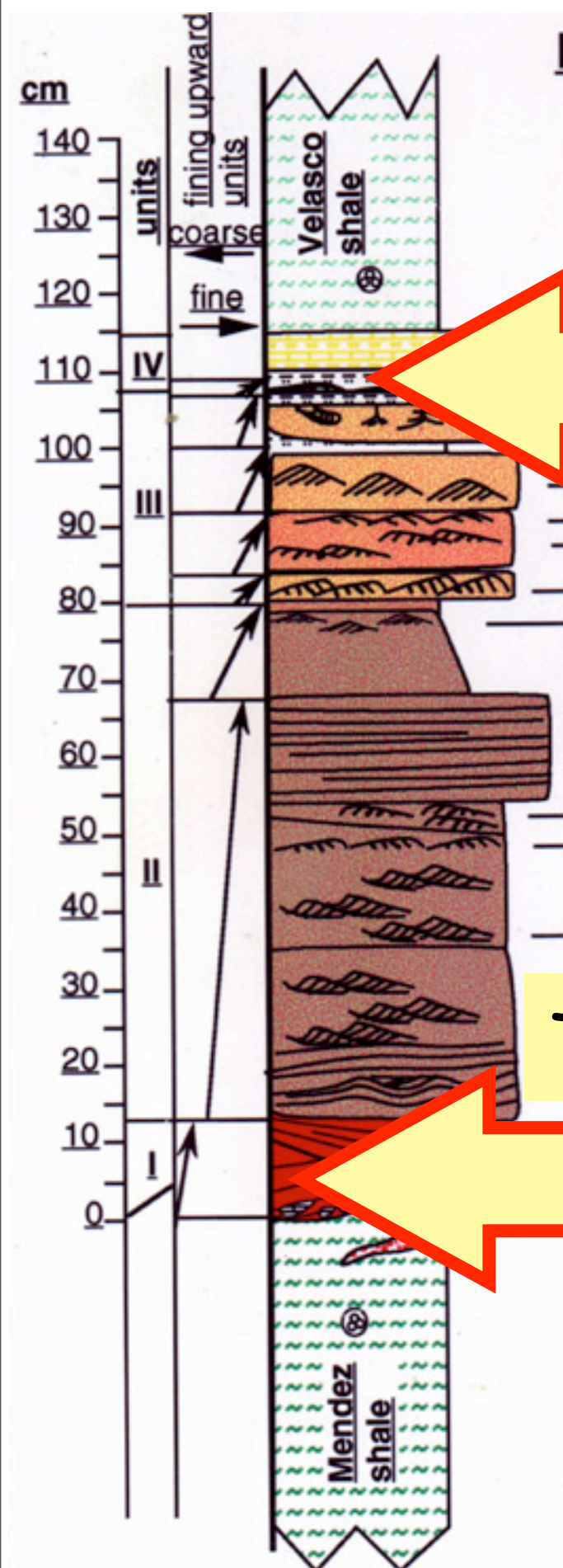
Glass core inside a K T spherule



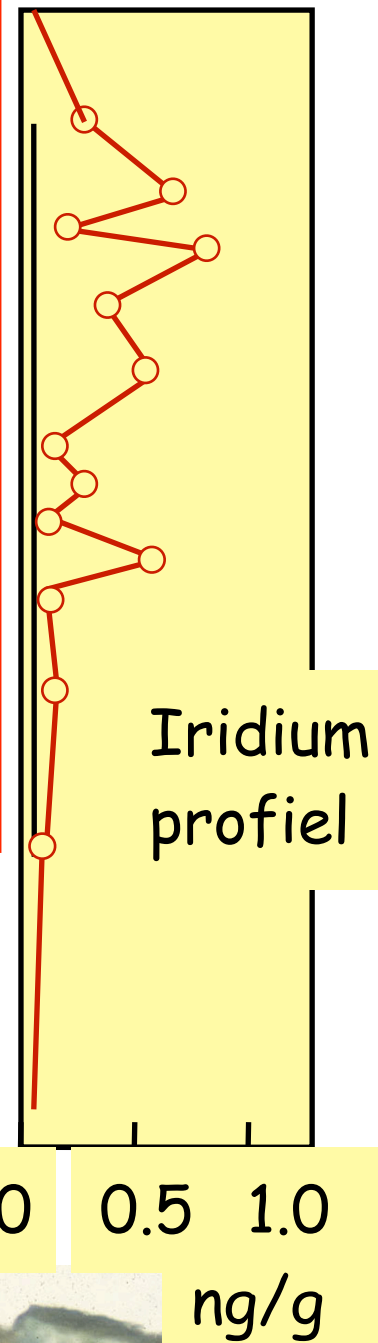
0.3 mm

Photo G. Izett

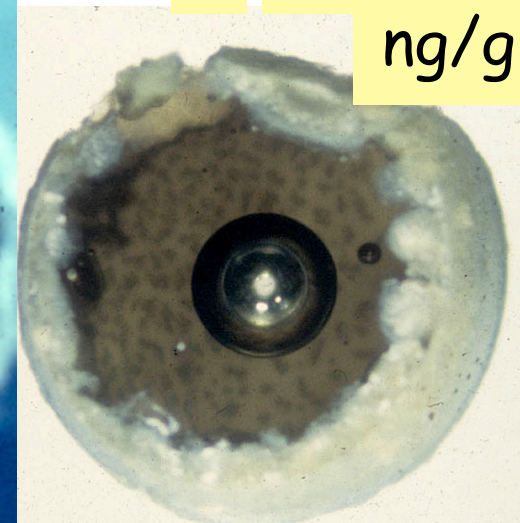
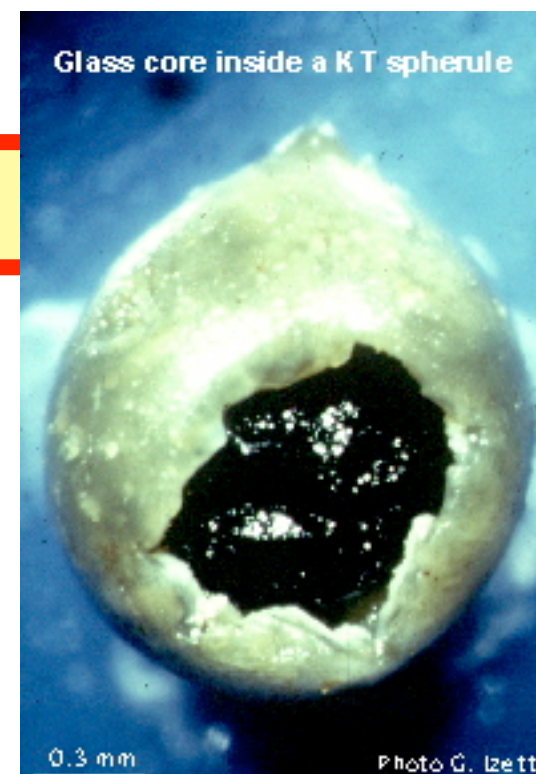
Sedimentologie van de Tsunamilaag



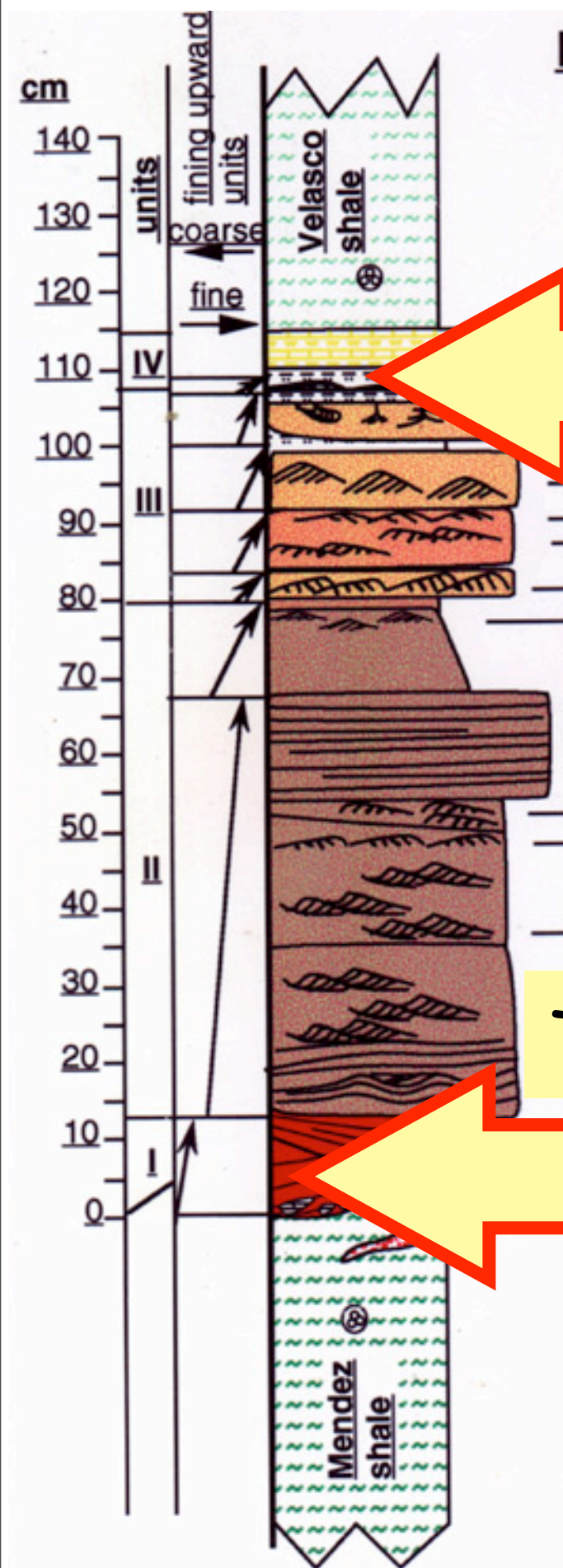
Iridium bovenin



Tektieten onderin



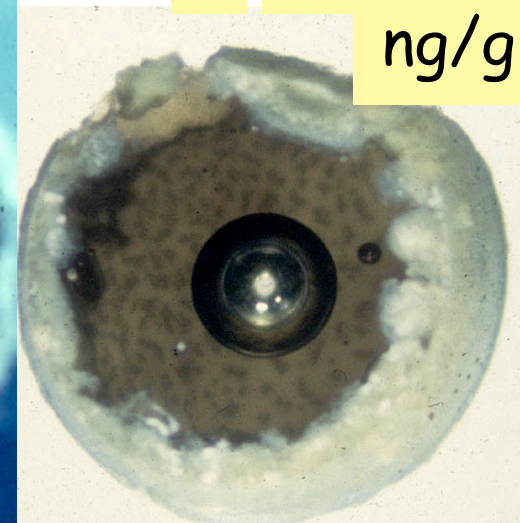
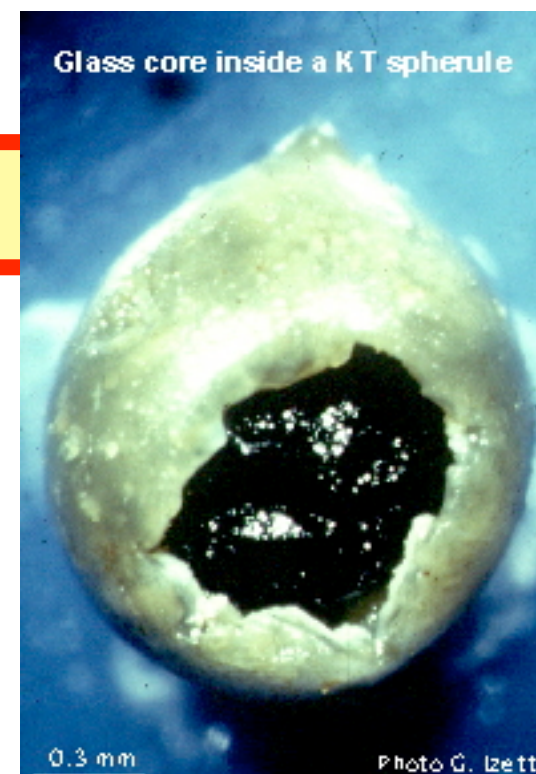
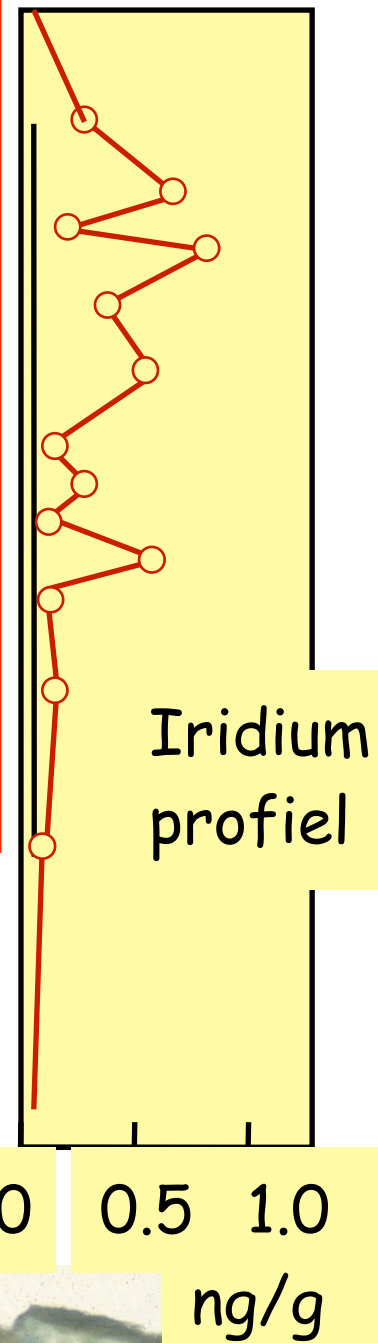
Sedimentologie van de Tsunamilaag



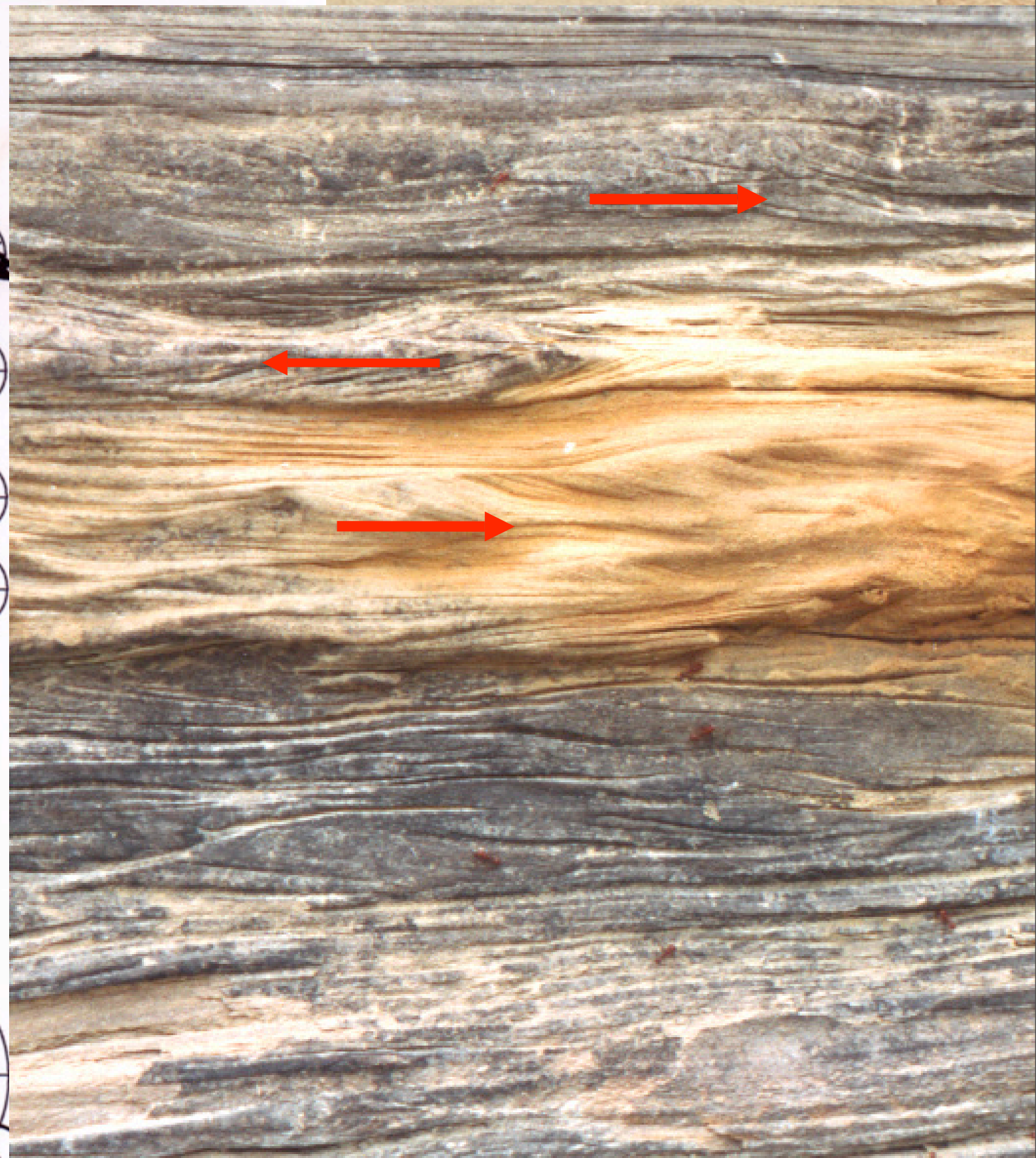
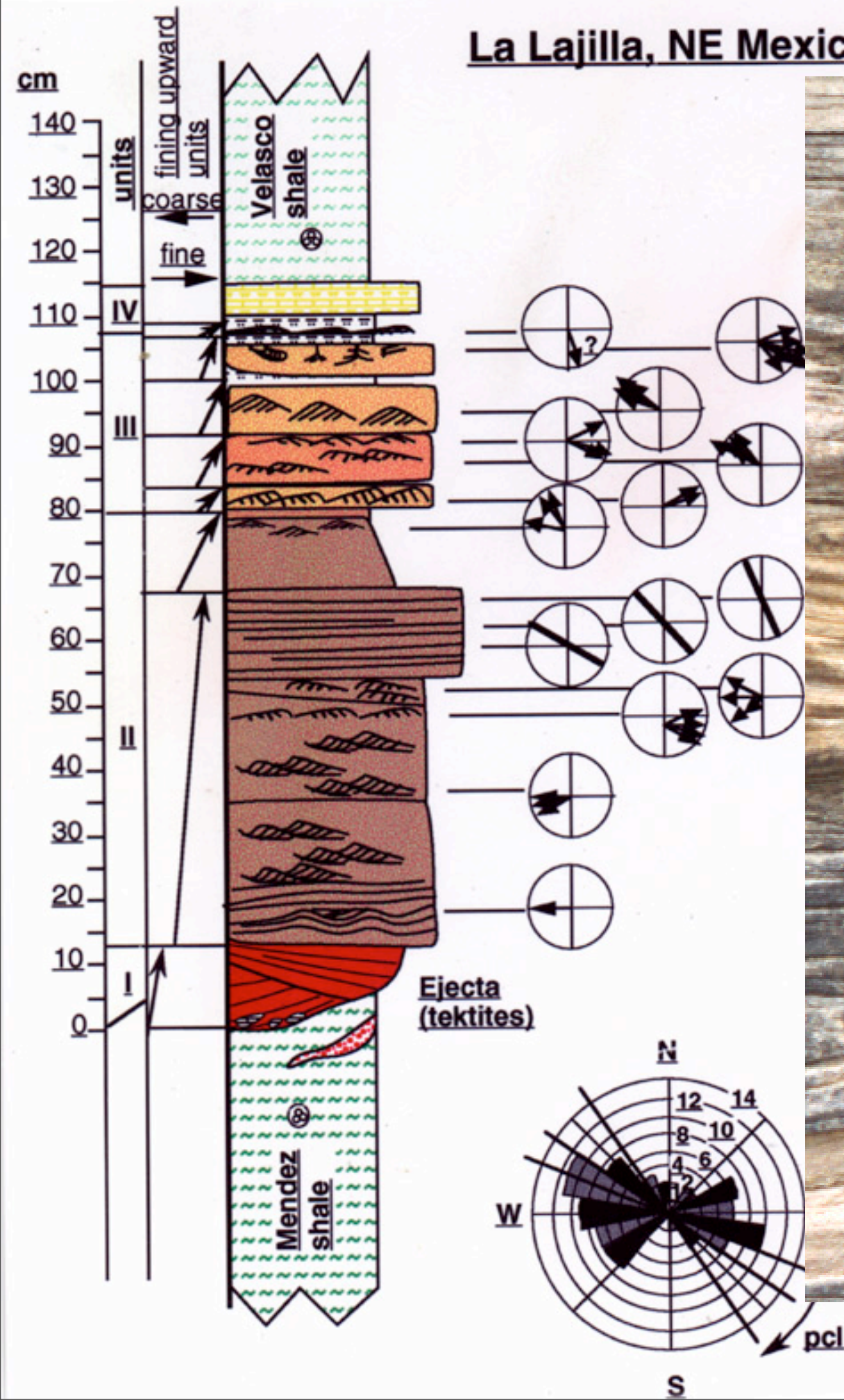
Iridium bovenin

Zandsteen ertussenin

Tektieten onderin



La Lajilla, NE Mexico



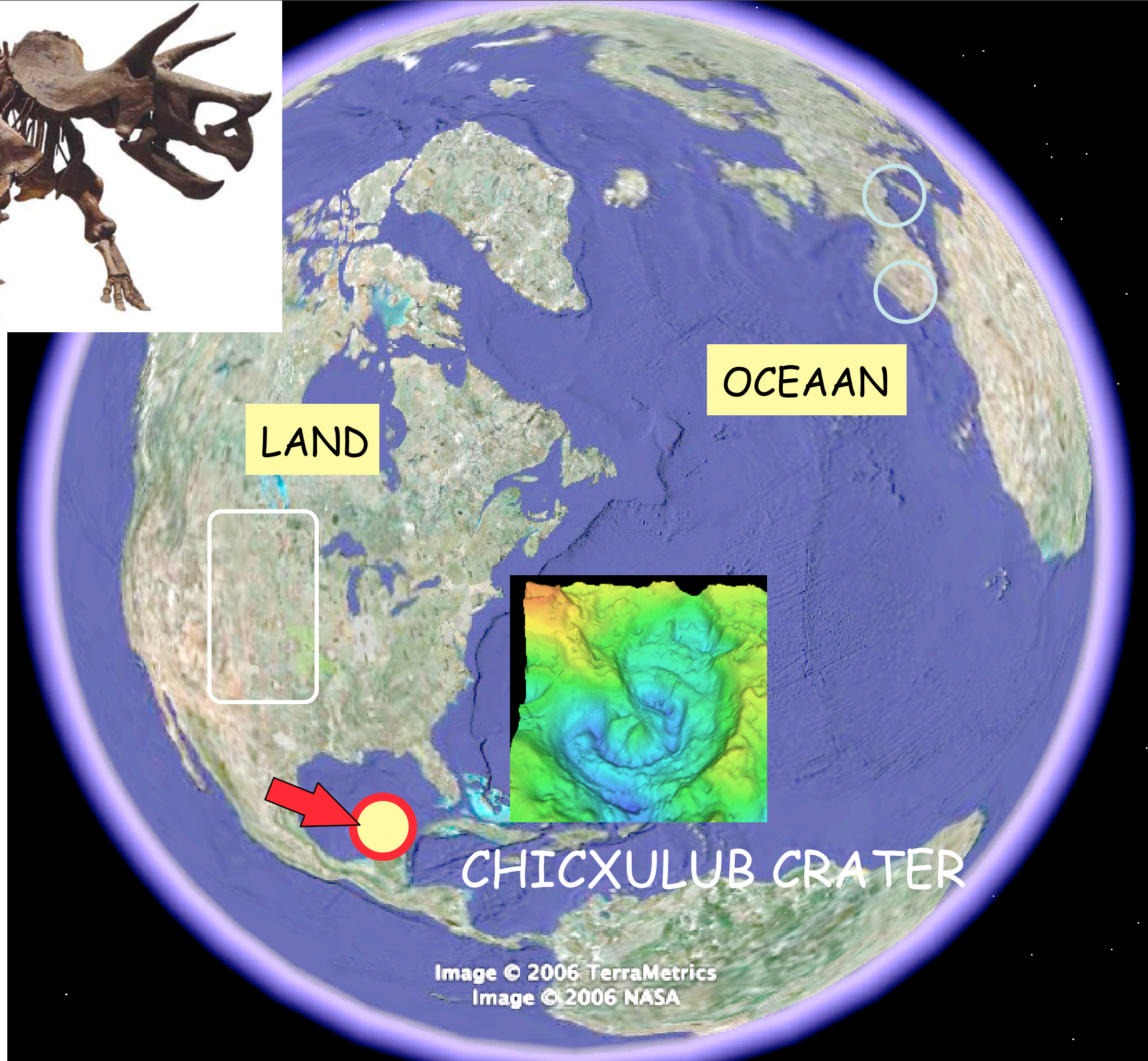


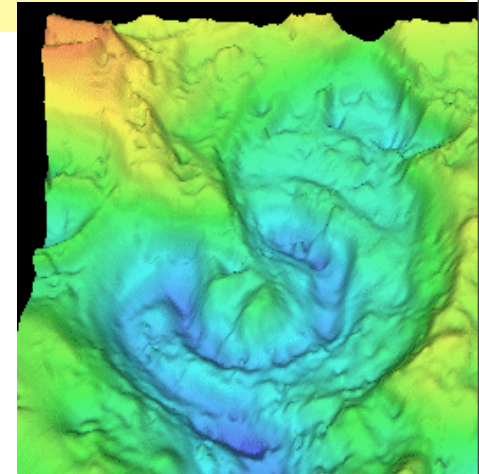
Image © 2006 TerraMetrics
Image © 2006 NASA

Diepboring in de Krater

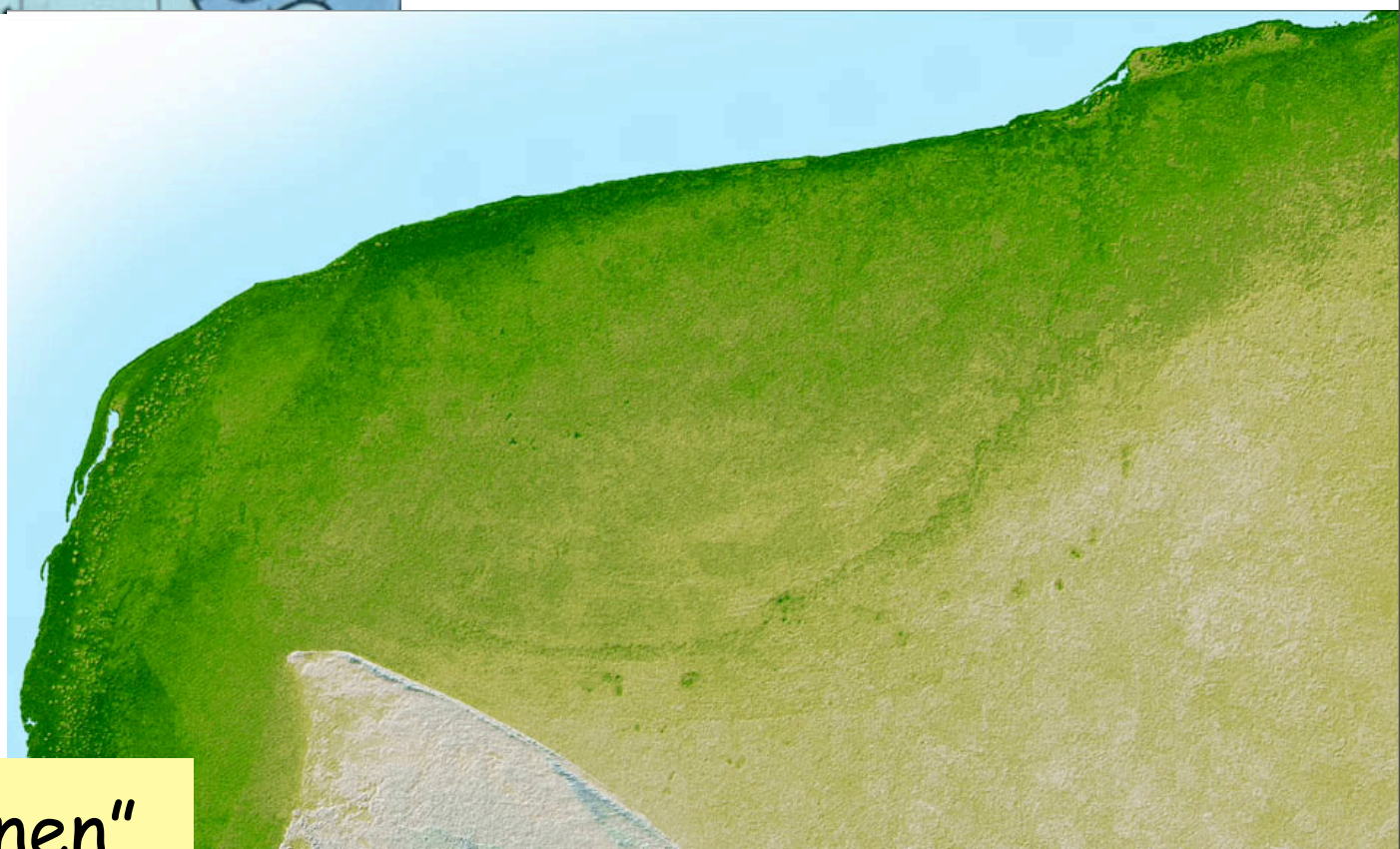
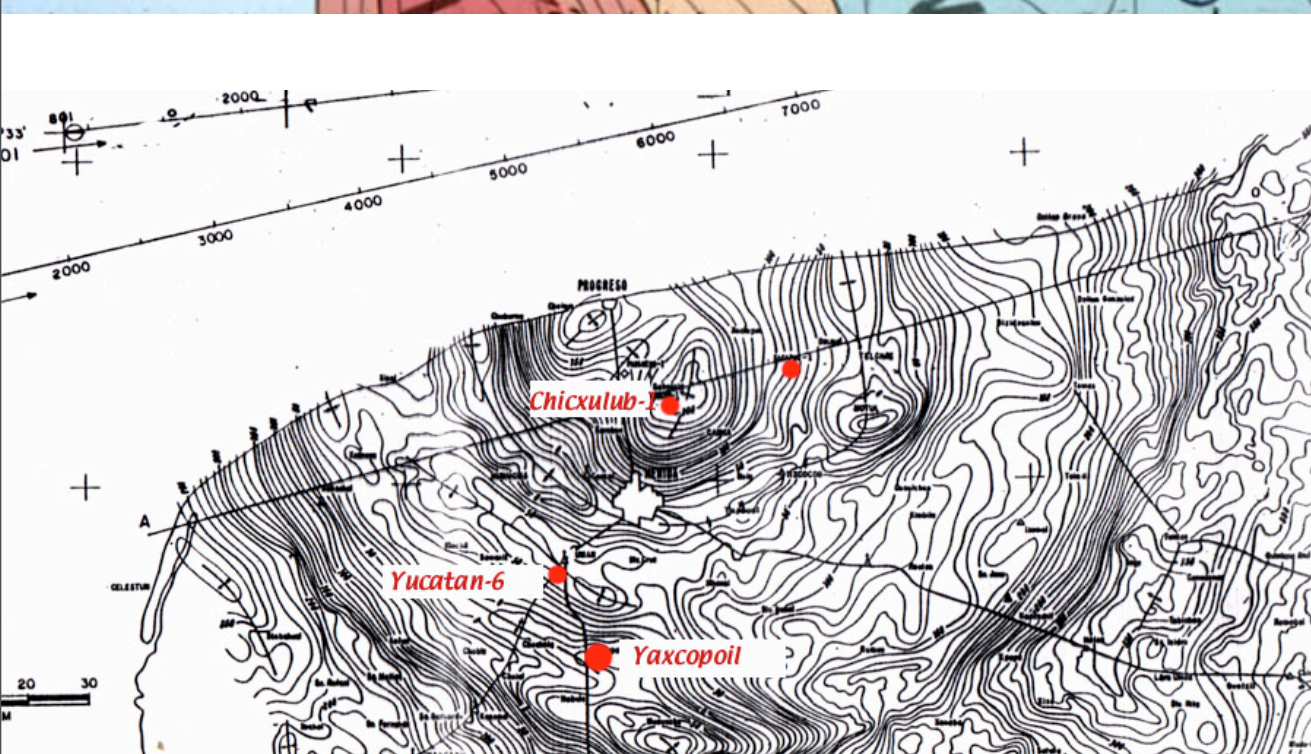
Chicxulub
Scientific
Drilling
Project

CSDP

Chicxulub crater



Magnetische afwijkingen
Isomilligal contours



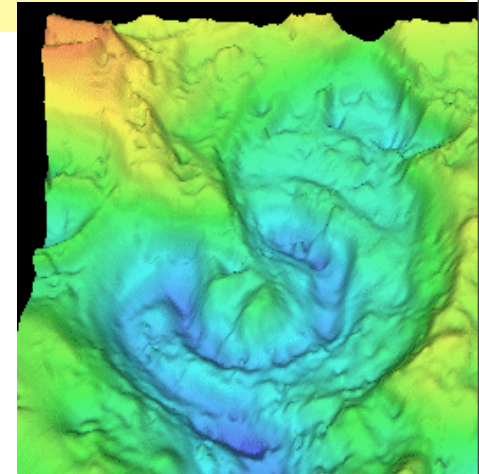
zwaartekrachtsafwijkingen "hoogtelijnen"

Diepboring in de Krater

Chicxulub
Scientific
Drilling
Project

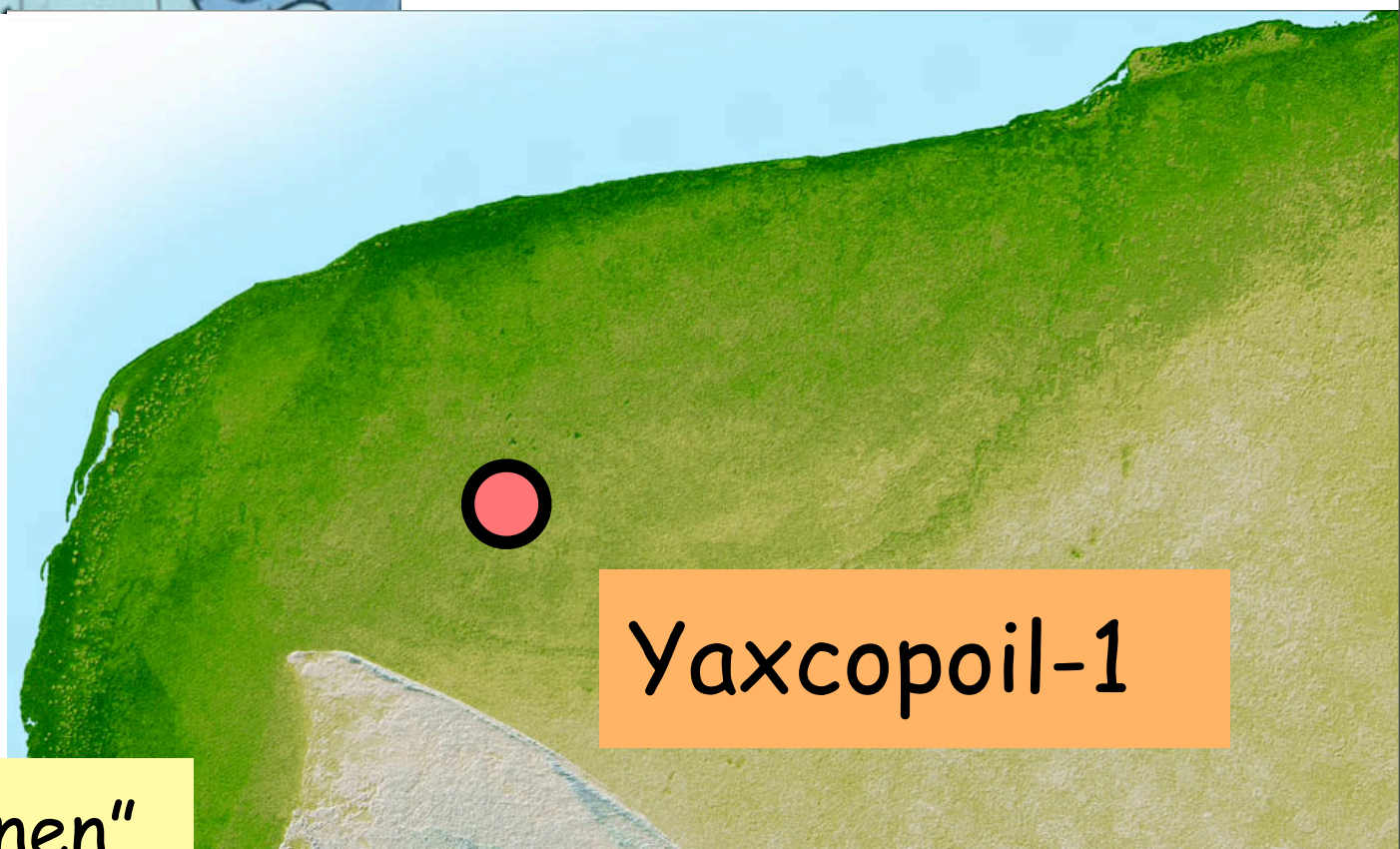
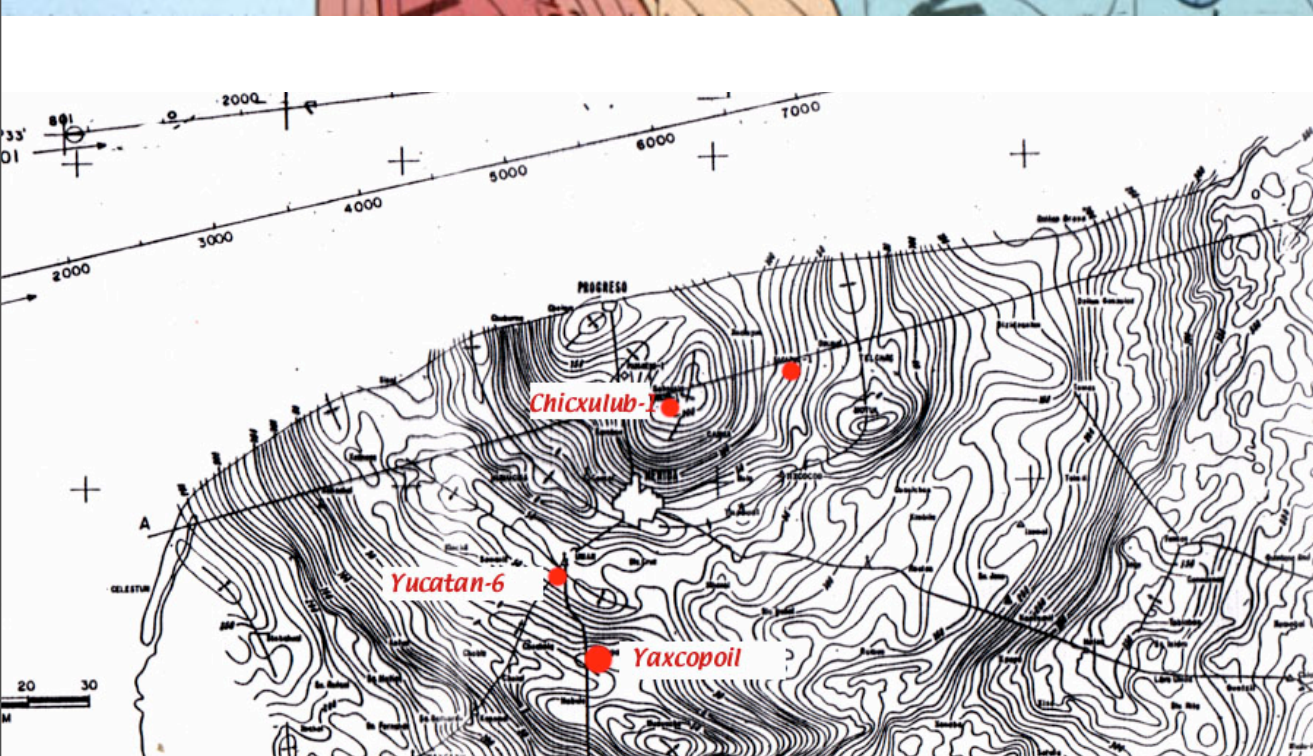
CSDP

Chicxulub crater



Magnetische afwijkingen
Isomilligal contours

Yaxcopoil-1

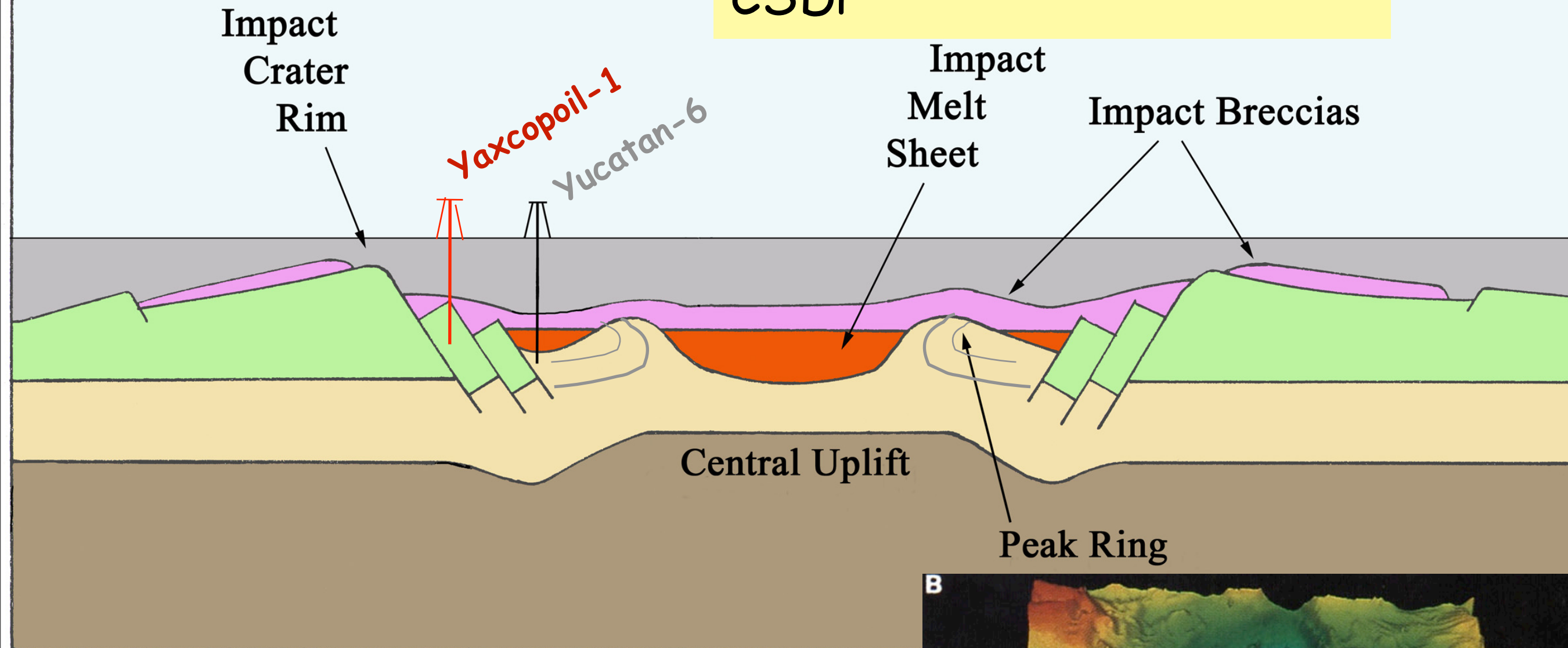


Yaxcopoil-1

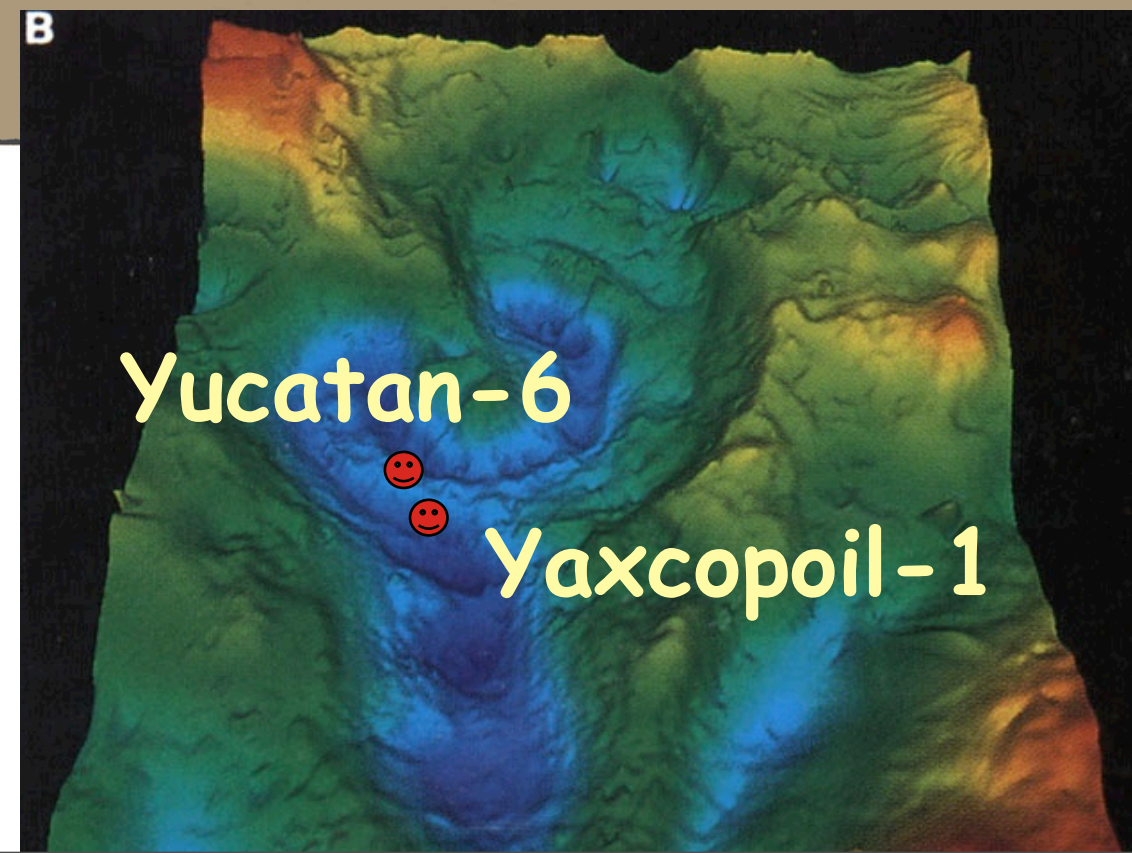
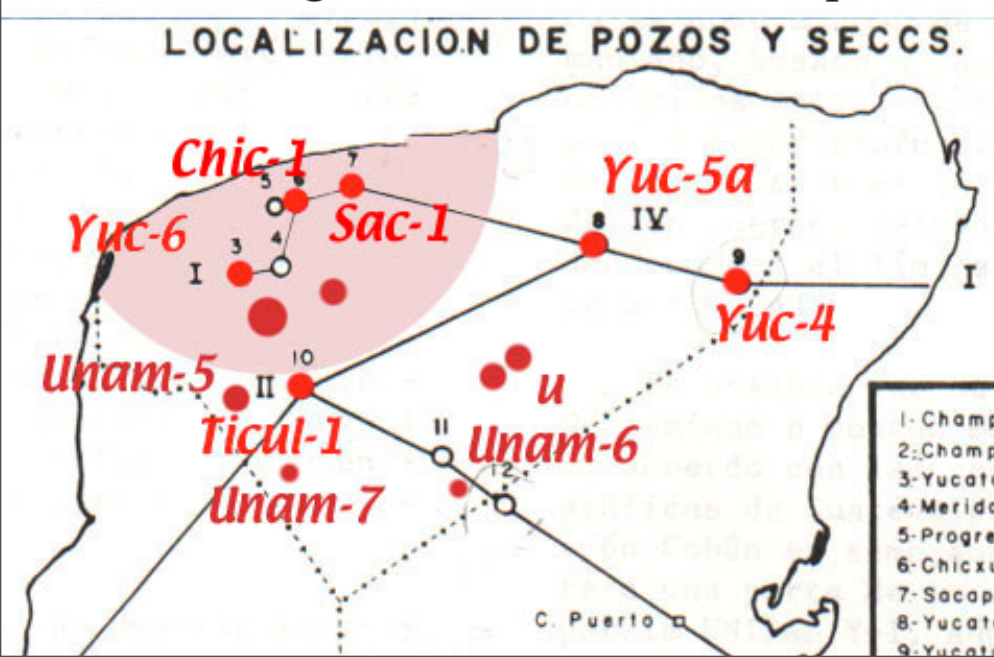
zwaartekrachtsafwijkingen "hoogtelijnen"

Yaxcopoil-1, where to drill?

Chicxulub drilling project, CSDP



David A. Kring, NASA/Univ. Arizona Space Imagery Center

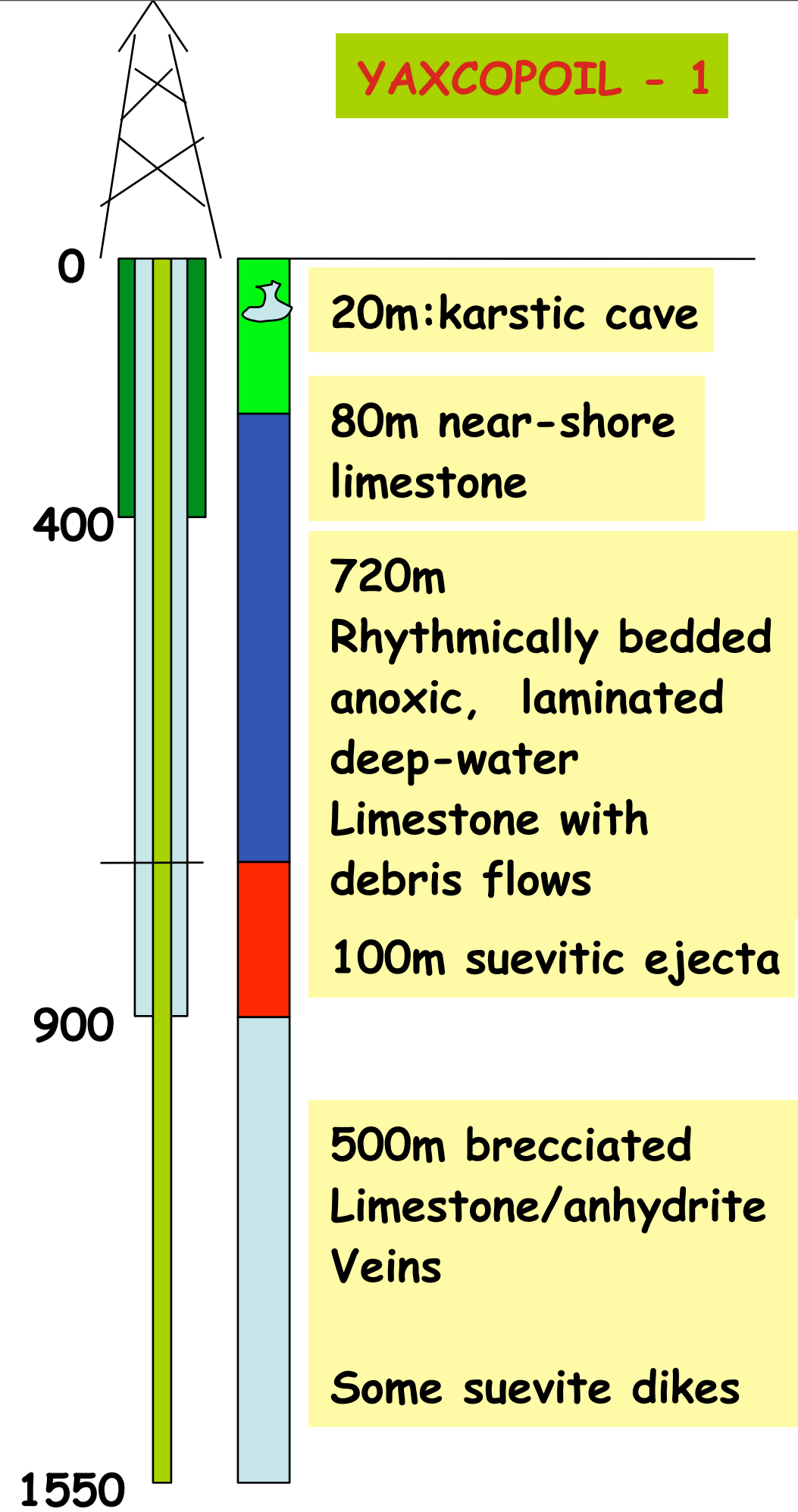




Chicxulub
Scientific
Drilling
Project

CSDP

YAXCOPOIL - 1



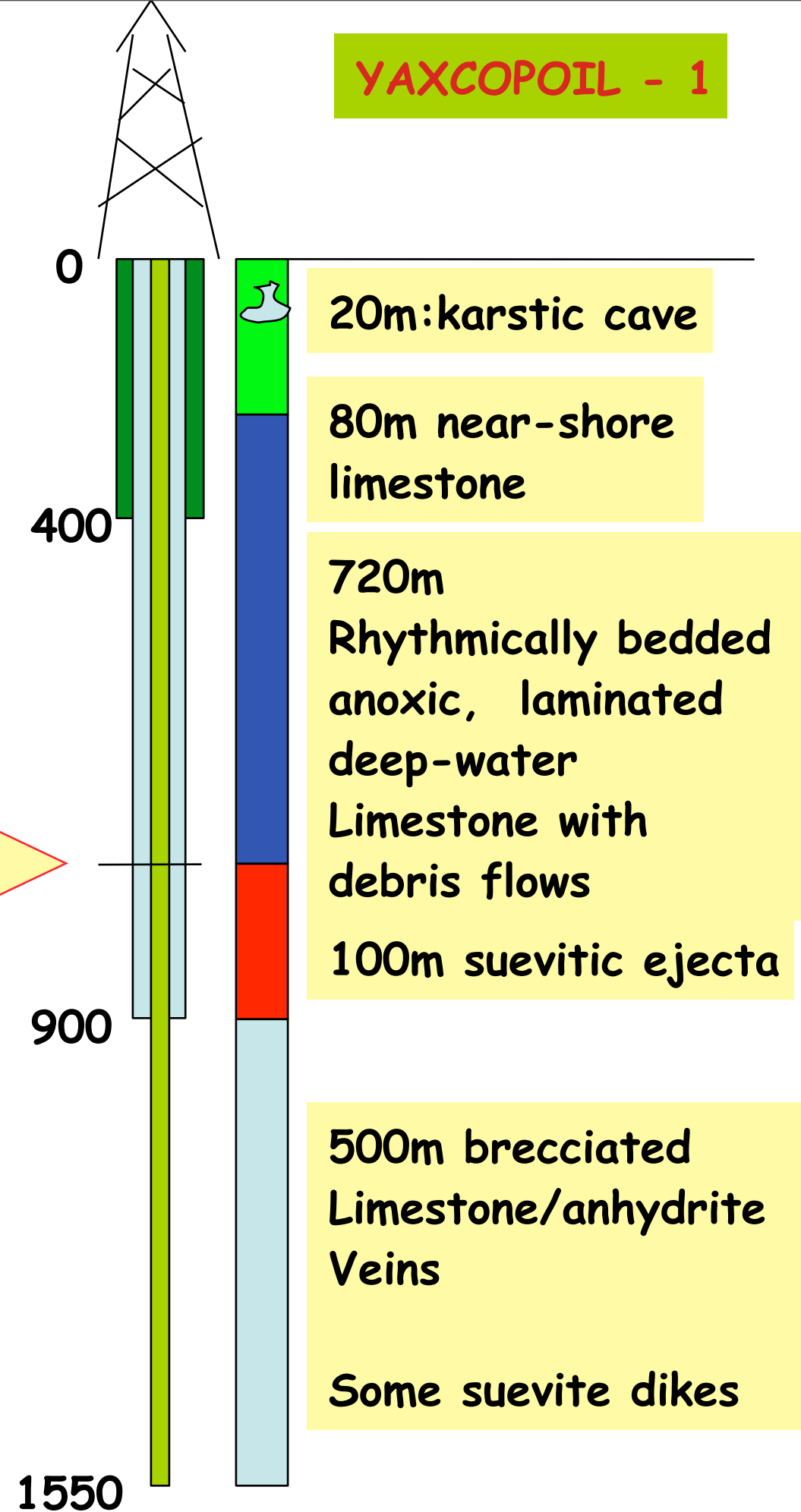


Chicxulub
Scientific
Drilling
Project

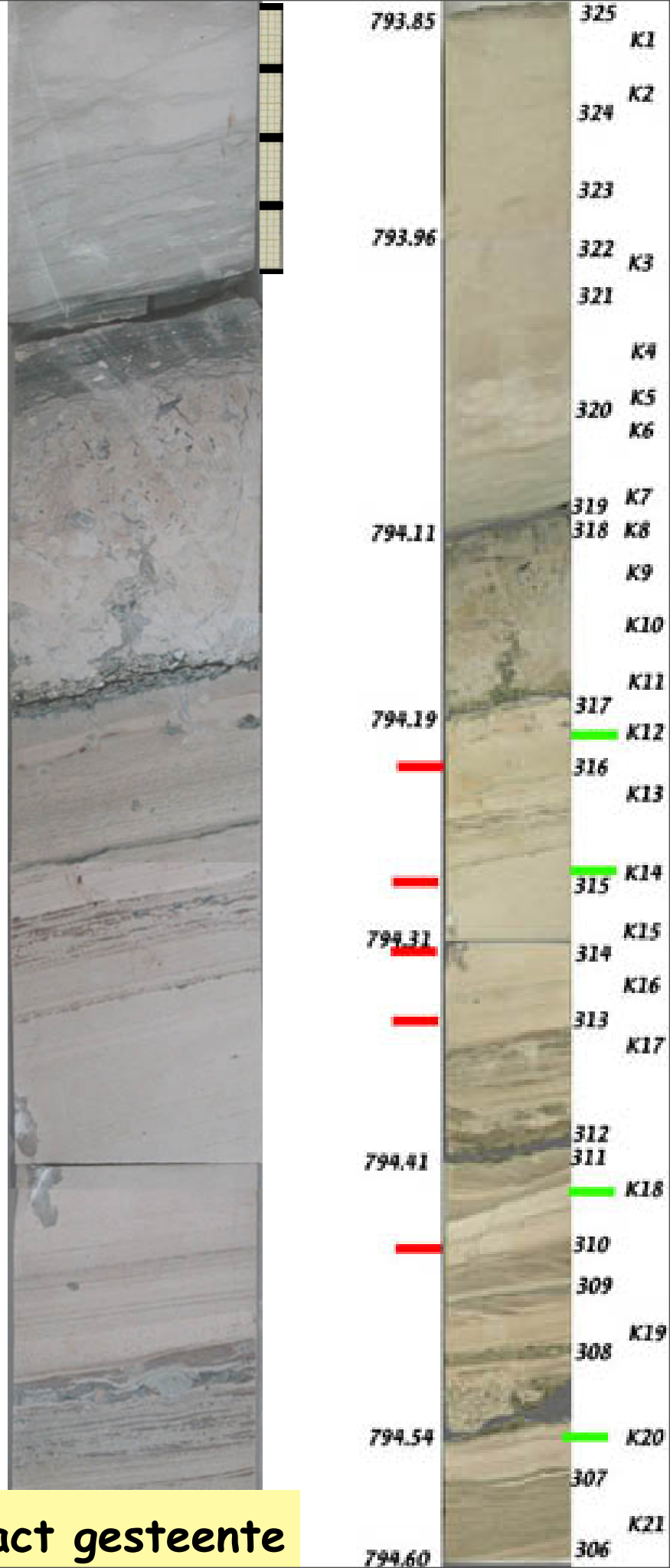
CSDP

YAXCOPOIL - 1

CRUCIAL CORE SEGMENT

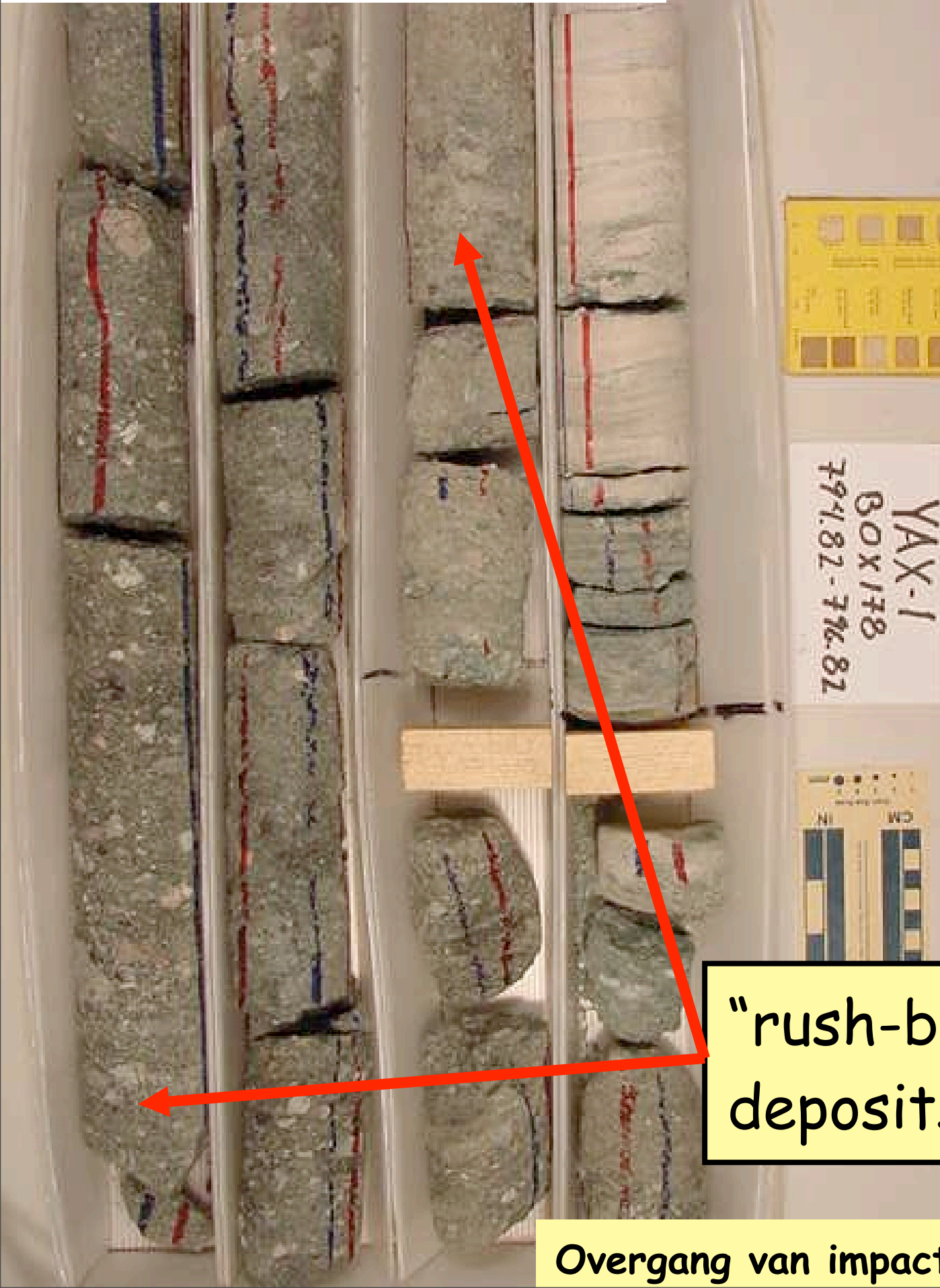


CRUCIAL CORE SEGMENT



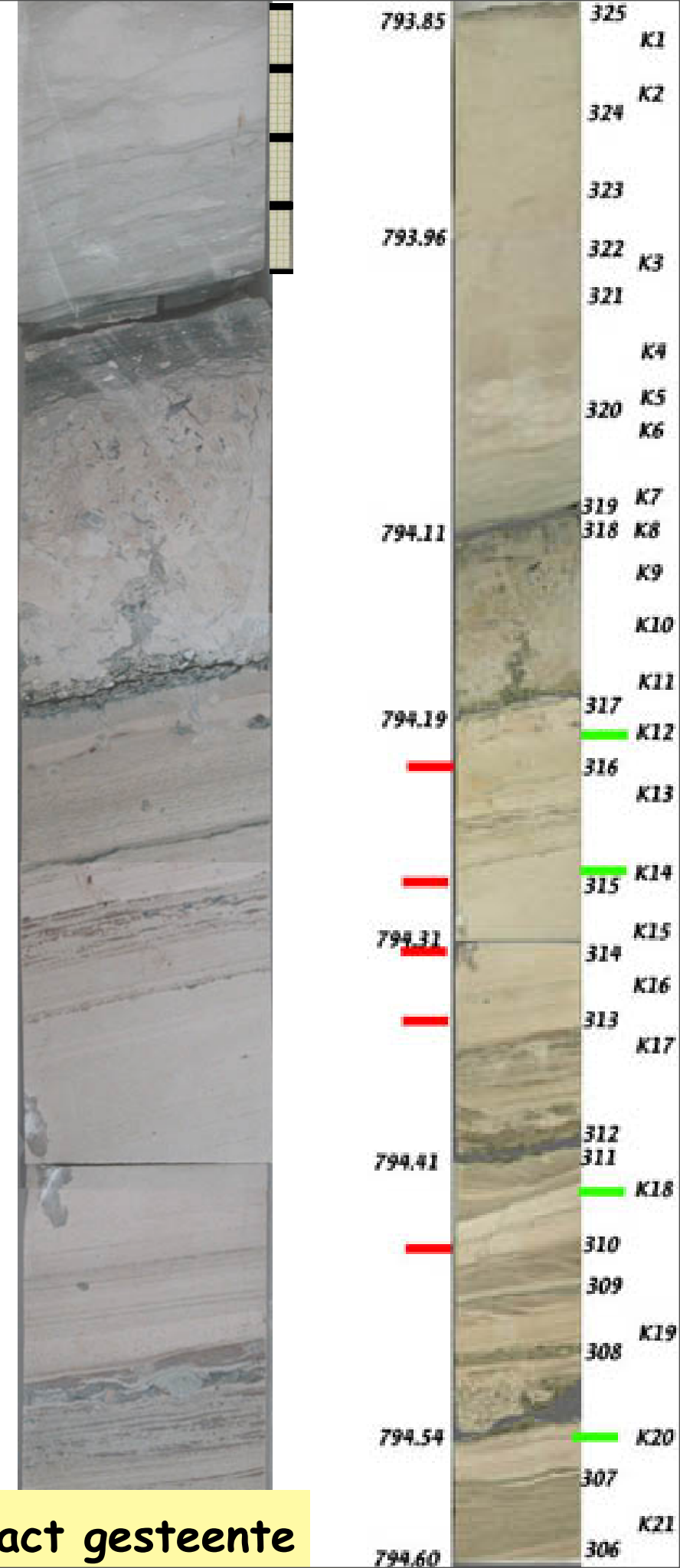
Overgang van impact naar post-impact gesteente

CRUCIAL CORE SEGMENT

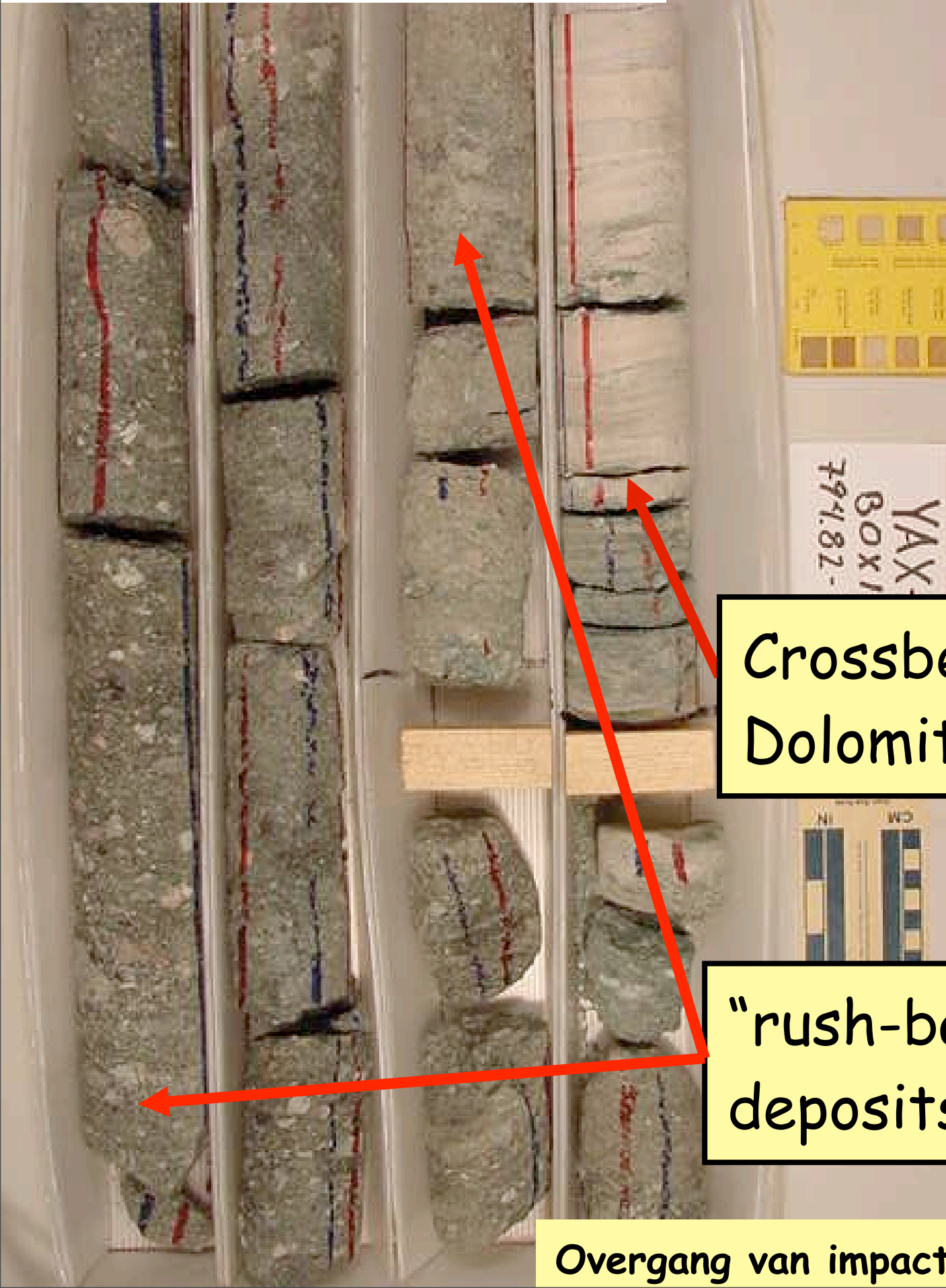


"rush-back deposits"

Overgang van impact naar post-impact gesteente



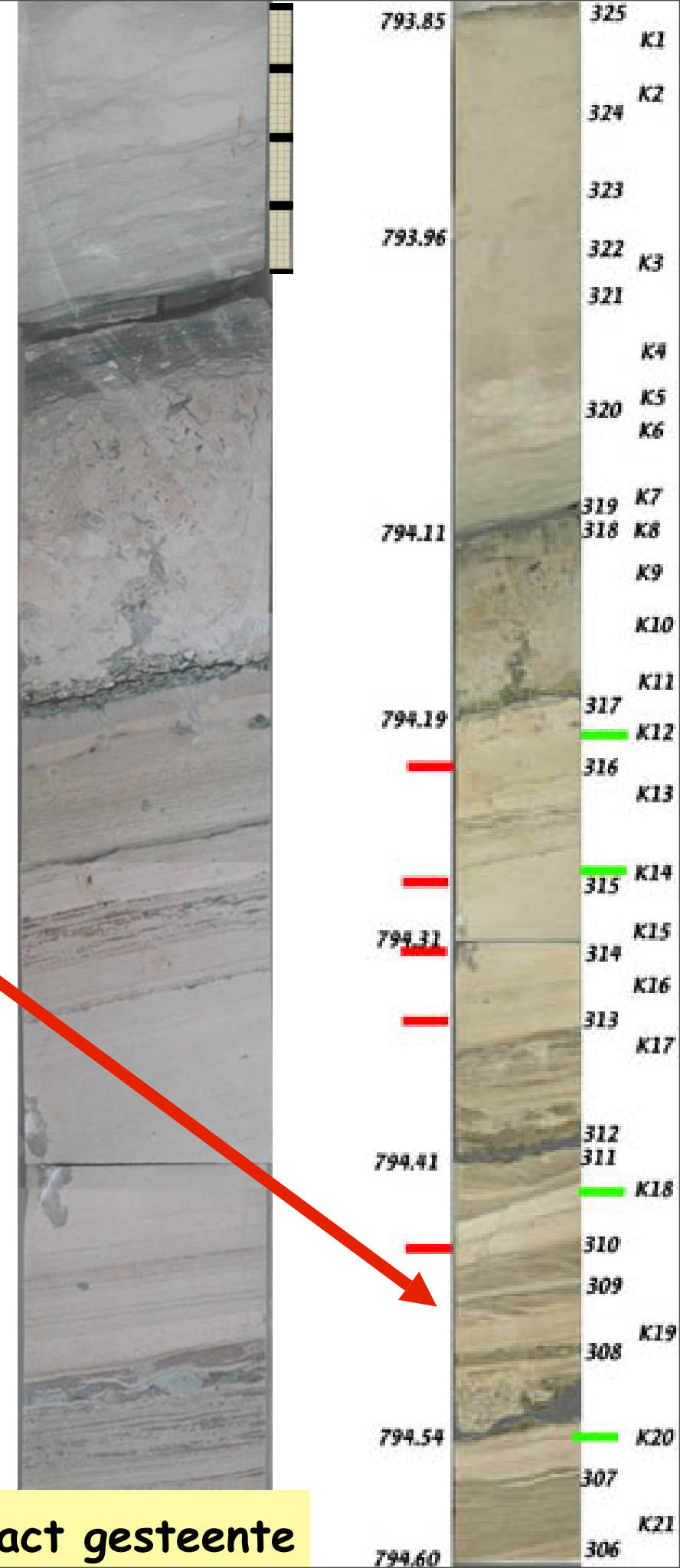
CRUCIAL CORE SEGMENT



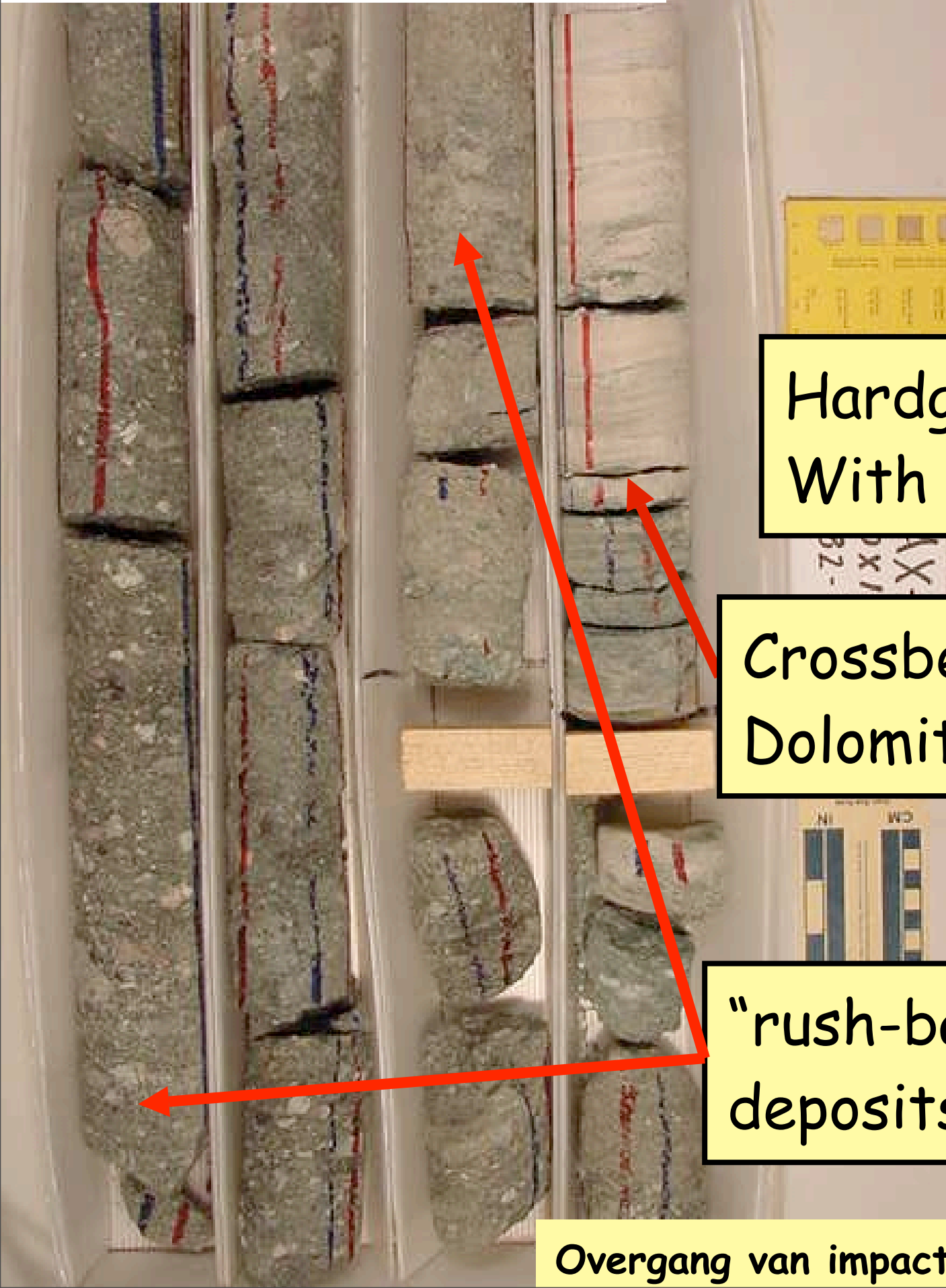
Crossbedded
Dolomitic sands

"rush-back
deposits"

Overgang van impact naar post-impact gesteente



CRUCIAL CORE SEGMENT

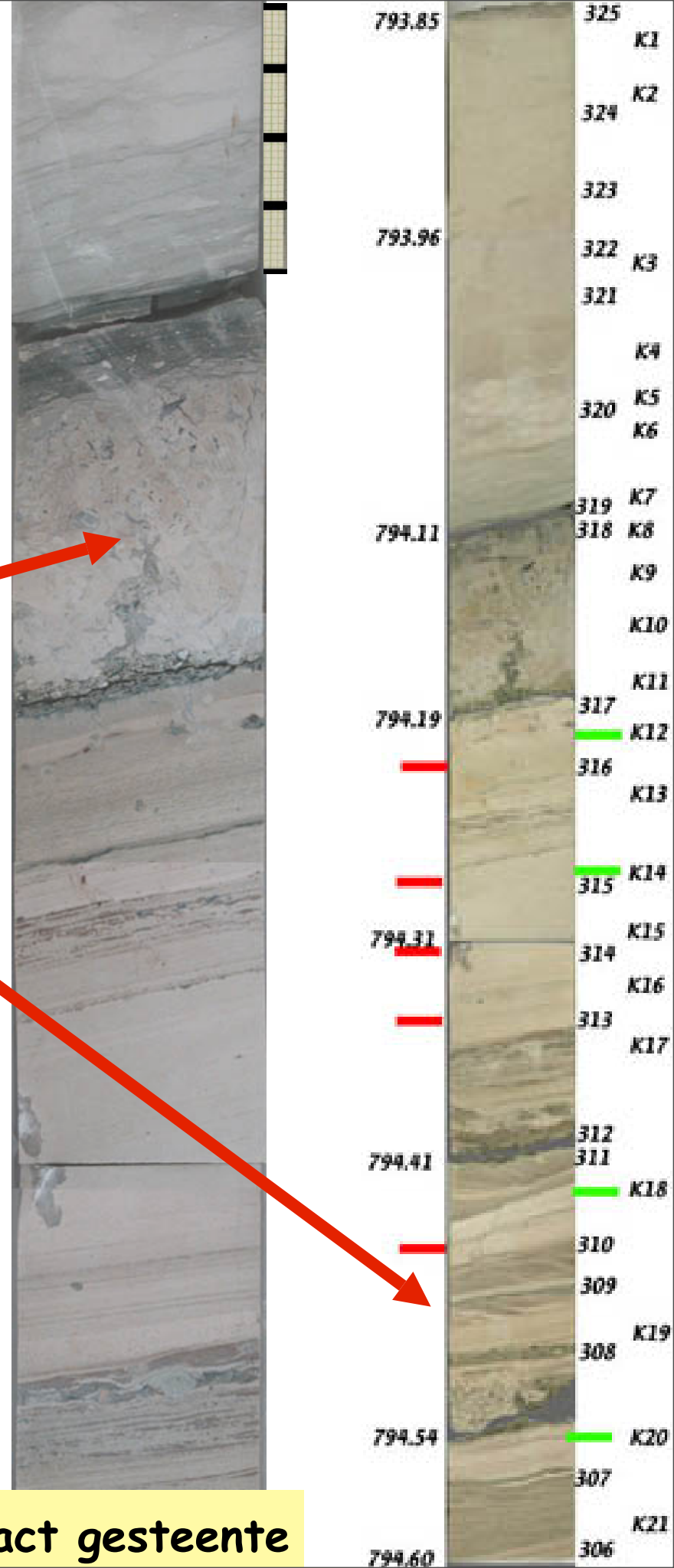


Hardground,
With burrows

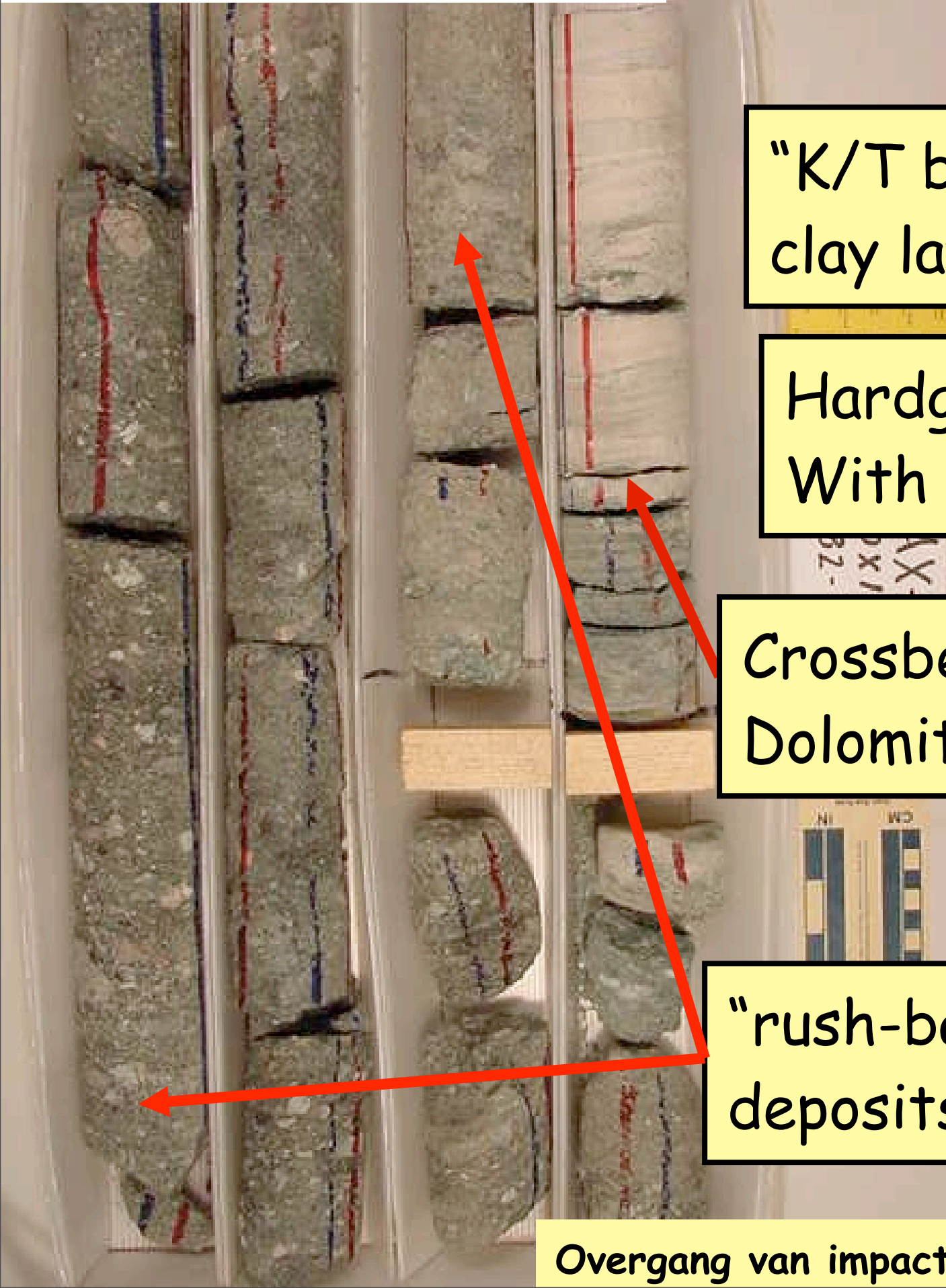
Crossbedded
Dolomitic sands

"rush-back
deposits"

Overgang van impact naar post-impact gesteente



CRUCIAL CORE SEGMENT

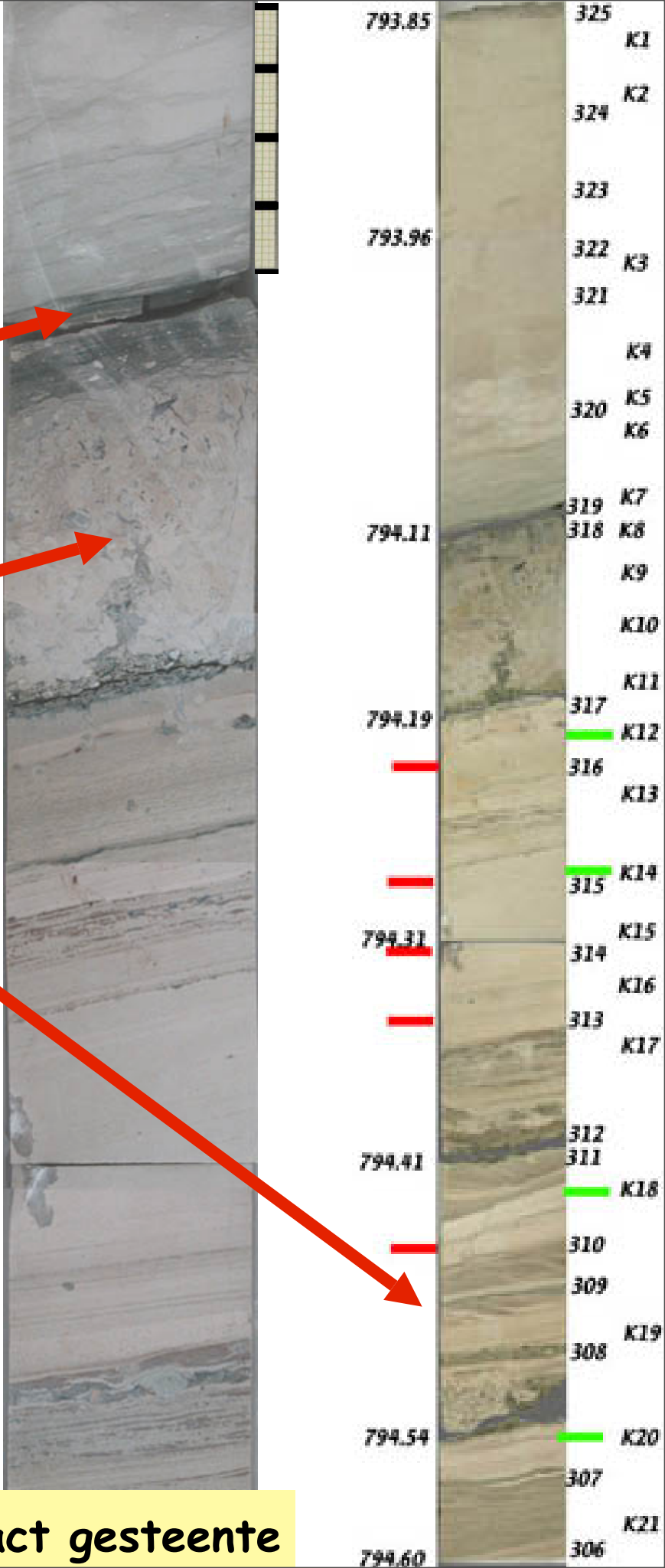


"K/T boundary
clay layer"?

Hardground,
With burrows

Crossbedded
Dolomitic sands

"rush-back
deposits"



Overgang van impact naar post-impact gesteente

CRUCIAL CORE SEGMENT



Base Paleocene

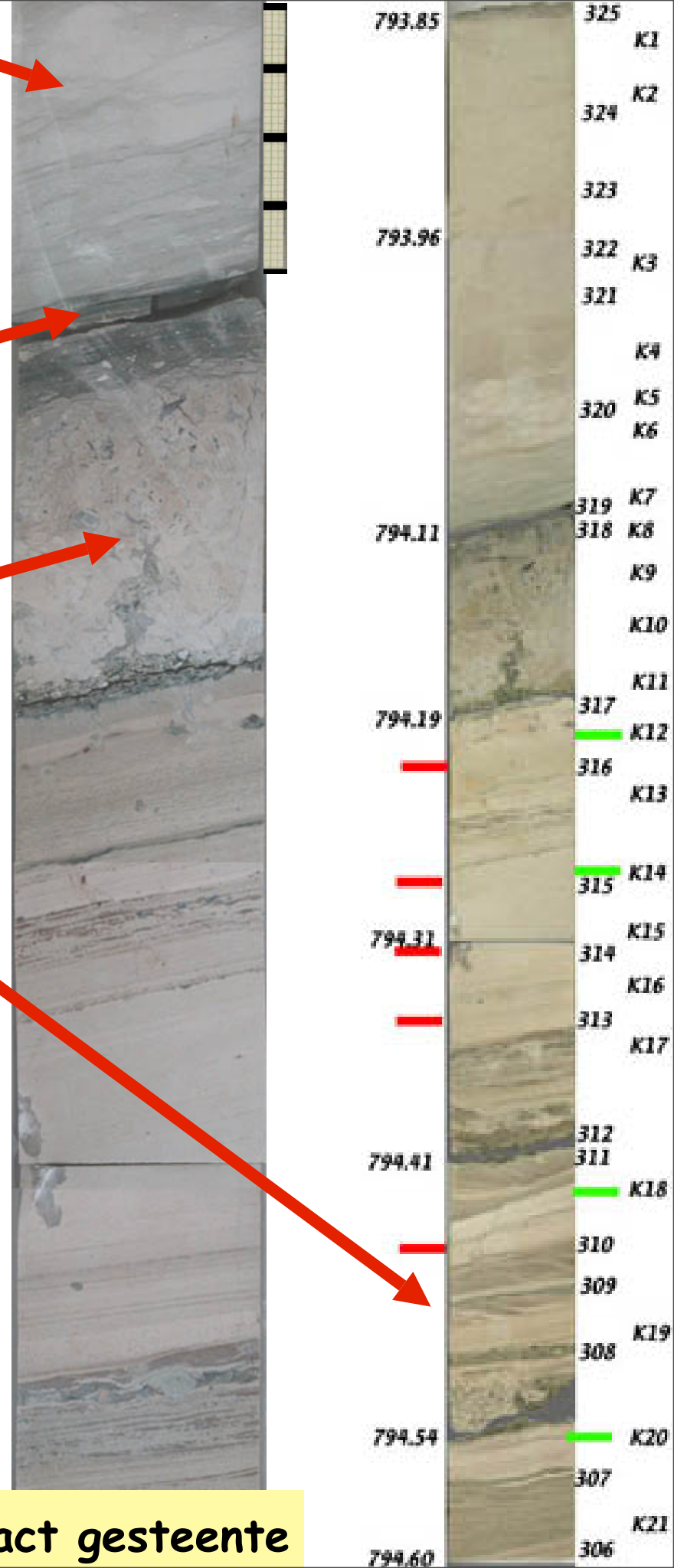
"K/T boundary
clay layer"?

Hardground,
With burrows

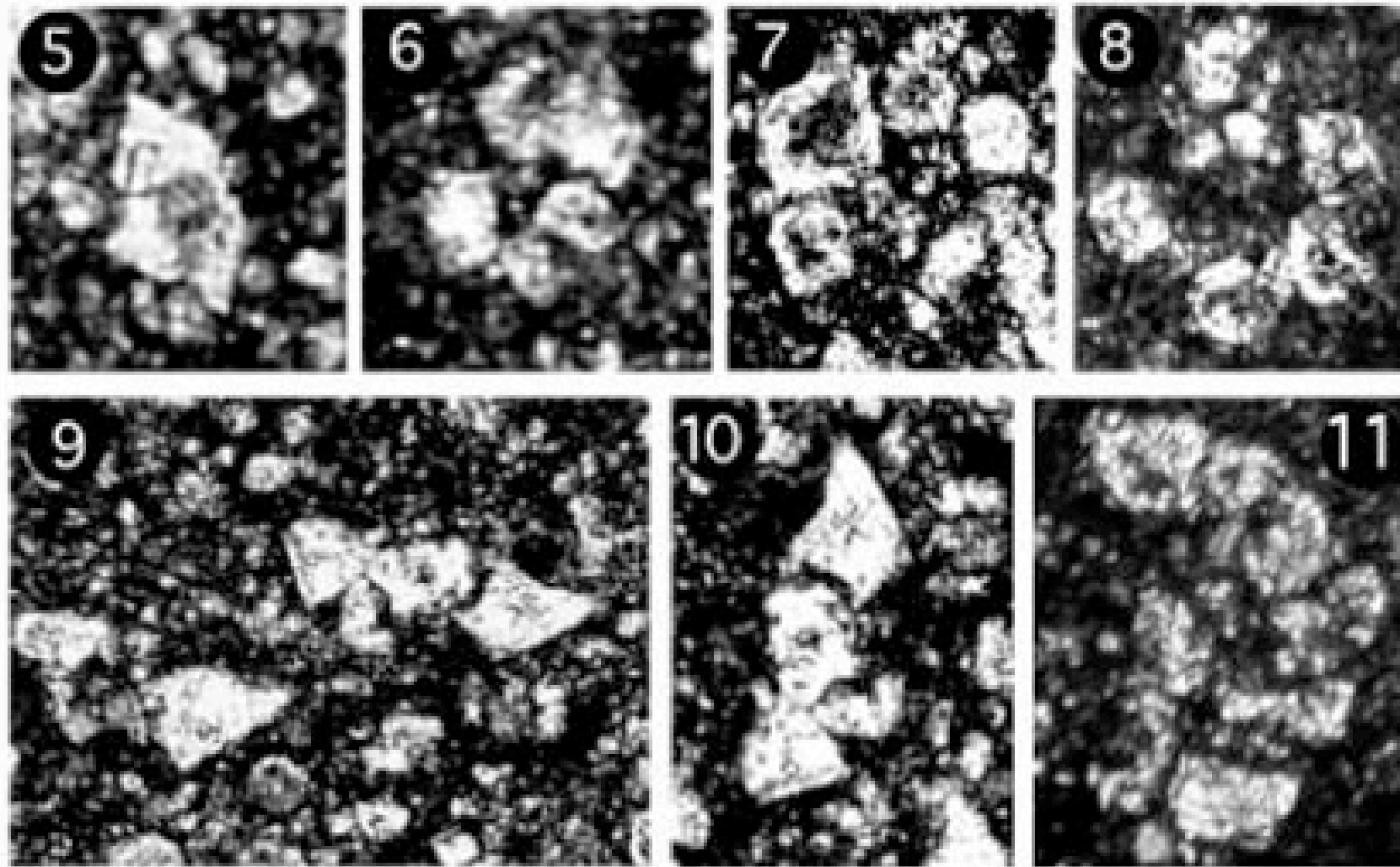
Crossbedded
Dolomitic sands

"rush-back
deposits"

Overgang van impact naar post-impact gesteente

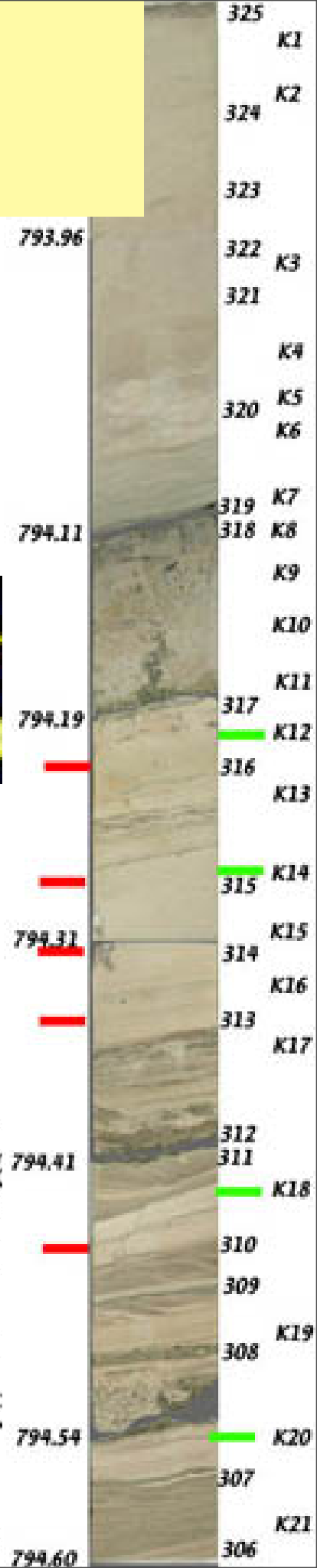


Maar tot onze verbazing denkt Gerta Keller **Hier**
Krijt foraminiferen gevonden te hebben!!

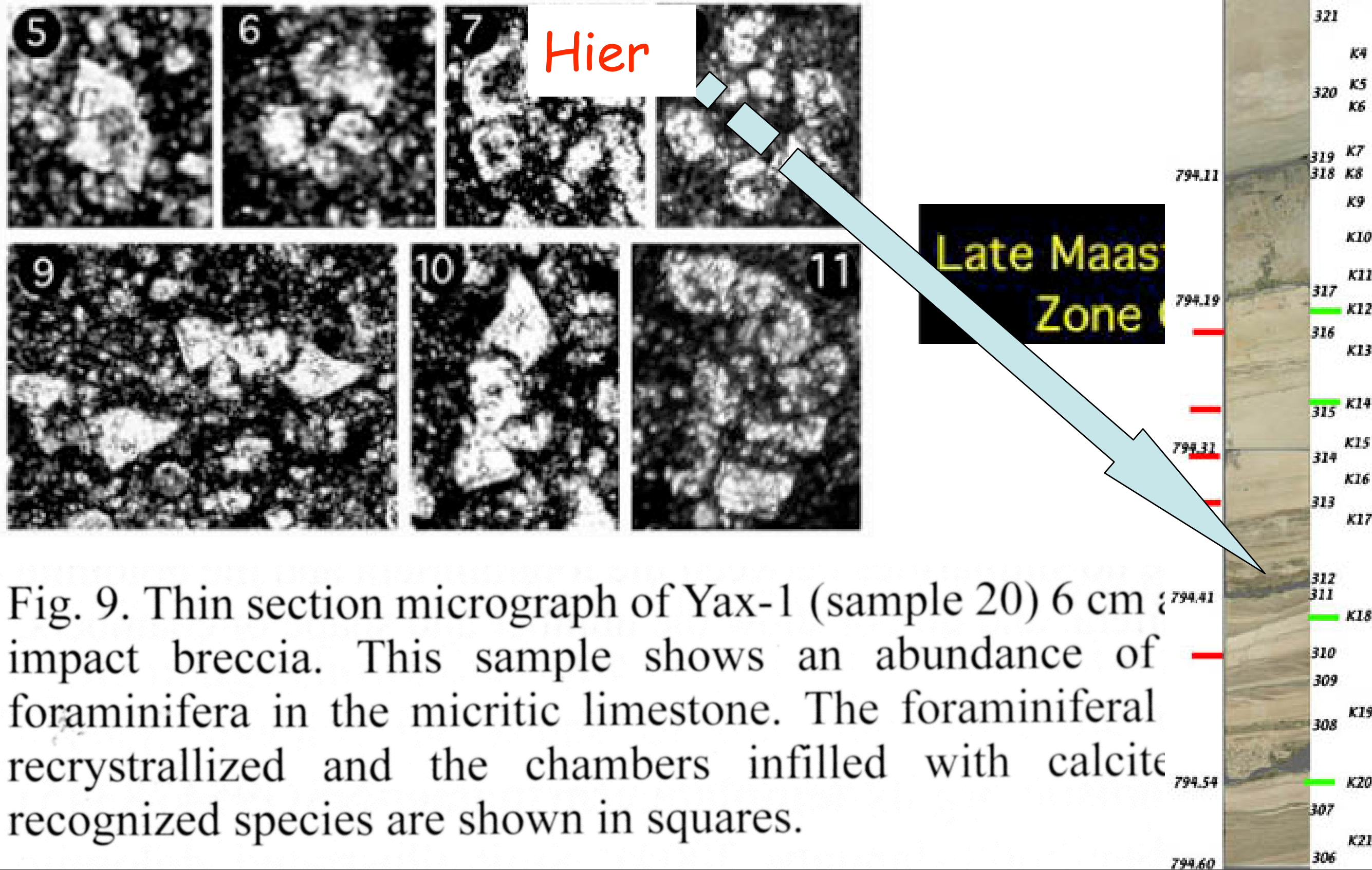


Late Maas
Zone

Fig. 9. Thin section micrograph of Yax-1 (sample 20) 6 cm ; impact breccia. This sample shows an abundance of foraminifera in the micritic limestone. The foraminiferal recrystallized and the chambers infilled with calcite recognized species are shown in squares.



Maar tot onze verbazing denkt Gerta Keller **Hier**
Krijt foraminiferen gevonden te hebben!!



YUCATAN
Chicxulub: Yax-1

NE MEXICO
El Penon & Loma Cerca

Deccan
Volcanism

MASS EXTINCTION
planktic foraminifera

10 20 30 40 50 60
No. Species

Ir (ng/g)
0.2 0.6 1.0

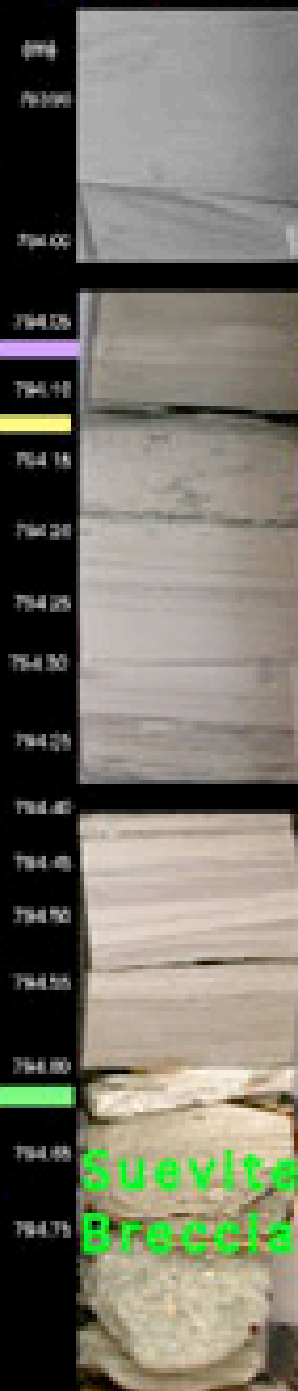
Ma

64.8

65.0

65.3

TERTIARY	Paleo. (Danian)	C29N	P1a
LATE CRETACEOUS	Late Maastrichtian	C29R	Zone CF1



Pla Impact

KT Impact



Chicxulub Impact

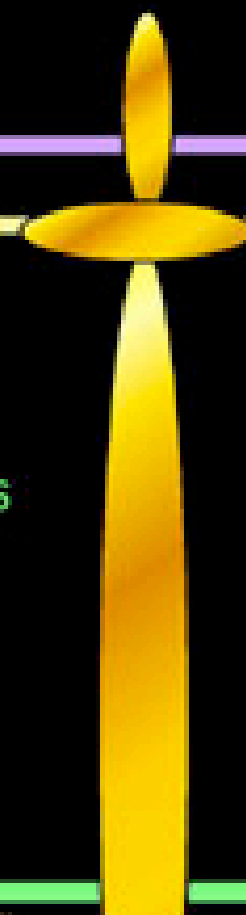
Suevite Breccia



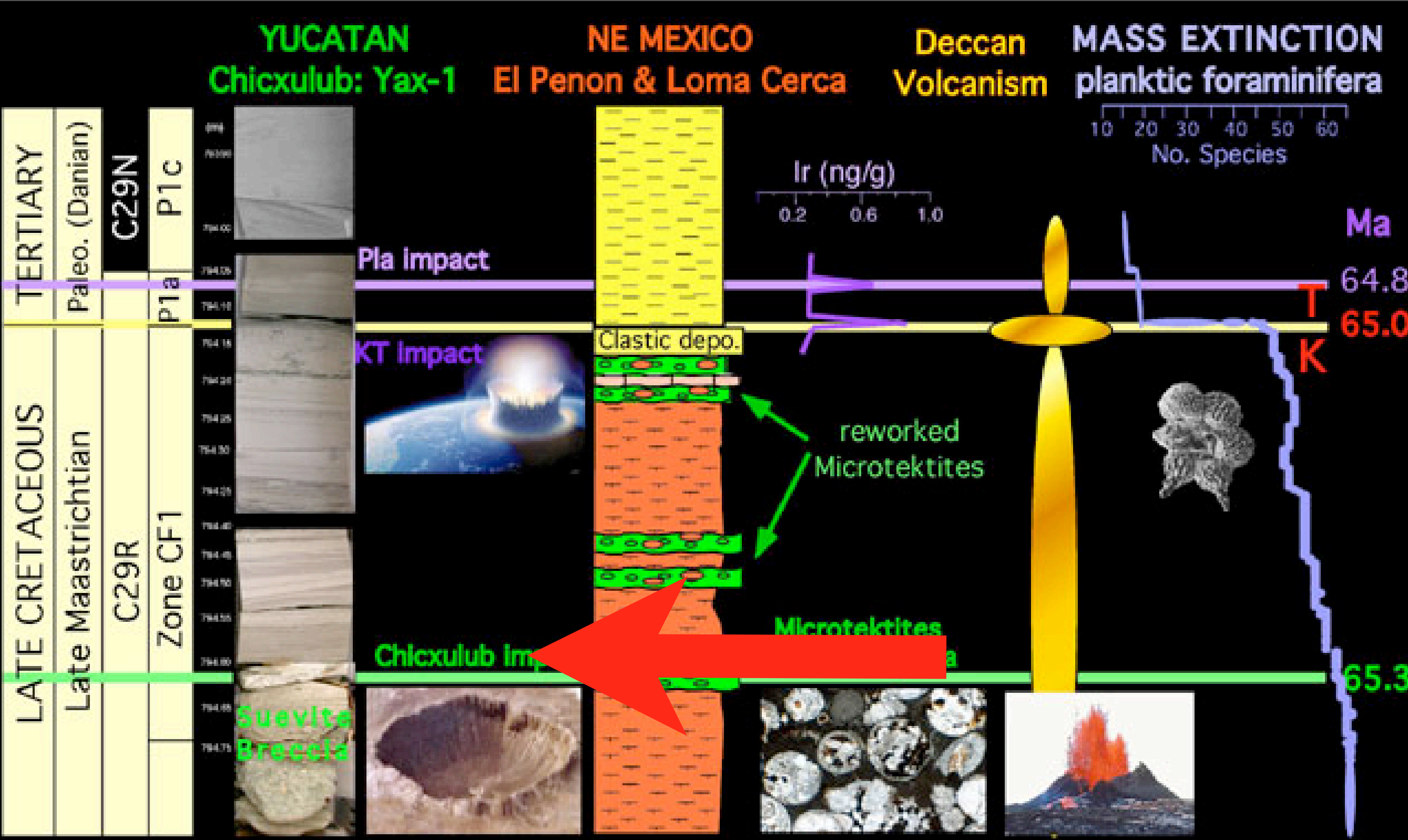
Clastic depo.

reworked
Microtektites

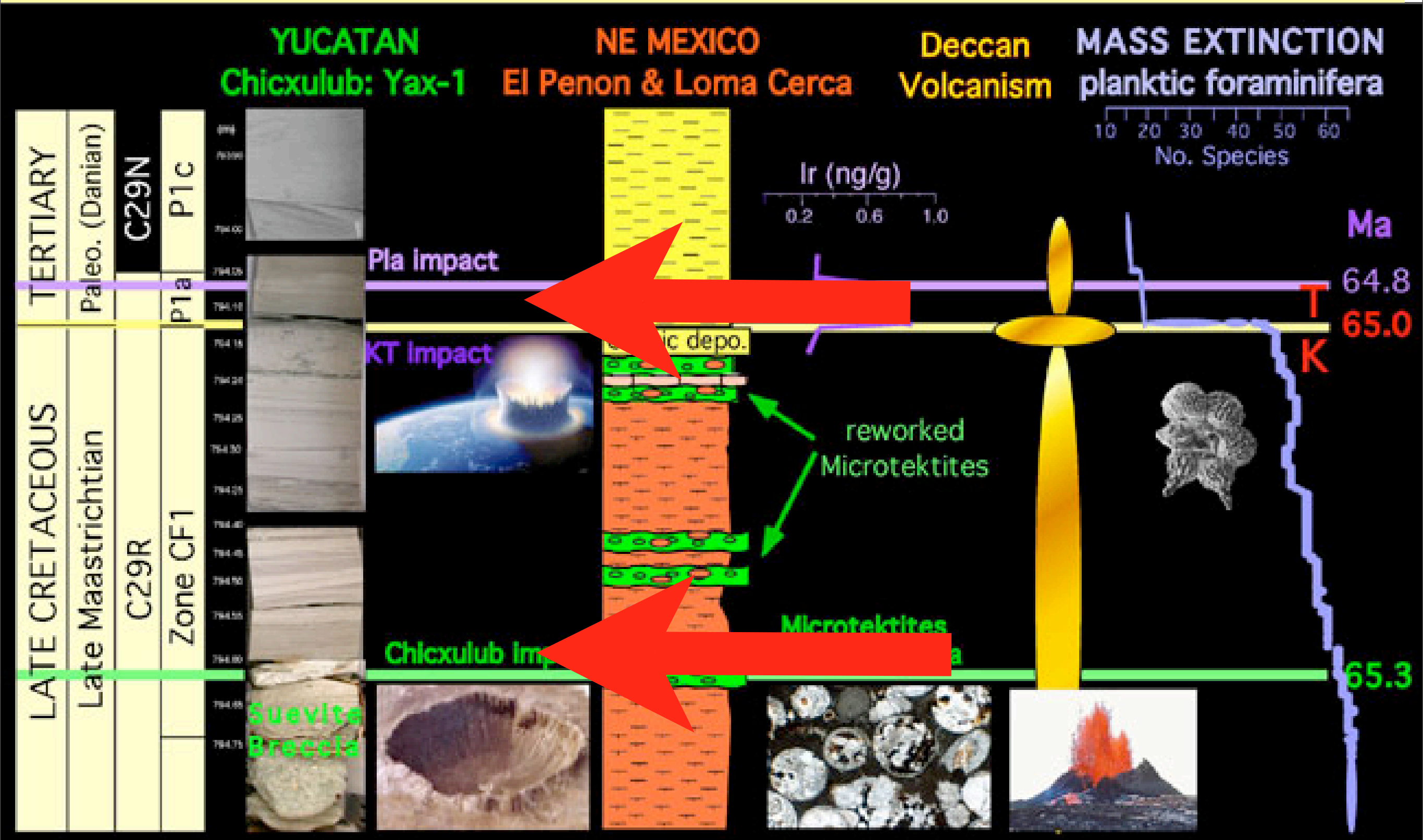
Microtektites
Chicxulub ejecta

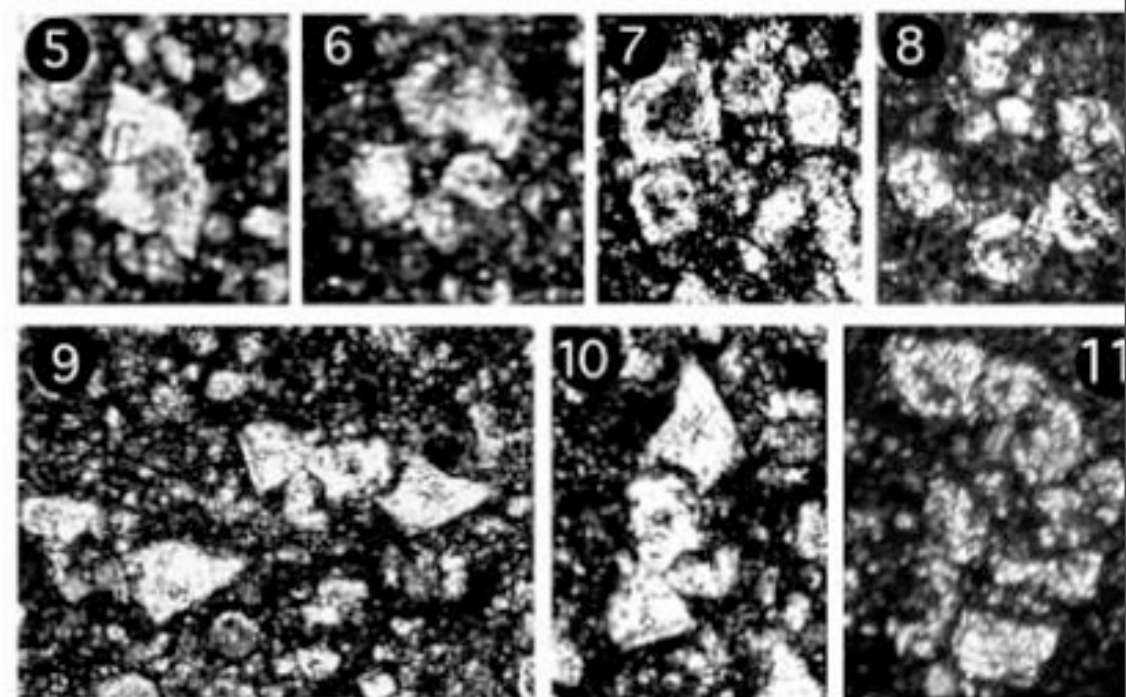


EN DAAROM DENKT KELLER DAT ER TWEE(drie) INSLAGEN HEBBEN
PLAATSGEVONDEN
EEN IN CHICXULUB, MEXICO

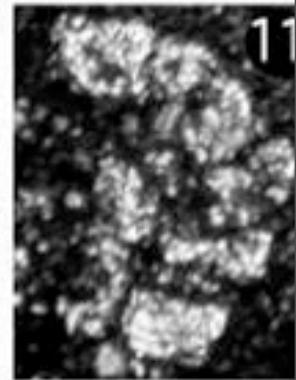
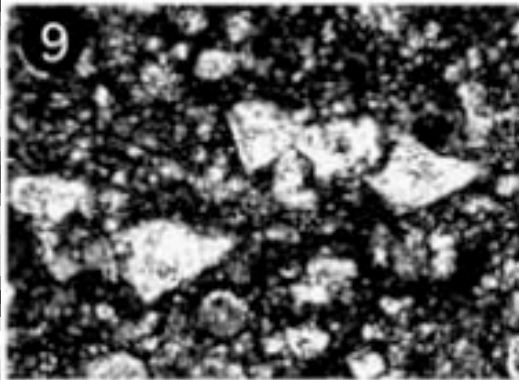
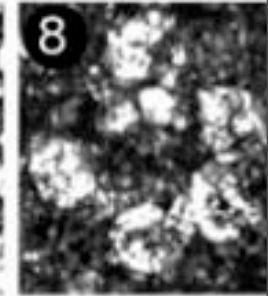
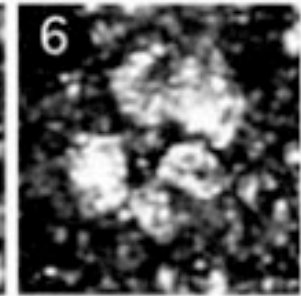
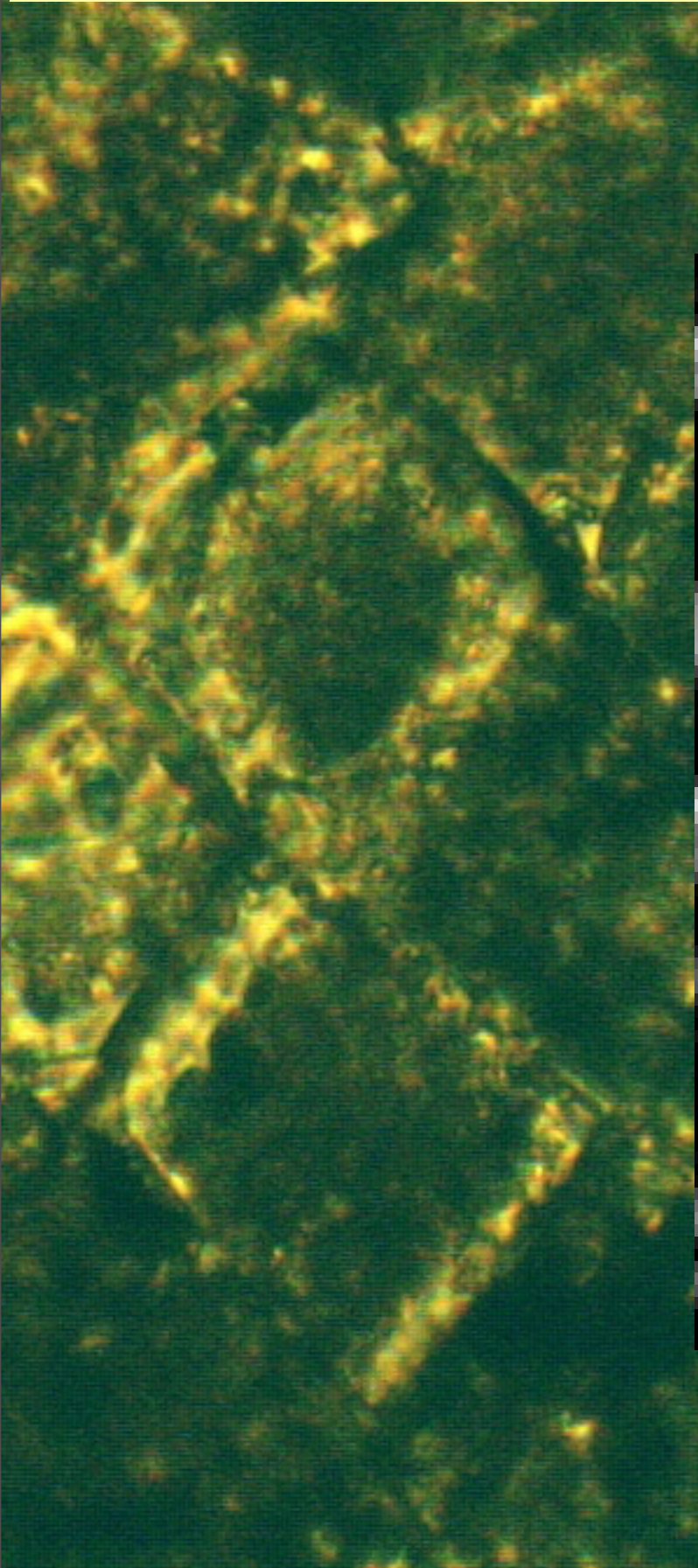


EN DAAROM DENKT KELLER DAT ER TWEE(drie) INSLAGEN HEBBEN
PLAATSGEVONDEN
EEN IN CHICXULUB, MEXICO EN EEN 300.000 JAAR LATER....Ergens



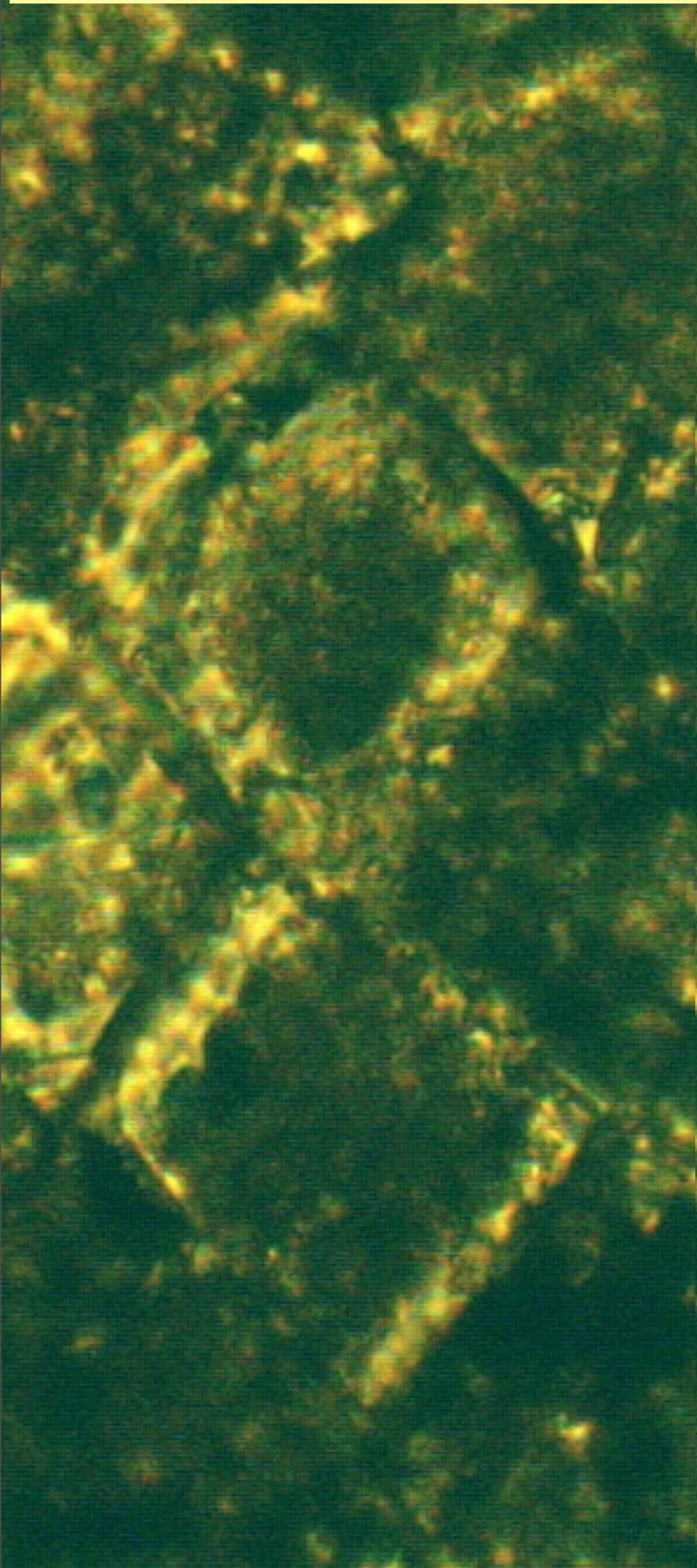


Maar zijn dit wel echte Foraminiferen?

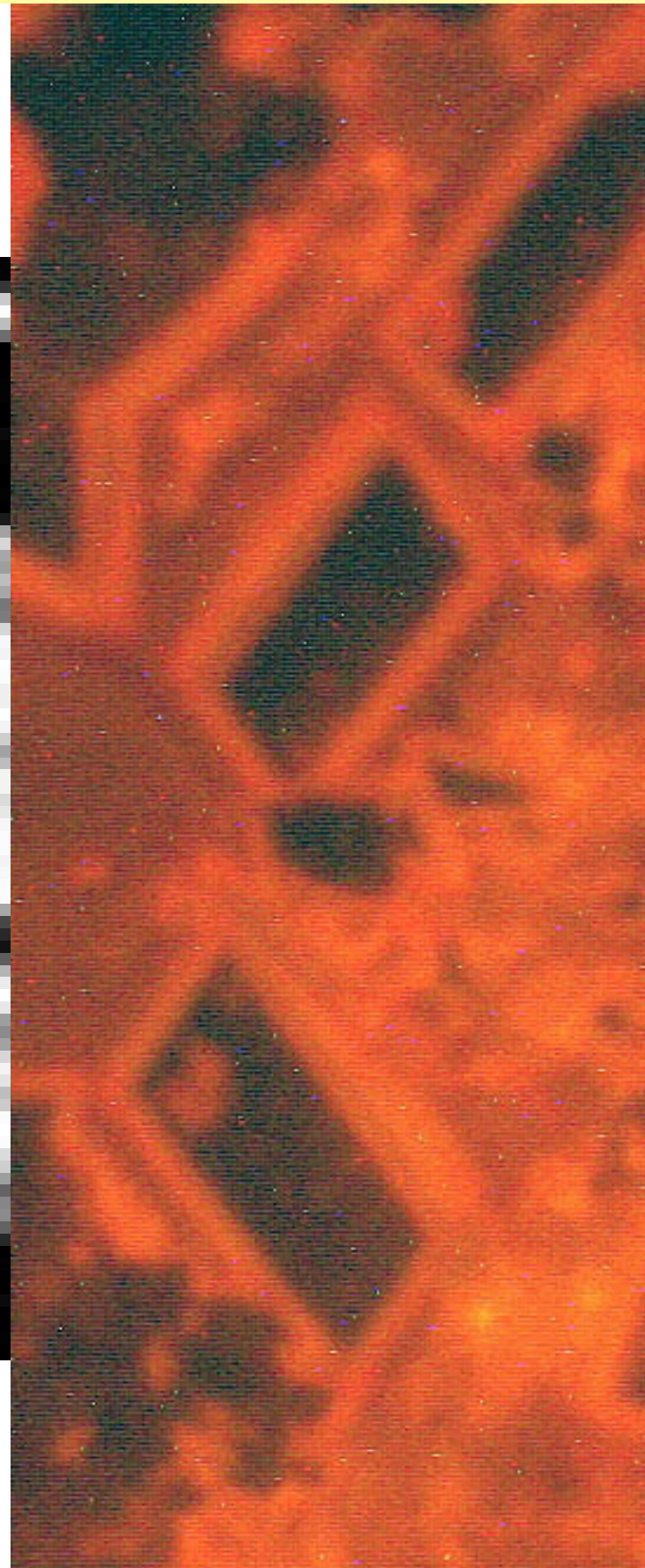


Transmitted

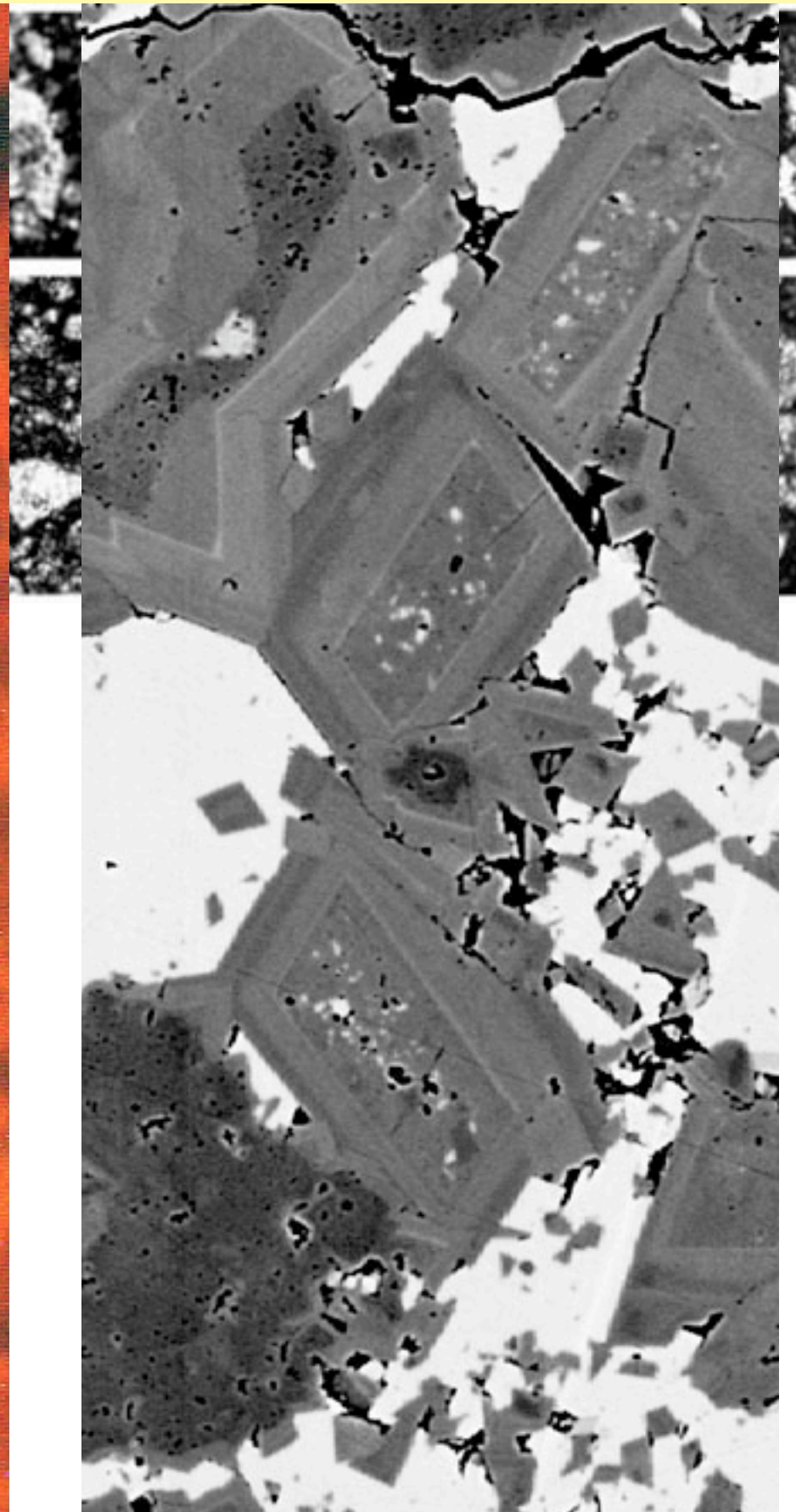
Maar zijn dit wel echte Foraminiferen?, of zijn het gewone dolomietkristallen?



Transmitted light



Cathode Luminescence



SEM backscatter

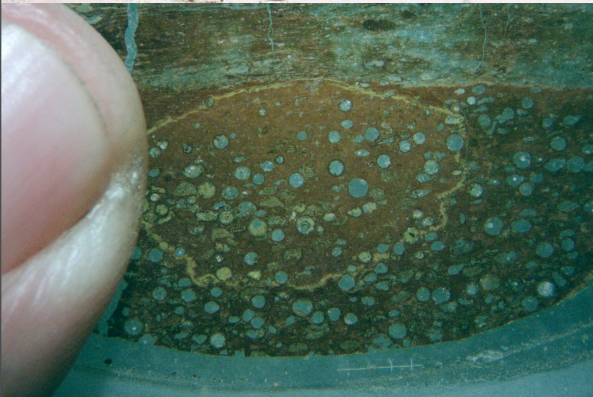
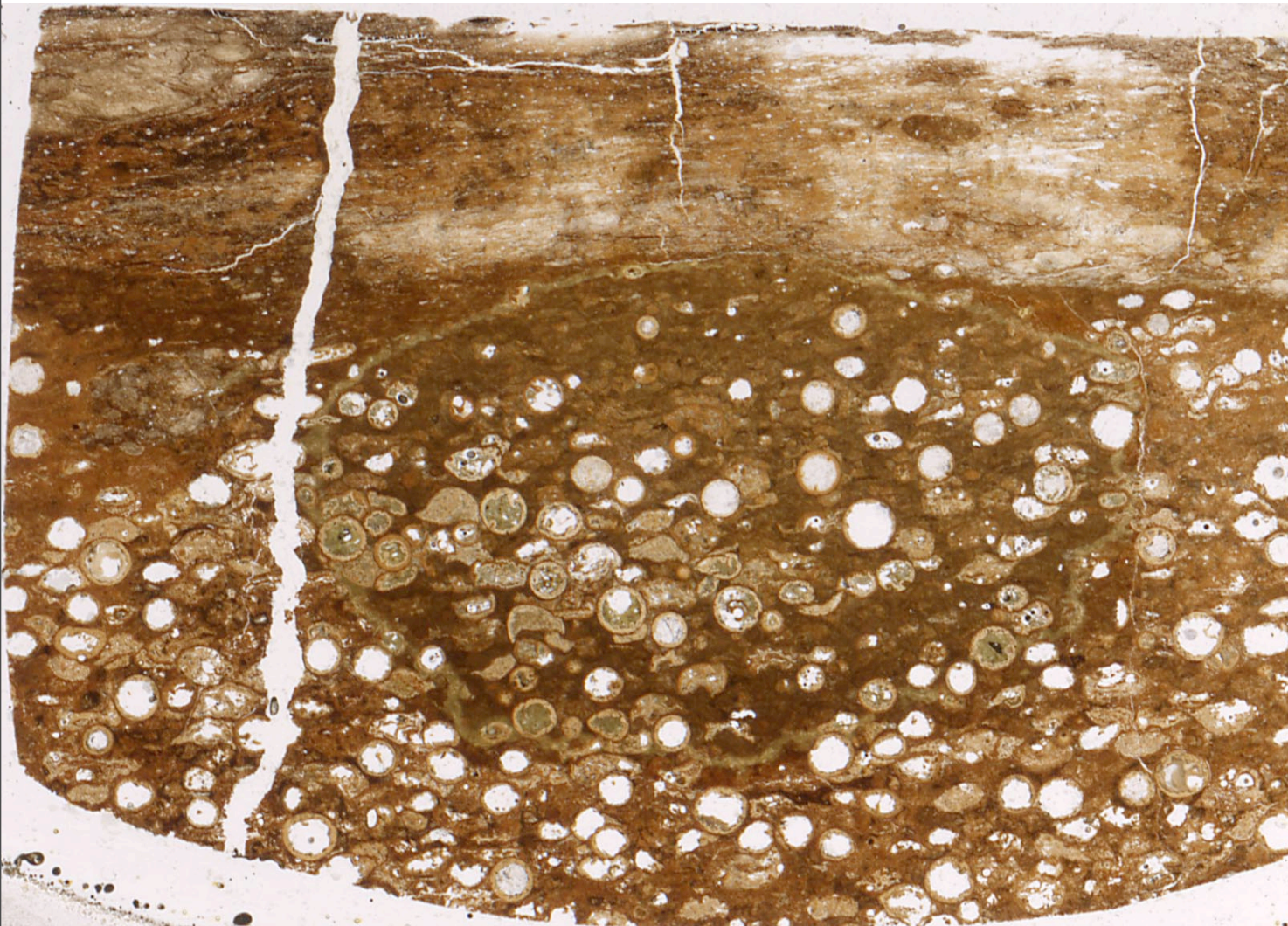
Het beste bewijs voor één inslag in plaats van drie komt uit de steenkoolmoerassen van de Montana tot New Mexico

Er is maar een ejectalaag bewaard gebleven

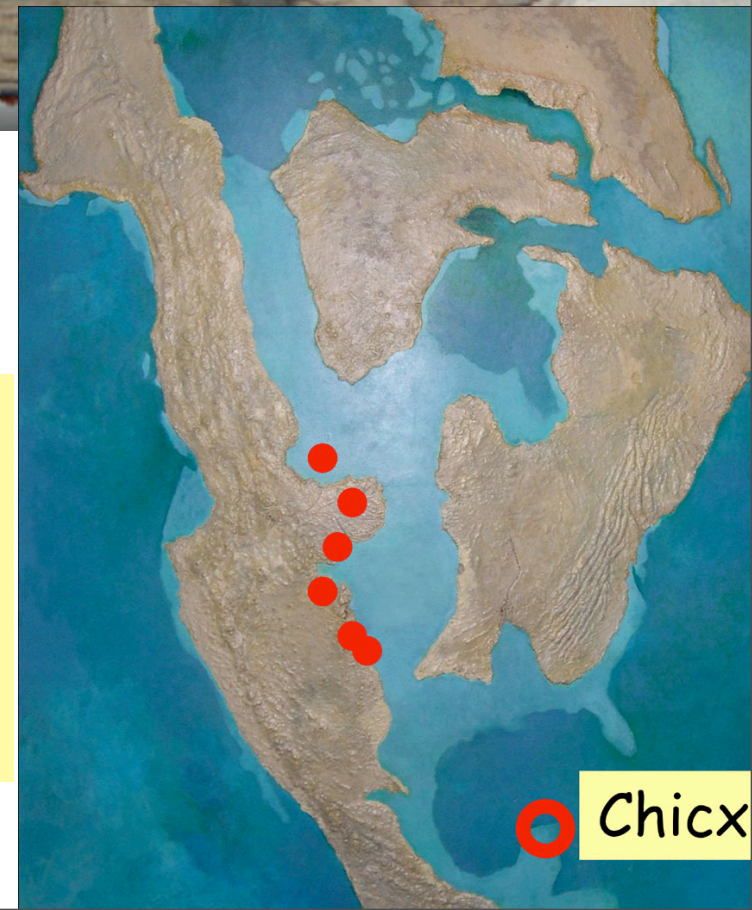
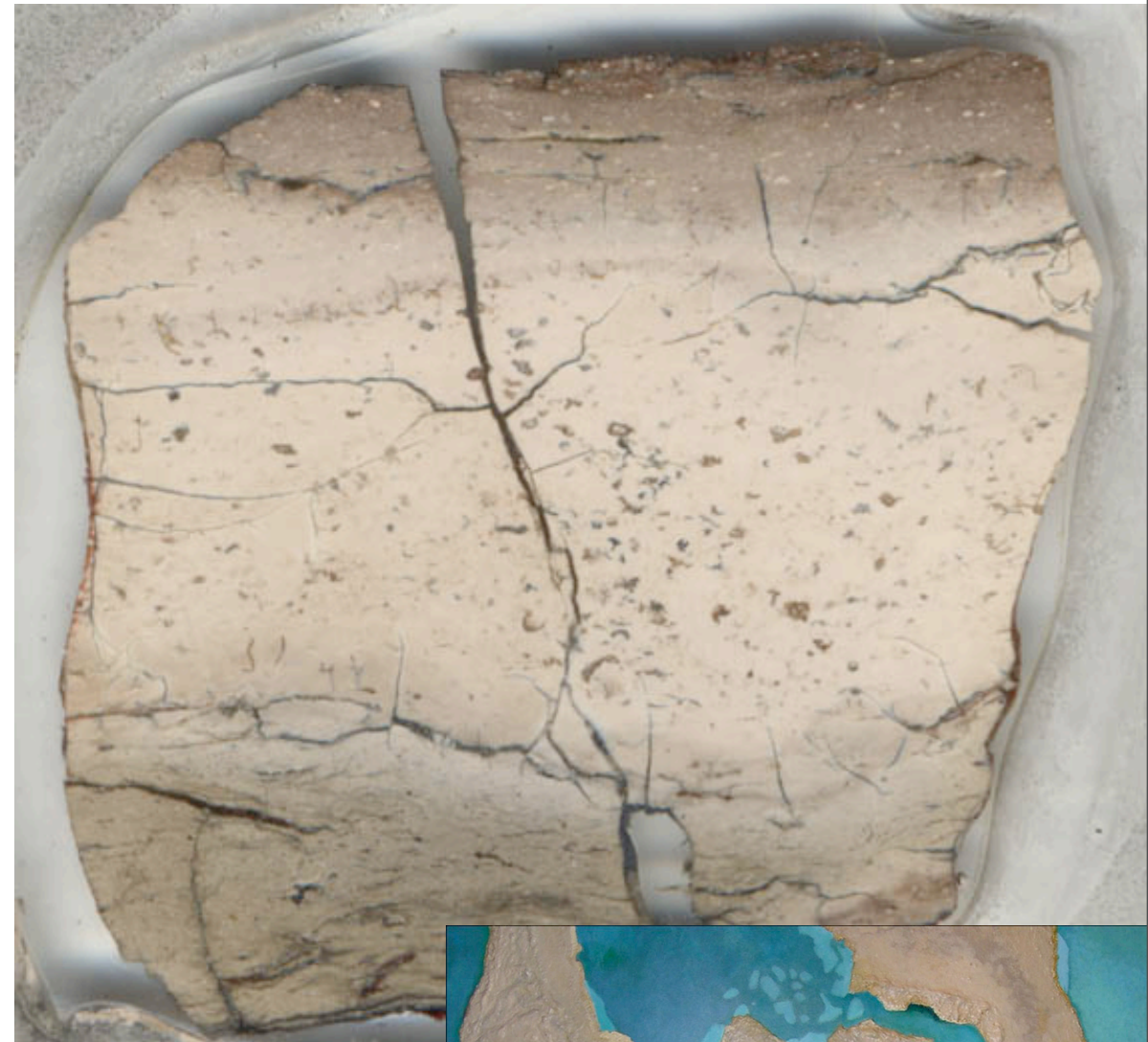
Raton Basin, New Mexico



Dogie Creek, Wyoming

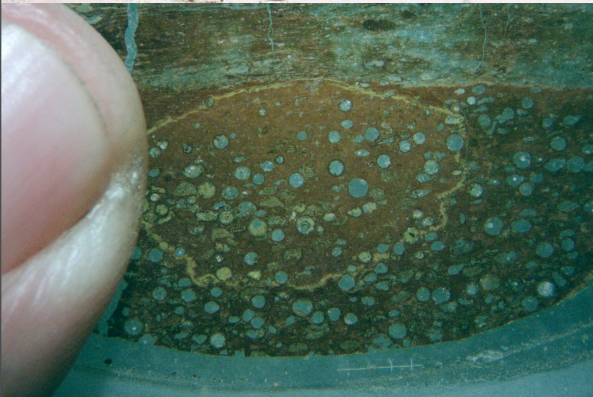
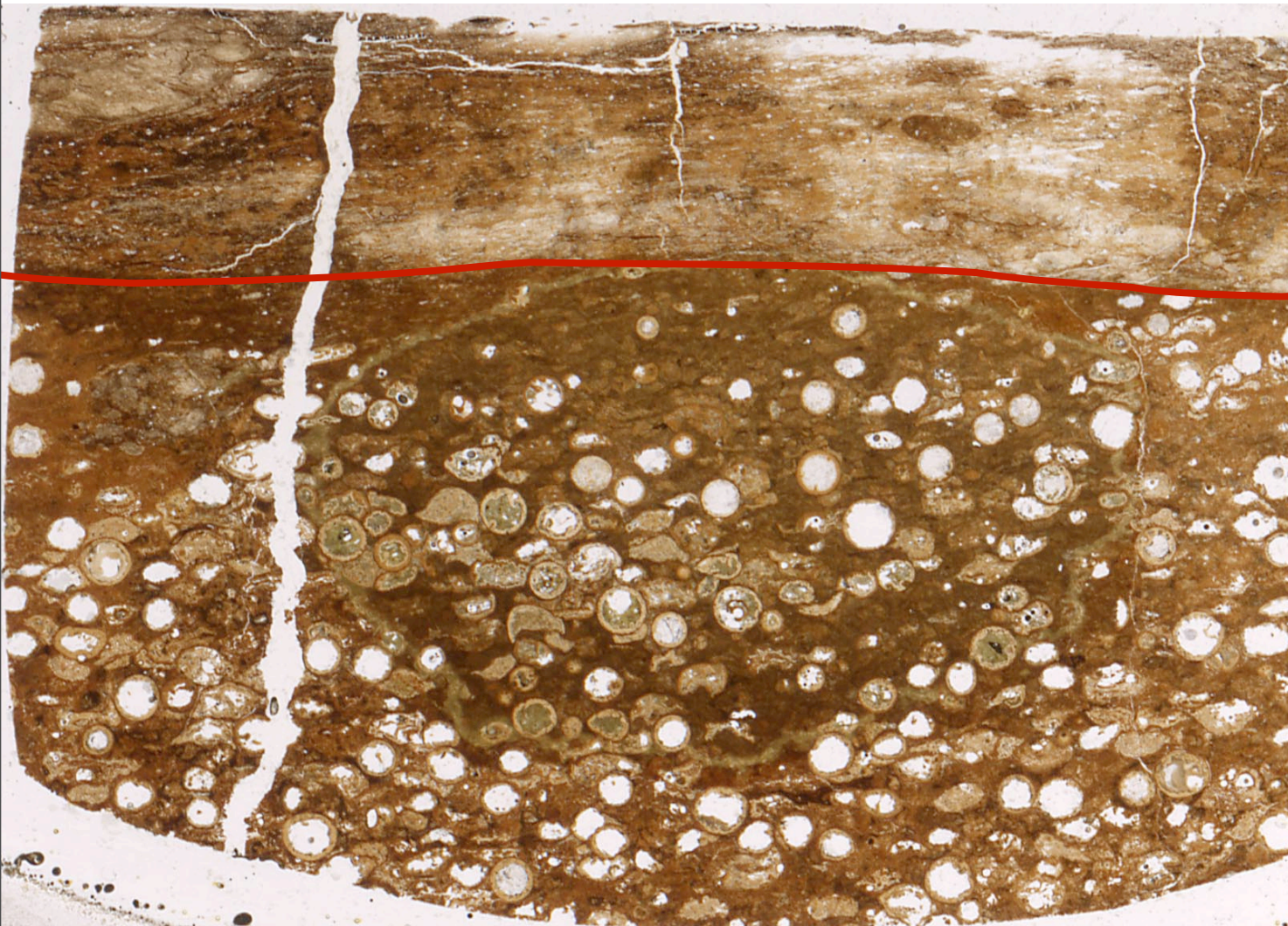


Brownie Butte, Montana

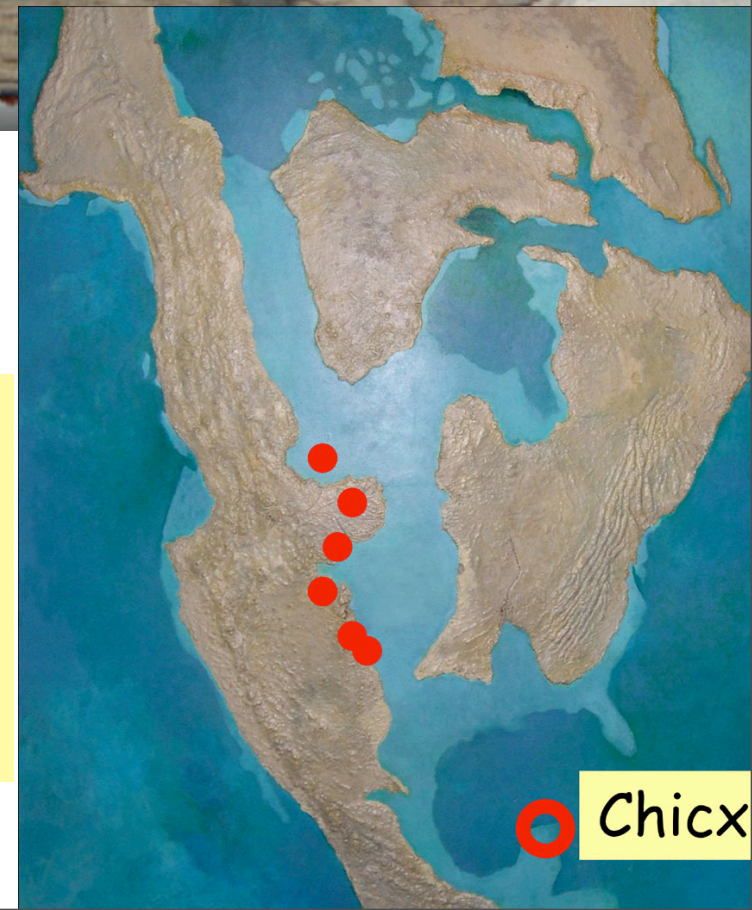
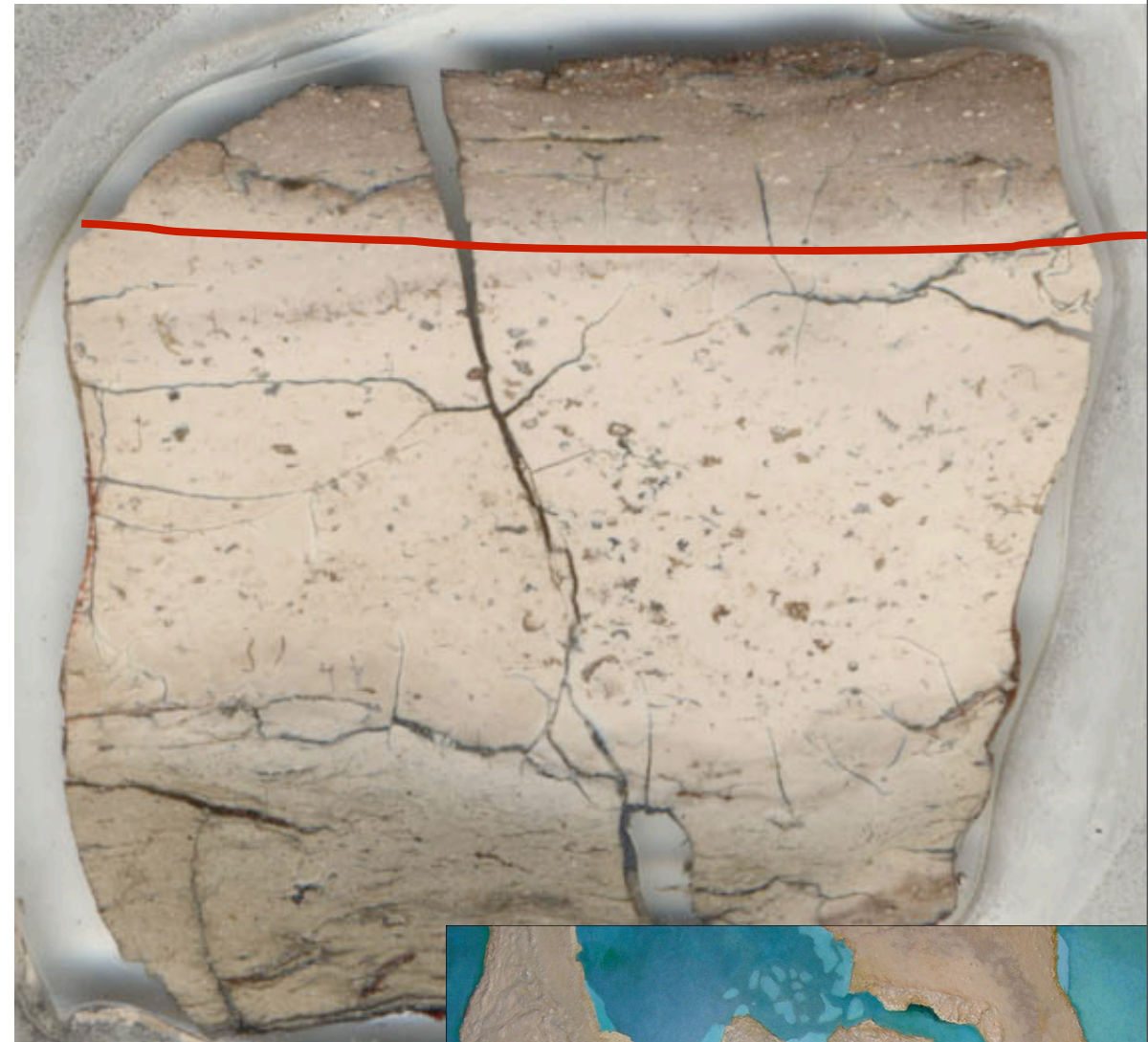


Van Noord naar Zuid is
deze ejectalaag overal
een "dubbele" laag

Dogie Creek, Wyoming

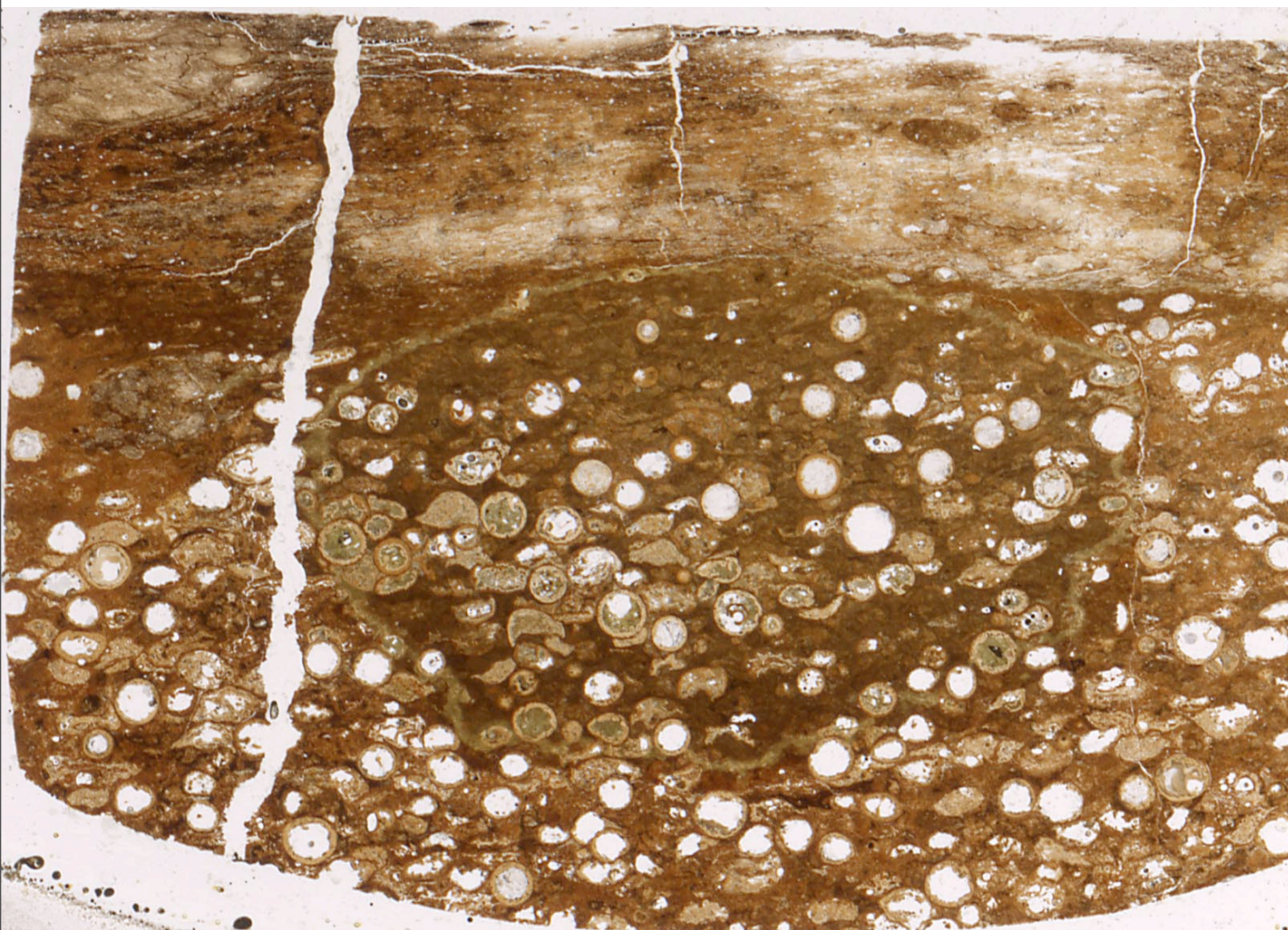


Brownie Butte, Montana

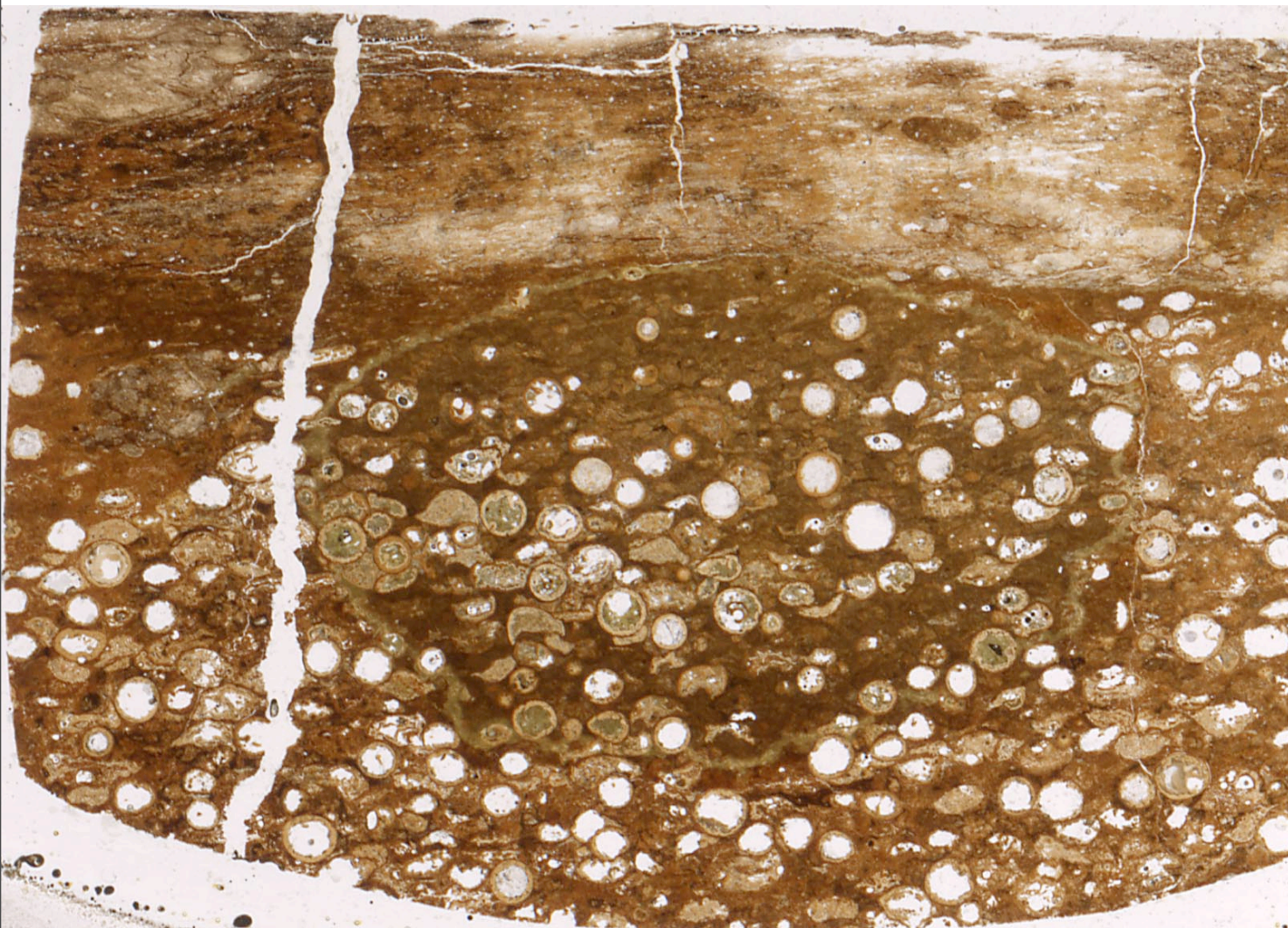


Van Noord naar Zuid is
deze ejectalaag overal
een "dubbele" laag

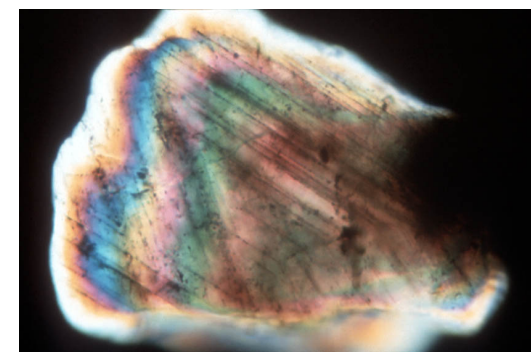
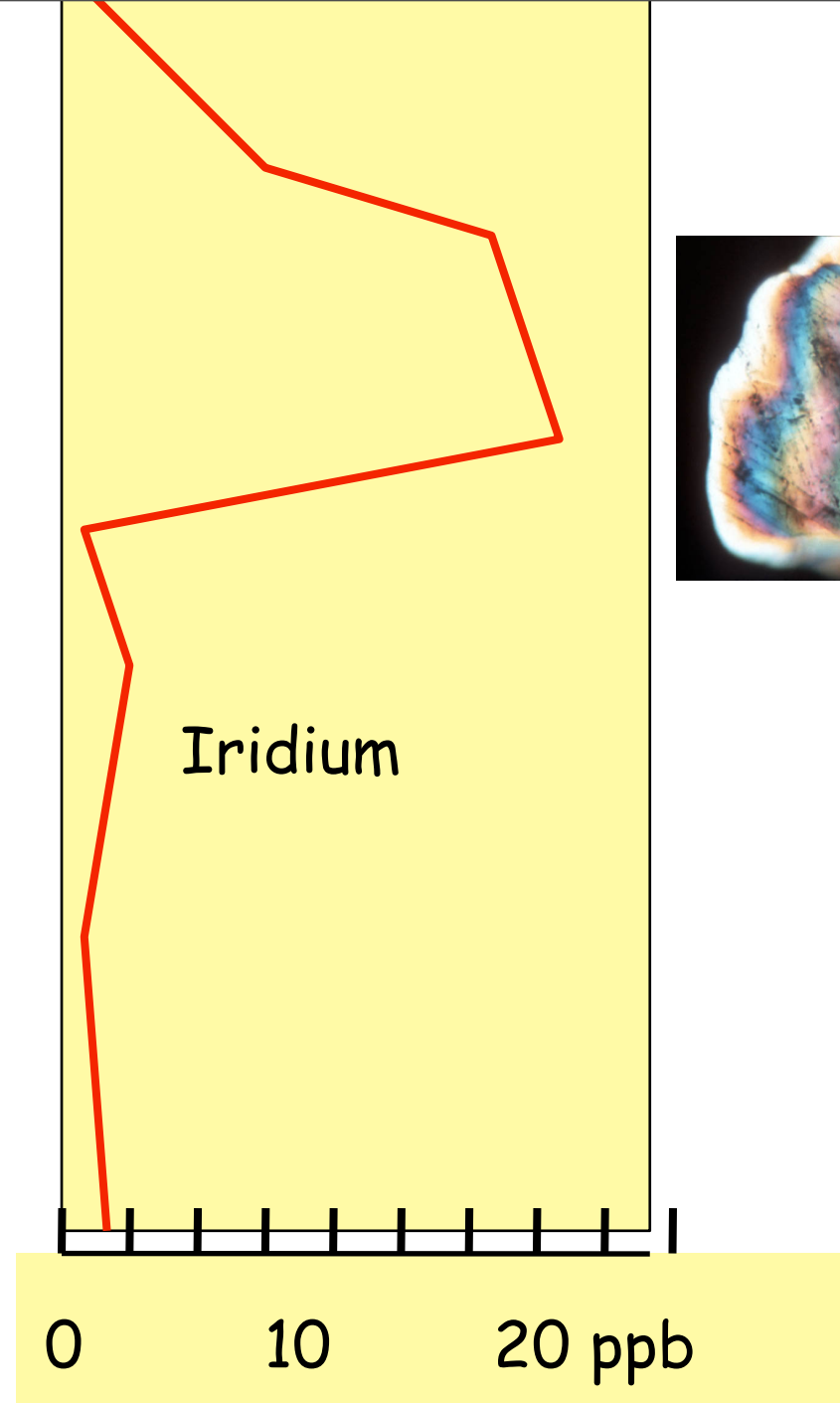
Dogie Creek, Wyoming



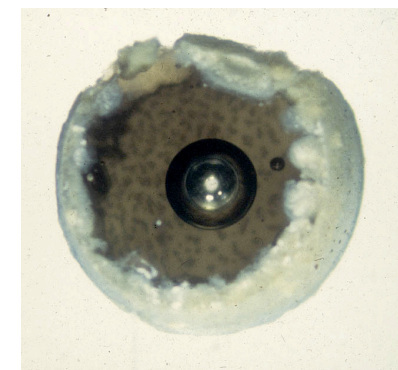
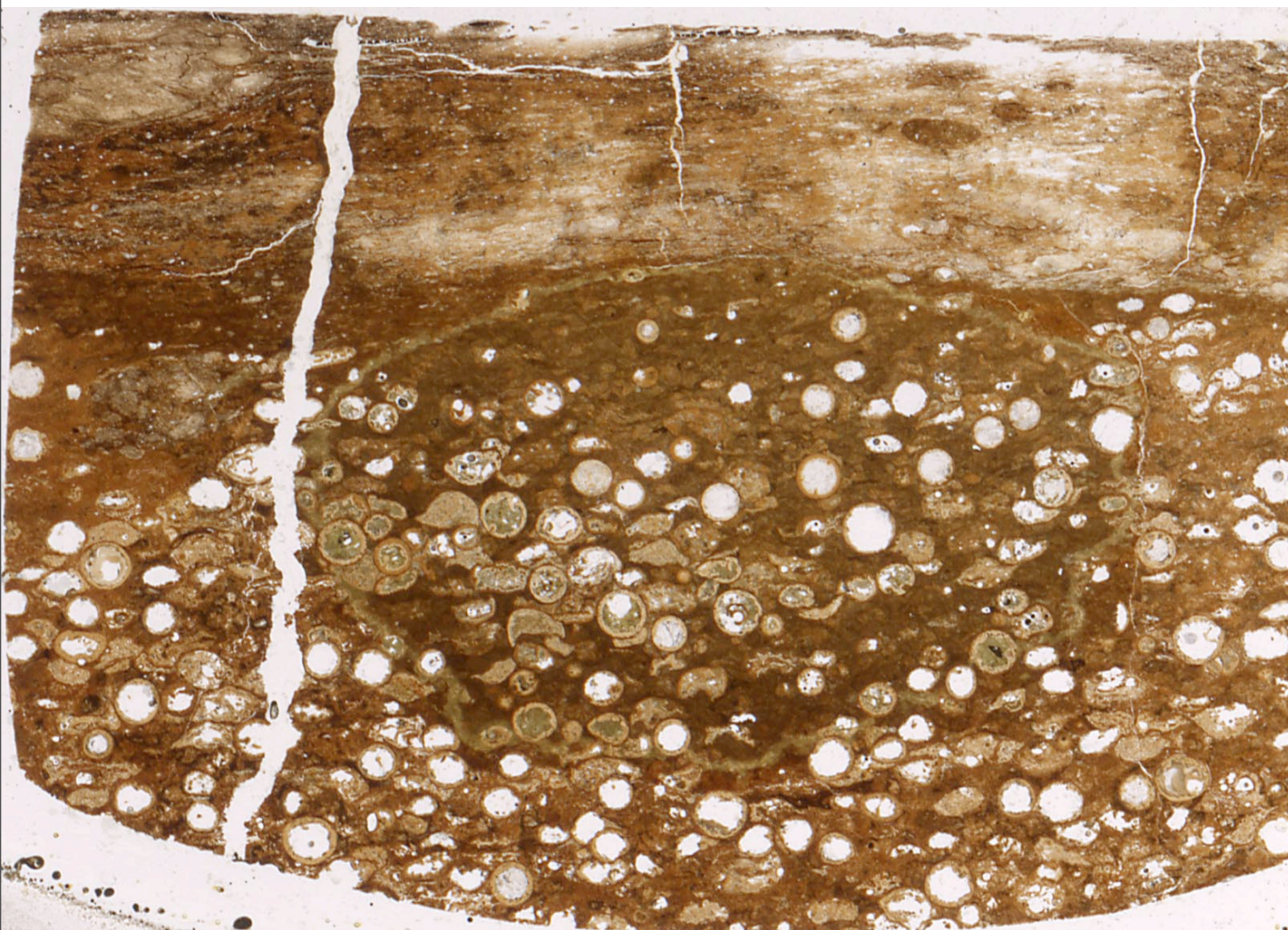
Dogie Creek, Wyoming



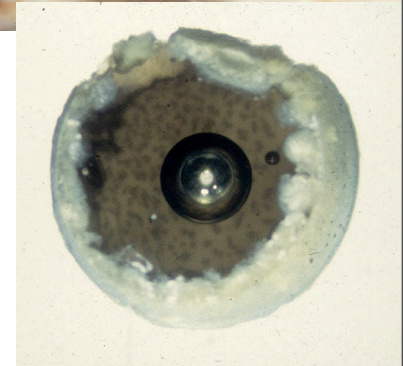
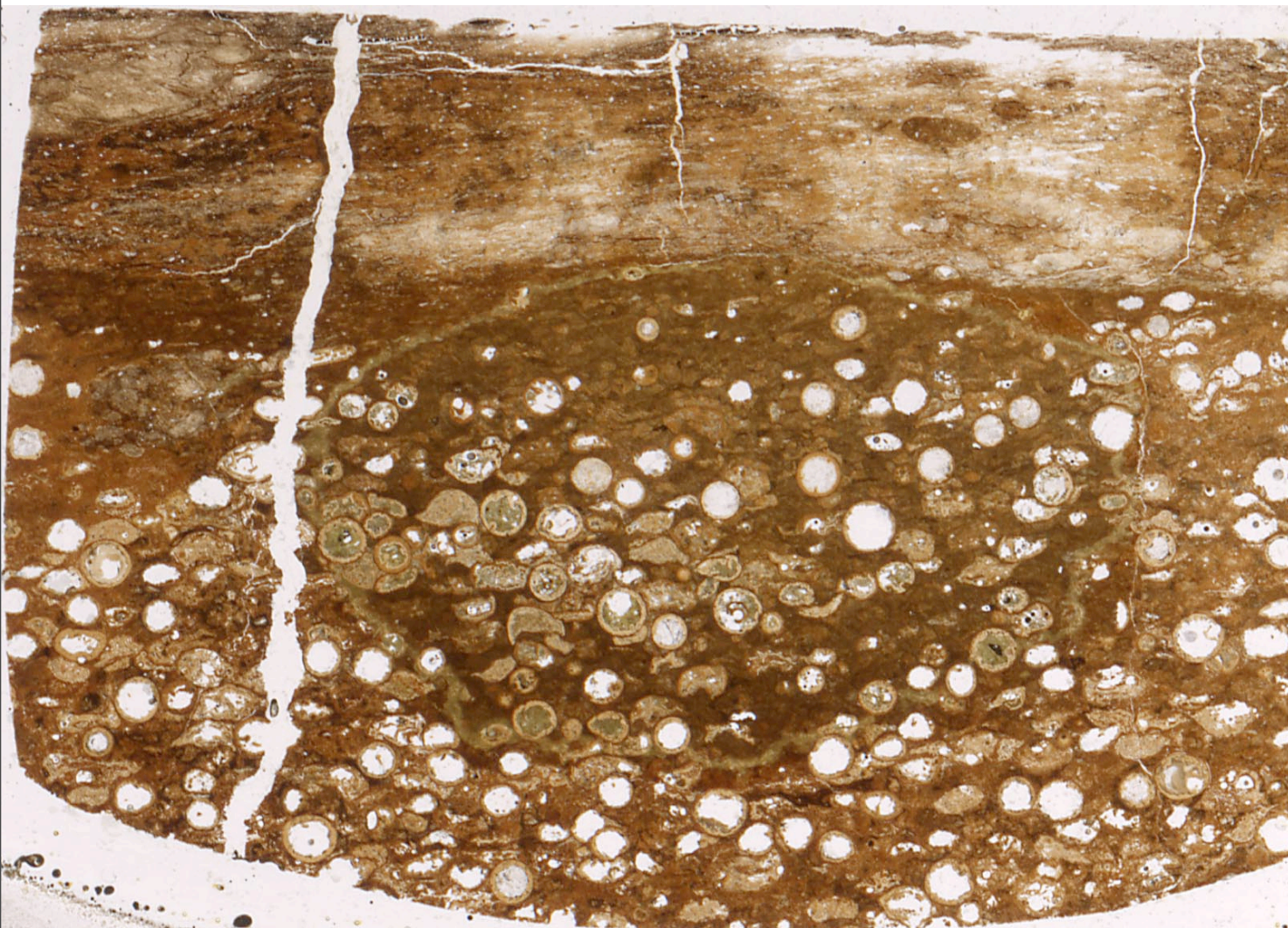
De bovenste laag is rijk aan iridium en geschokte kwarts.



Dogie Creek, Wyoming

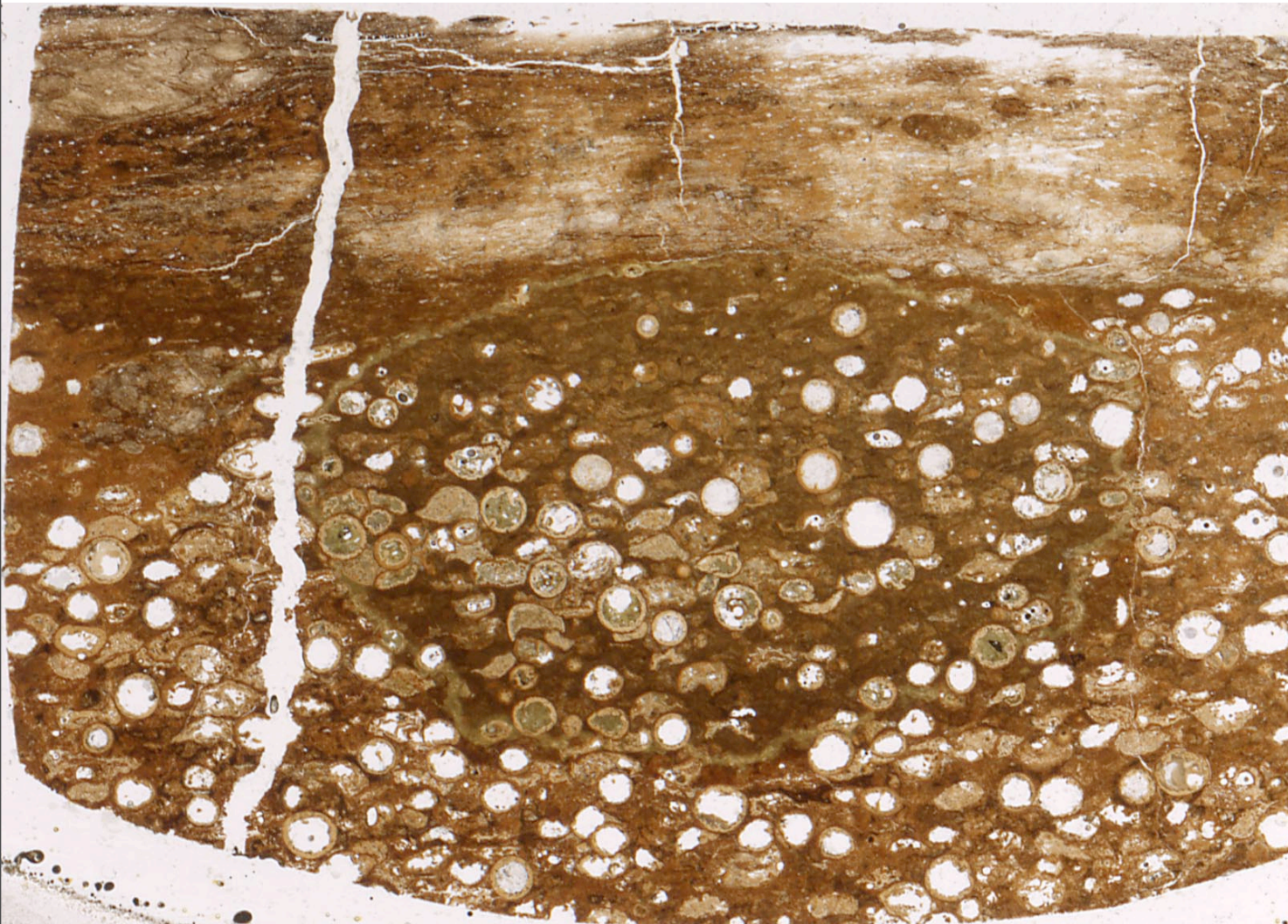


Dogie Creek, Wyoming

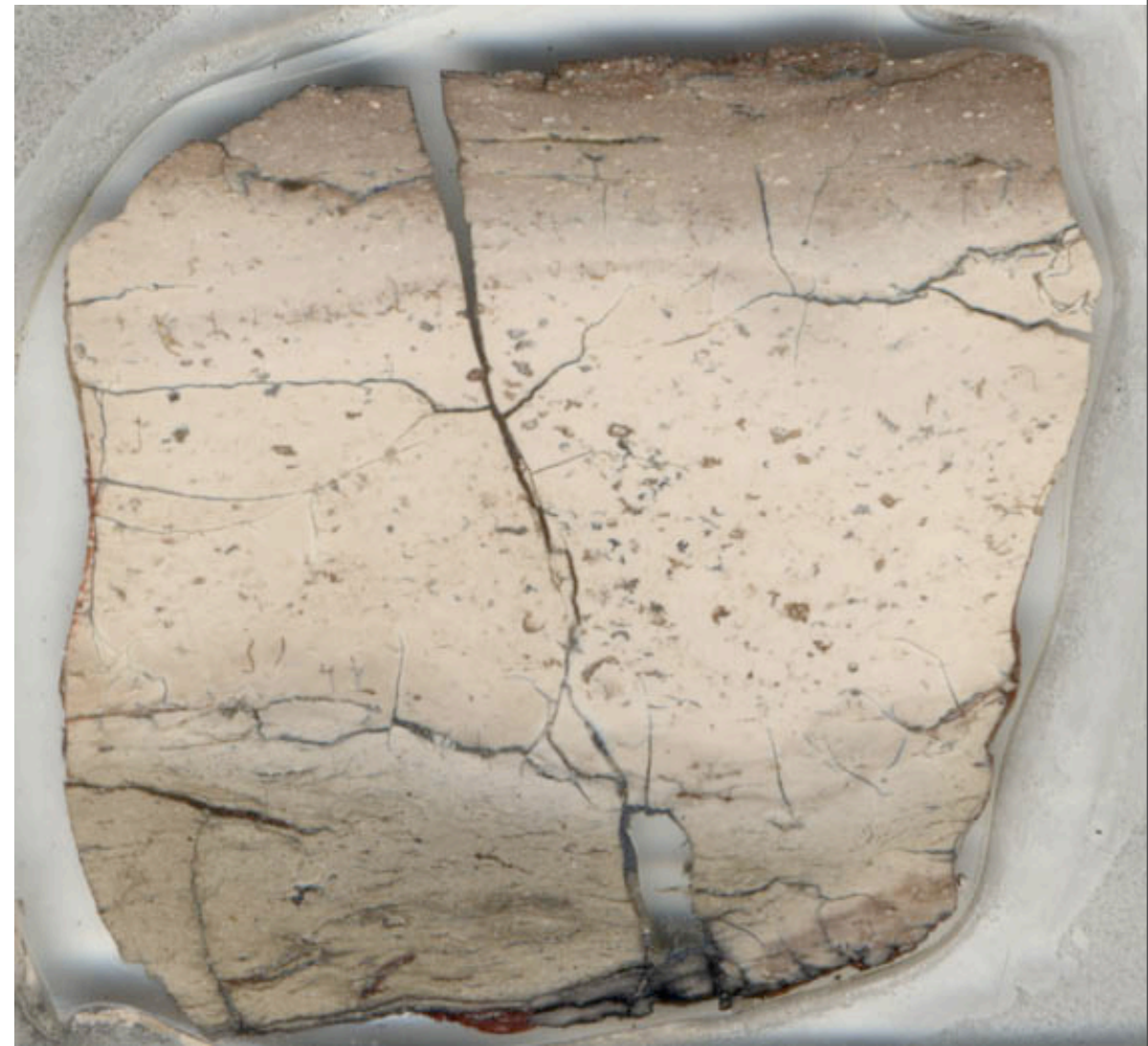


De onderste zit vol met omgezette tektieten

Er komt tussen de laagjes zelfs geen laagje van afgevallen
bladeren voor

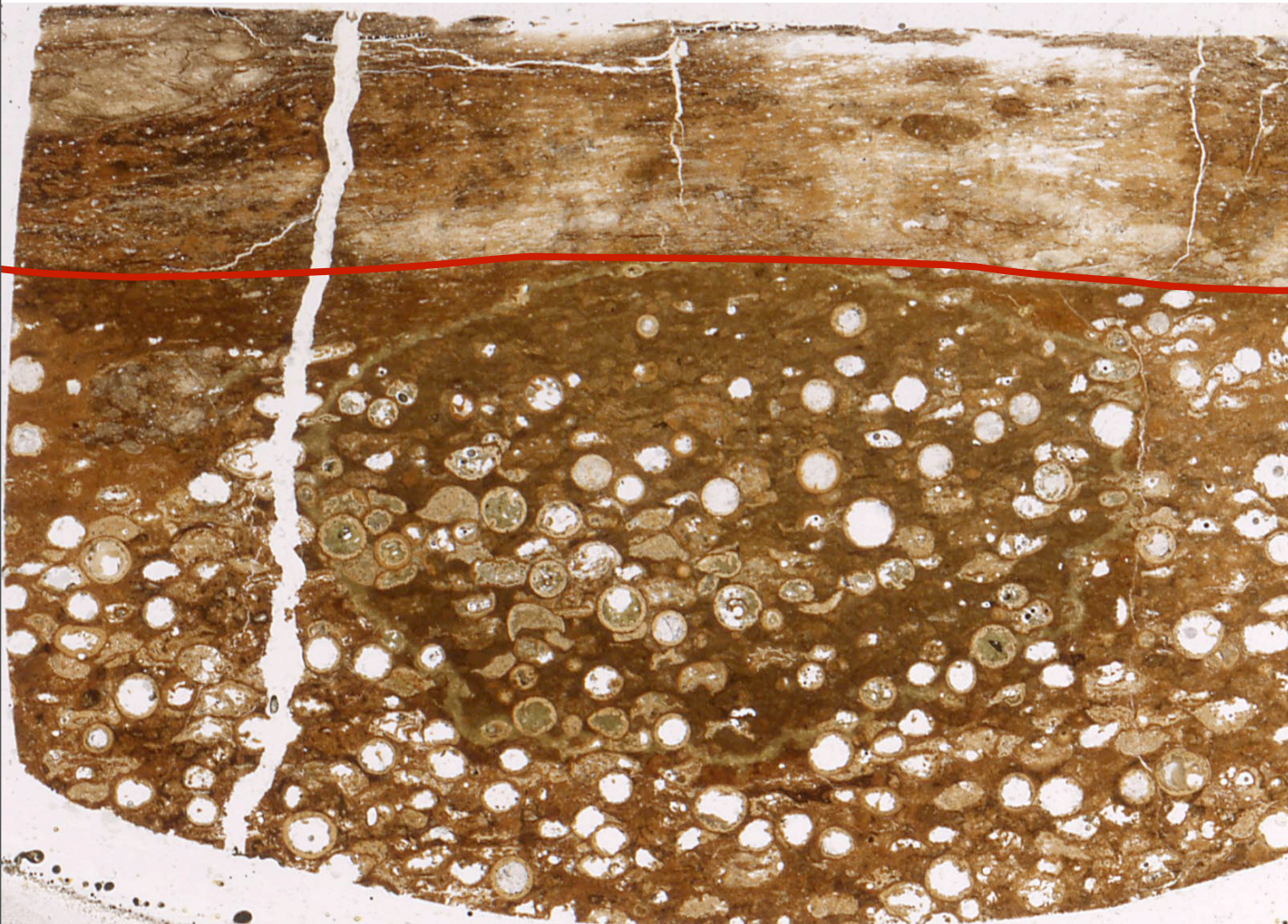


Dogie Creek, Wyoming

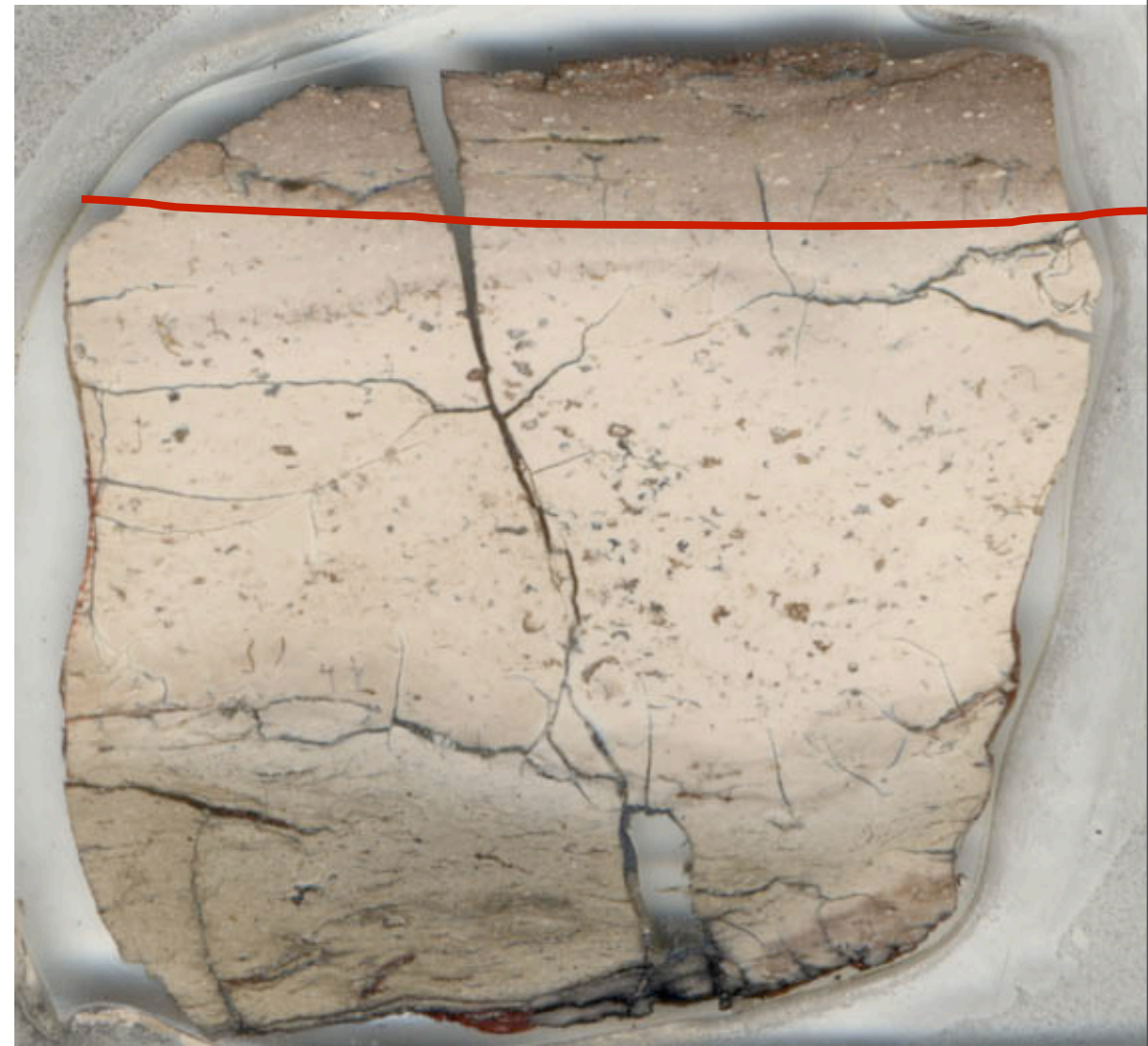


Brownie Butte Montana

Er komt tussen de laagjes zelfs geen laagje van afgevallen bladeren voor



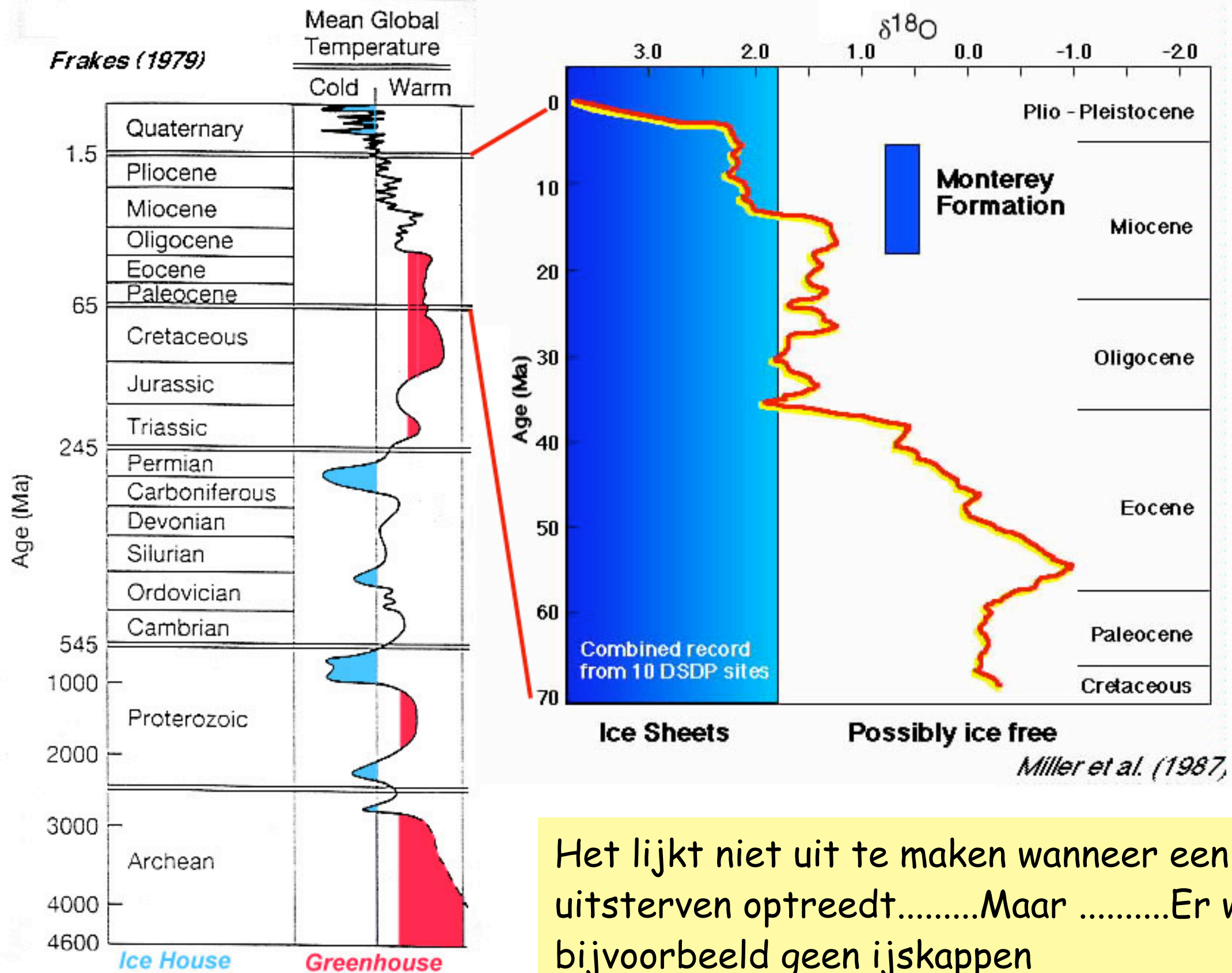
Dogie Creek, Wyoming



Brownie Butte Montana

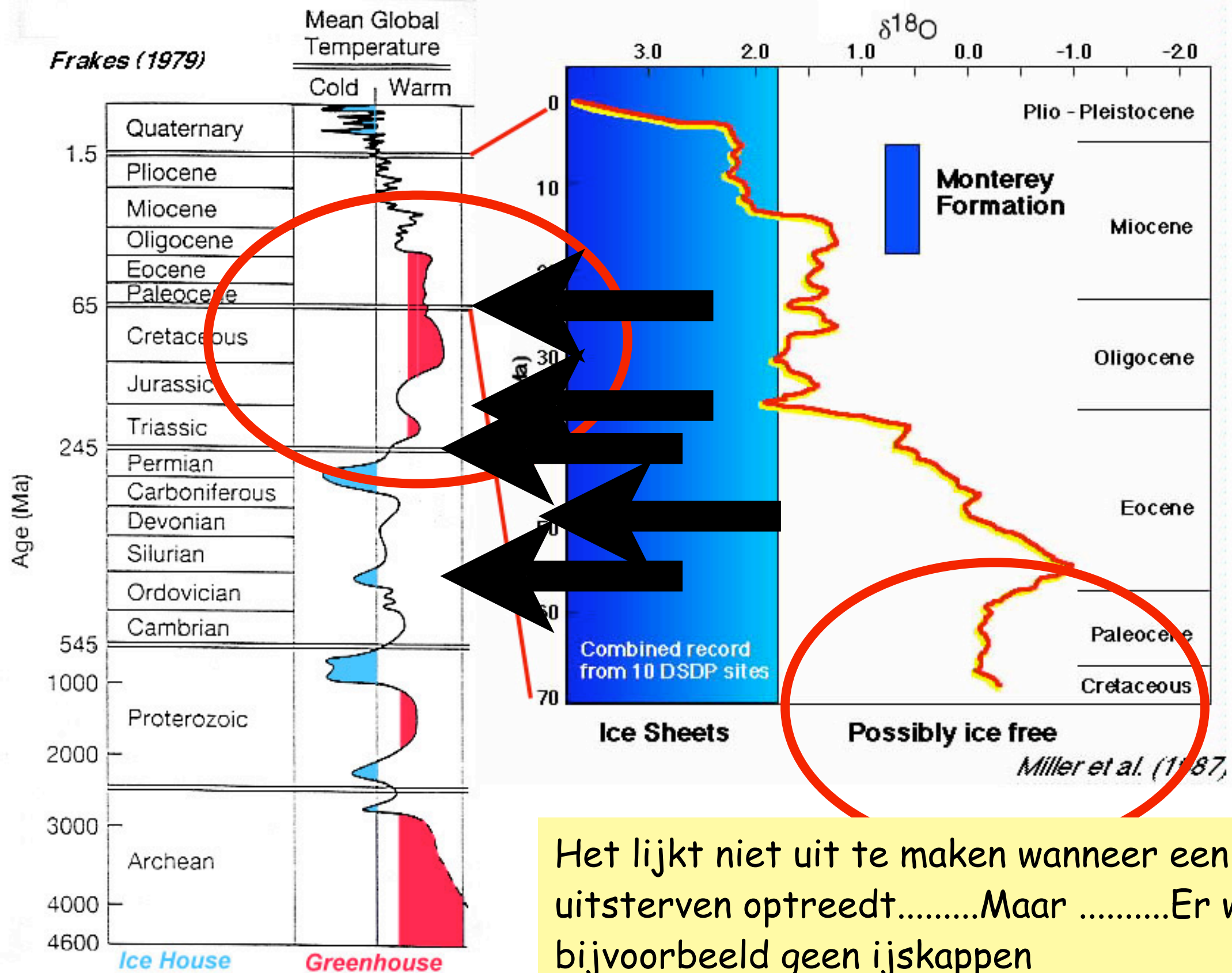
Laat staan 300.000 jaar.....

Maar is de inslag zaligmakend, of komt die wel op een heel ongelukkig moment??



Het lijkt niet uit te maken wanneer een massaal uitsterven optreedt.....MaarEr waren bijvoorbeeld geen ijskappen

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Het lijkt niet uit te maken wanneer een massaal uitsterven optreedt.....MaarEr waren bijvoorbeeld geen ijskappen

Dus wat is belangrijk bij Massa-extincties?

End Ordovician

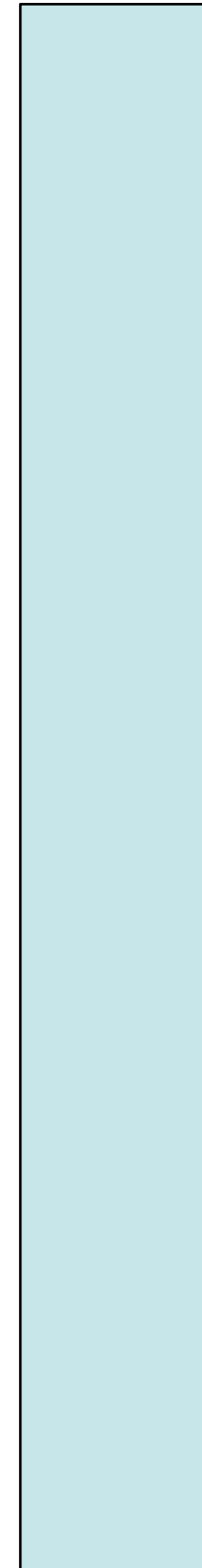
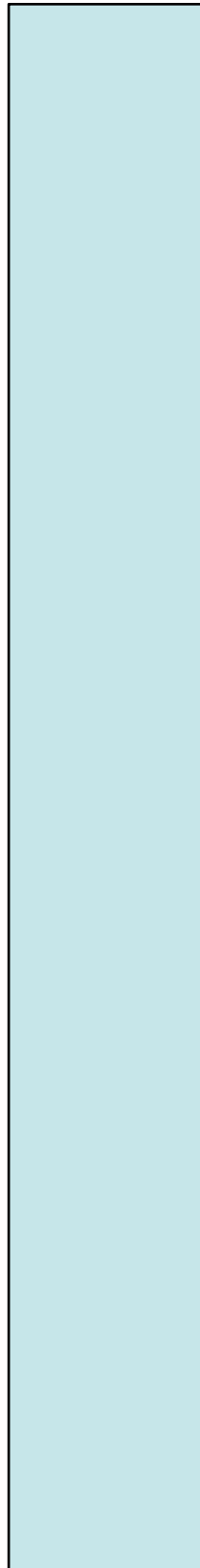
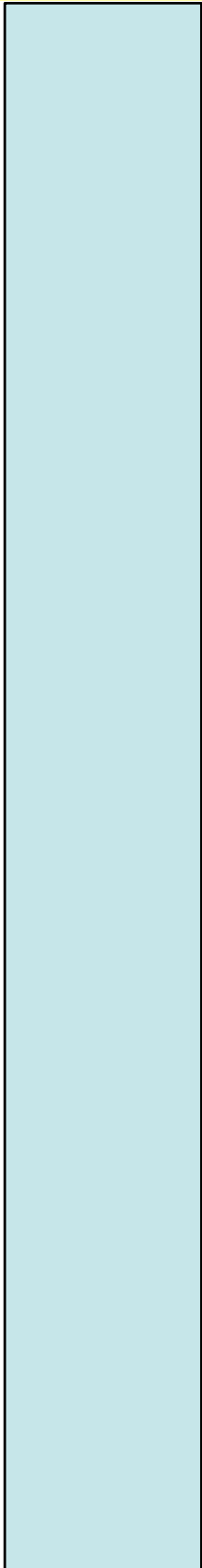
420milj

Permian Triassic

250milj

Cretaceous Tertiary

65milj



Dus wat is belangrijk bij Massa-extincties?

End Ordovician

420milj

massa extincties

Glaciation

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250milj

Volcanism/anoxia?

Cretaceous Tertiary

65milj

massa extincties

Impact



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End Ordovician

420milj

massa extincties

Glaciation



Boda event:
Corals at 70°S
GREENHOUSE
No polar icecaps

Permian Triassic

250milj

Volcanism/anoxia?

Cretaceous Tertiary

65milj

massa extincties

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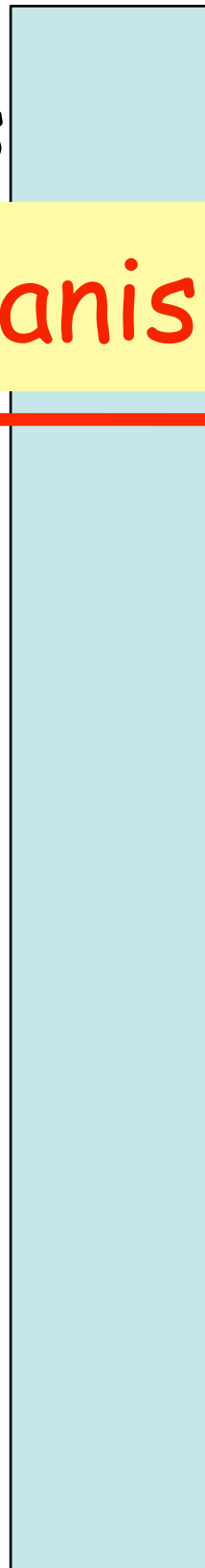
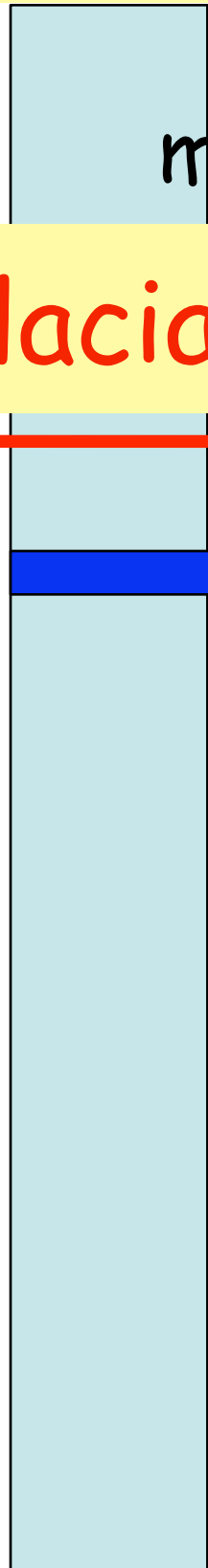
Karoo:
Reptiles at 60-70°
GREENHOUSE
No polar icecaps

Cretaceous Tertiary

65milj

massa extincties

Impact



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Corals at 70°S
GREENHOUSE
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250milj

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Reptiles at 60-70°
GREENHOUSE
No polar icecaps

Cretaceous Tertiary

65milj

massa extincties

Impact

Maastrichtian
Dinosaurs at 70°
GREENHOUSE
No polar icecaps



Dus wat is belangrijk voor Massa-extincties?

End Ordovician

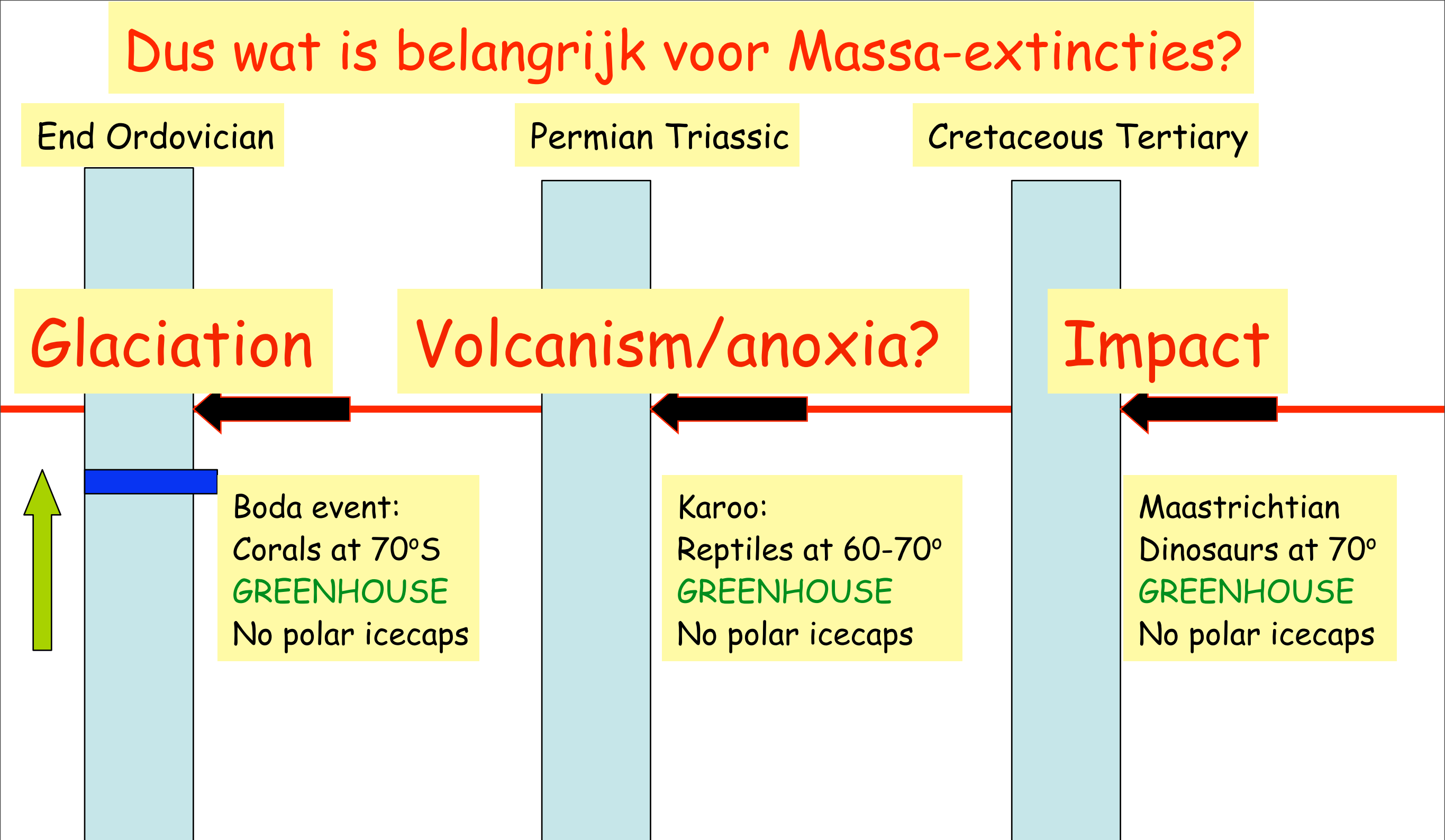
Permian Triassic

Cretaceous Tertiary

Glaciation

Volcanism/anoxia?

Impact

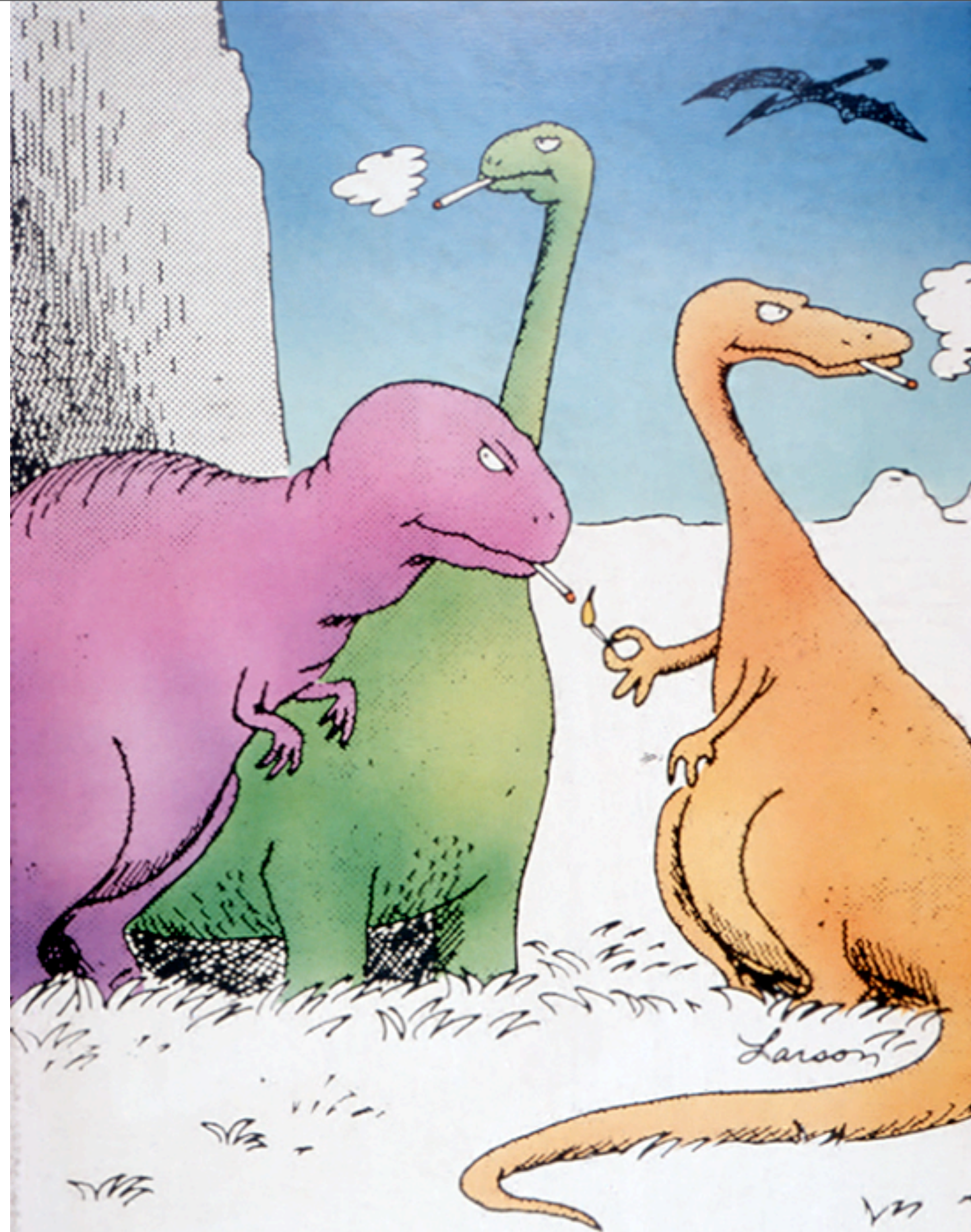


Boda event:
Corals at 70°S
GREENHOUSE
No polar icecaps

Karoo:
Reptiles at 60-70°
GREENHOUSE
No polar icecaps

Maastrichtian
Dinosaurs at 70°
GREENHOUSE
No polar icecaps

Misschien zijn levende wezens wel te veel gespecialiseerd en aangepast aan een warm, gelijkmatig klimaat, waardoor ze kwetsbaar worden voor plotselinge veranderingen??



The real reason dinosaurs became extinct.