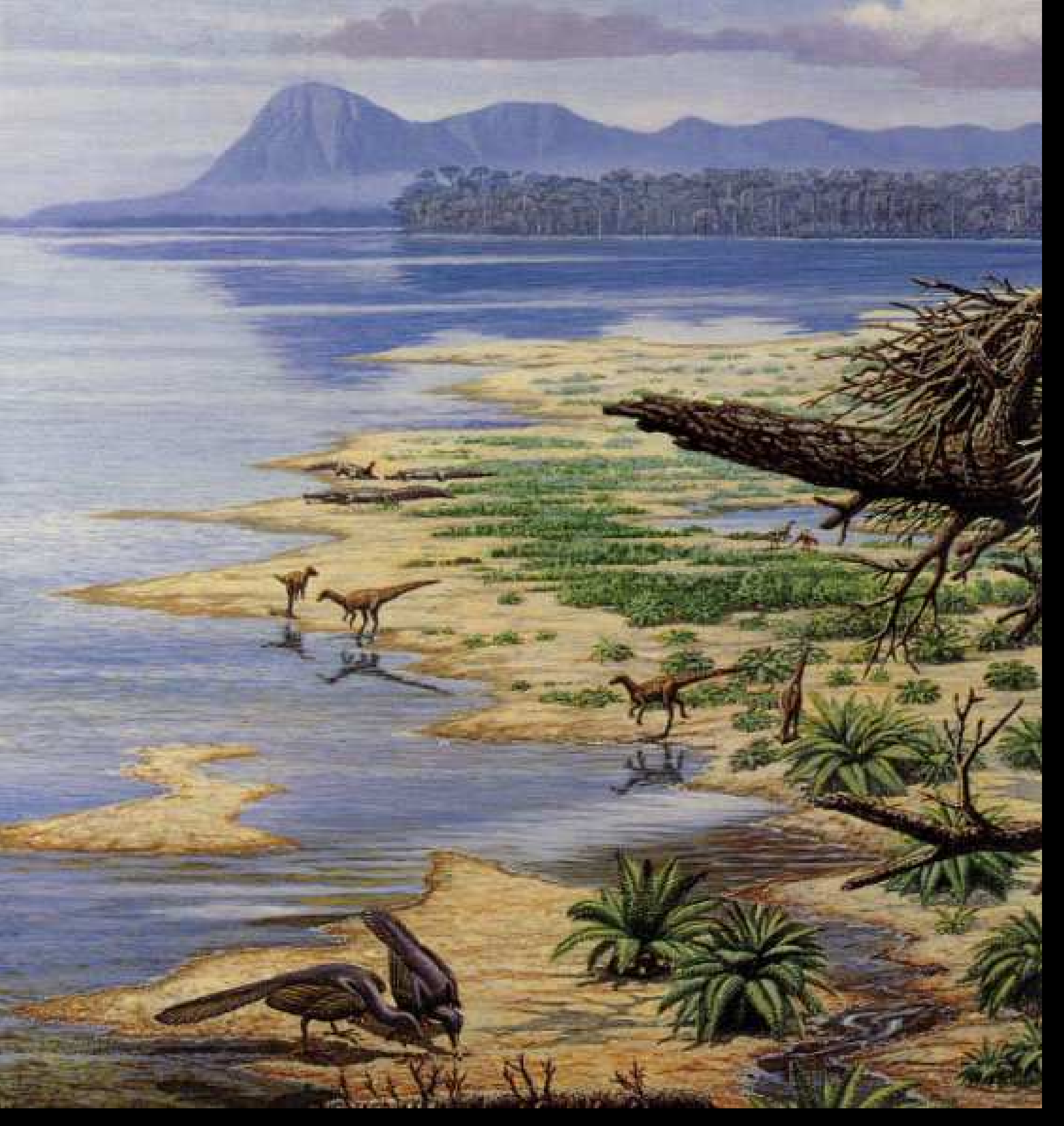
Topolino Rosso e il Dinosauro cattivo

Grimm & Grimm (1857)

C’era una volta 66 milioni di anni fa il florido Periodo Cretaceo …

E tutti vivevano felici e contenti: i dinosauri, gli uccelli, i pesci, un po' meno i piccoli mammiferi

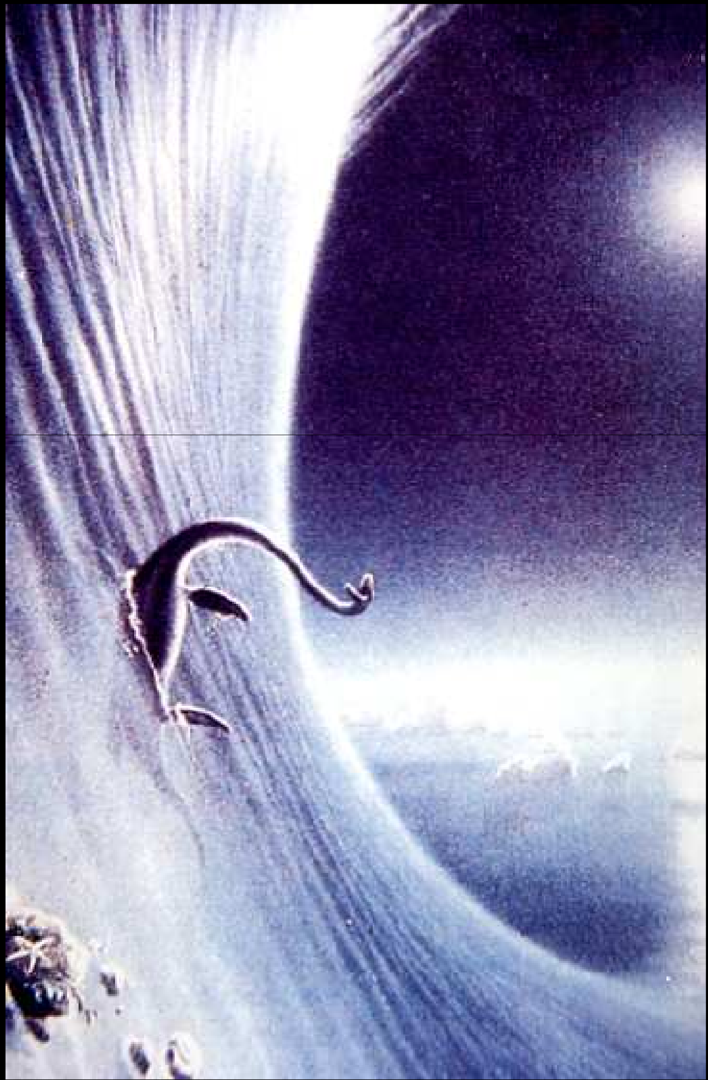


.. che in un qualche modo si arrangiavano a vivere da sottomessi in un mondo dominato dai dinosauri cattivi.

Poi una notte di primavera apparve nel cielo un grande bagliore. Una cometa o piuttosto un asteroide? Un gigantesco meteorite, insomma.

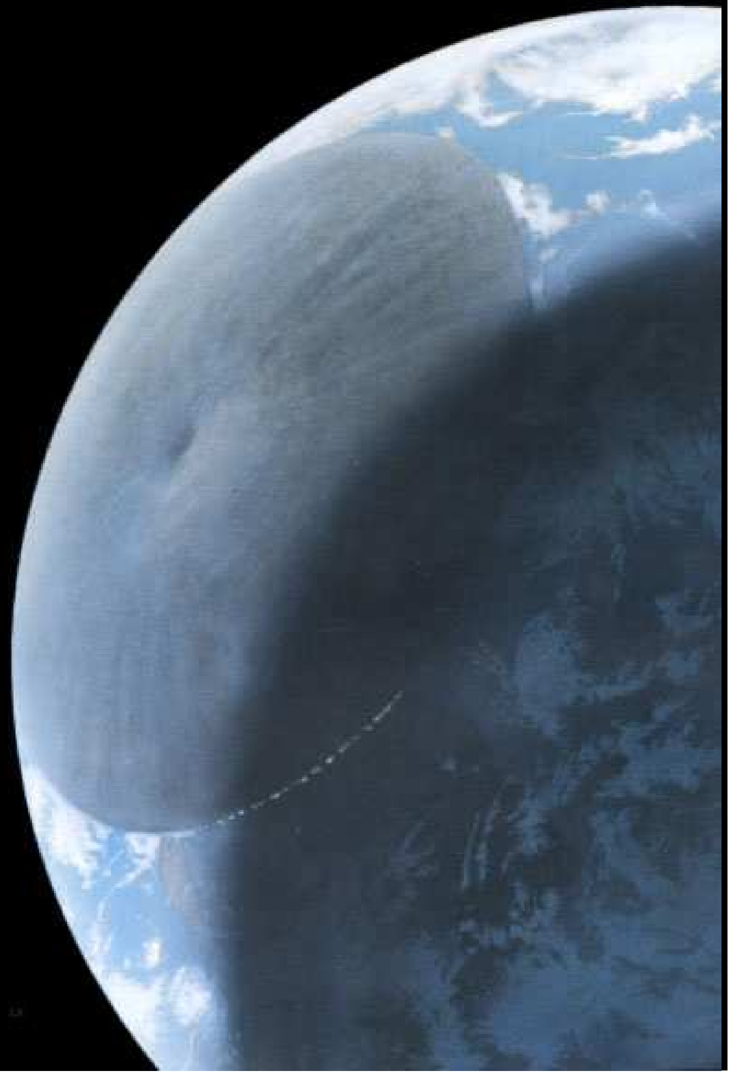
Dopo pochi istanti si vide al di là dell'orizzonte una gran luce che si espanse rischiarando il cielo come fosse giorno. Ci fu un pauroso boato e tutta la Terra vibrò come fosse una campana.

Onde immense si alzarono nell'oceano che s'infransero sulle coste dei continenti spazzando via tutto.



Dall’occhio dell’immane esplosione fuoriuscì una nuvola di polveri e gas incandescenti….

… che espandendosi nella stratosfera ben presto avvolse l’intero pianeta sprofondandolo in una fredda e interminabile notte invernale.



Per molti anni durò questo inverno freddo e buio che rendendo impossibile la fotosintesi sconvolse l'intero ecosistema della Terra minando la base della catena alimentare.

Quando finalmente la cortina di polveri si diradò, i raggi del Sole poterono illuminare di nuovo la Terra ma era una luce fioca per via dei gas dell’esplosione che persistevano nell’atmosfera causando un disastroso effetto serra che sarebbe durato decine di migliaia di anni.

In pochi sopravvissero a quella catastrofe che portò all'estinzione di gran parte delle specie vegetali e animali, inclusi i Dinosauri che fino ad allora erano gli incontrastati dominatori del pianeta in cima alla catena alimentare.

Passarono centinaia di migliaia di anni prima che la Terra tornasse a splendere piena di vita con il suo colore blu e i superstiti della grande estinzione di massa poterono evolversi popolando con nuove specie un rinnovato pianeta ora dominato dai mammiferi.

E vissero felici e contenti fino alla comparsa dell'Uomo.

6 June 1980, Volume 208, Number 4448 SCIENCE

Extraterrestrial Cause for the Cretaceous-Tertiary Extinction

Experimental results and theoretical interpretation

Luis W. Alvarez, Walter Alvarez, Frank Asaro, Helen V. Michel

Summary. Platinum metals are depleted in the earth's crust relative to their cosmic abundance; concentrations of these elements in deep-sea sediments may thus indicate influxes of extraterrestrial material. Deep-sea limestones exposed in Italy, Denmark, and New Zealand show iridium increases of about 30, 160, and 20 times, respectively, above the background level at precisely the time of the Cretaceous-Tertiary extinctions, 65 million years ago. Reasons are given to indicate that this iridium is of extraterrestrial origin, but did not come from a nearby supernova. A hypothesis is suggested which accounts for the extinctions and the iridium observations. Impact of a large earth-crossing asteroid would inject about 60 times the object's mass into the atmosphere as pulverized rock; a fraction of this dust would stay in the stratosphere for several years and be distributed worldwide. The resulting darkness would suppress photosynthesis, and the expected biological consequences match quite closely the extinctions observed in the paleontological record. One prediction of this hypothesis has been verified: the chemical composition of the boundary clay, which is thought to come from the stratospheric dust, is markedly different from that of clay mixed with the Cretaceous and Tertiary limestones, which are chemically similar to each other. Four different independent estimates of the diameter of the asteroid give values that lie in the range 10 ± 4 kilometers.

In the 570-million-year period for which abundant fossil remains are available, there have been five great biological crises, during which many groups of organisms died out. The most recent of the great extinctions is used to define the boundary between the Cretaceous and Tertiary periods, about 65 million years ago. At this time, the marine reptiles, the flying reptiles, and both orders of dinosaurs died out (*1*), and extinctions occurred at various taxonomic levels among the marine invertebrates. Dramatic extinctions occurred among the microscopic floating animals and plants; both the calcareous planktonic foraminifera and the calcareous nannoplankton were nearly exterminated, with only a few species surviving the crisis. On the other hand, some groups were little affected, including the land plants, crocodiles, snakes, mammals, and many kinds of invertebrates. Russell (*2*) concludes that about half of the genera living at that time perished during the extinction event.

Many hypotheses have been proposed to explain the Cretaceous-Tertiary (C-T) extinctions (*3, 4*), and two recent meetings on the topic (*5, 6*) produced no sign of a consensus. Suggested causes include gradual or rapid changes in oceanographic, atmospheric, or climatic conditions (*7*) due to a random (*8*) or a cyclical (*9*) coincidence of causative factors; a magnetic reversal (*10*); a nearby supernova (*11*); and the flooding of the ocean surface by fresh water from a postulated arctic lake (*12*).

A major obstacle to determining the cause of the extinction is that virtually all the available information on events at the time of the crisis deals with biological changes seen in the paleontological record and is therefore inherently indirect. Little physical evidence is available, and it also is indirect. This includes variations in stable oxygen and carbon isotopic ratios across the boundary in pelagic sediments, which may reflect changes in temperature, salinity, oxygenation, and organic productivity of the ocean water, and which are not easy to interpret (*13, 14*). These isotopic changes are not particularly striking and, taken by themselves, would not suggest a dramatic crisis. Small changes in minor and trace element levels at the C-T boundary have been noted from limestone sections in Denmark and Italy (*15*), but these data also present interpretational difficulties. It is noteworthy that in pelagic marine sequences, where nearly continuous deposition is to be expected, the C-T boundary is commonly marked by a hiatus (*3, 16*).

In this article we present direct physical evidence for an unusual event at exactly the time of the extinctions in the planktonic realm. None of the current hypotheses adequately accounts for this evidence, but we have developed a hypothesis that appears to offer a satisfactory explanation for nearly all the available paleontological and physical evidence.

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0036-8075/80/0606-1095$02.00/0

Alvarez et al. (1980)

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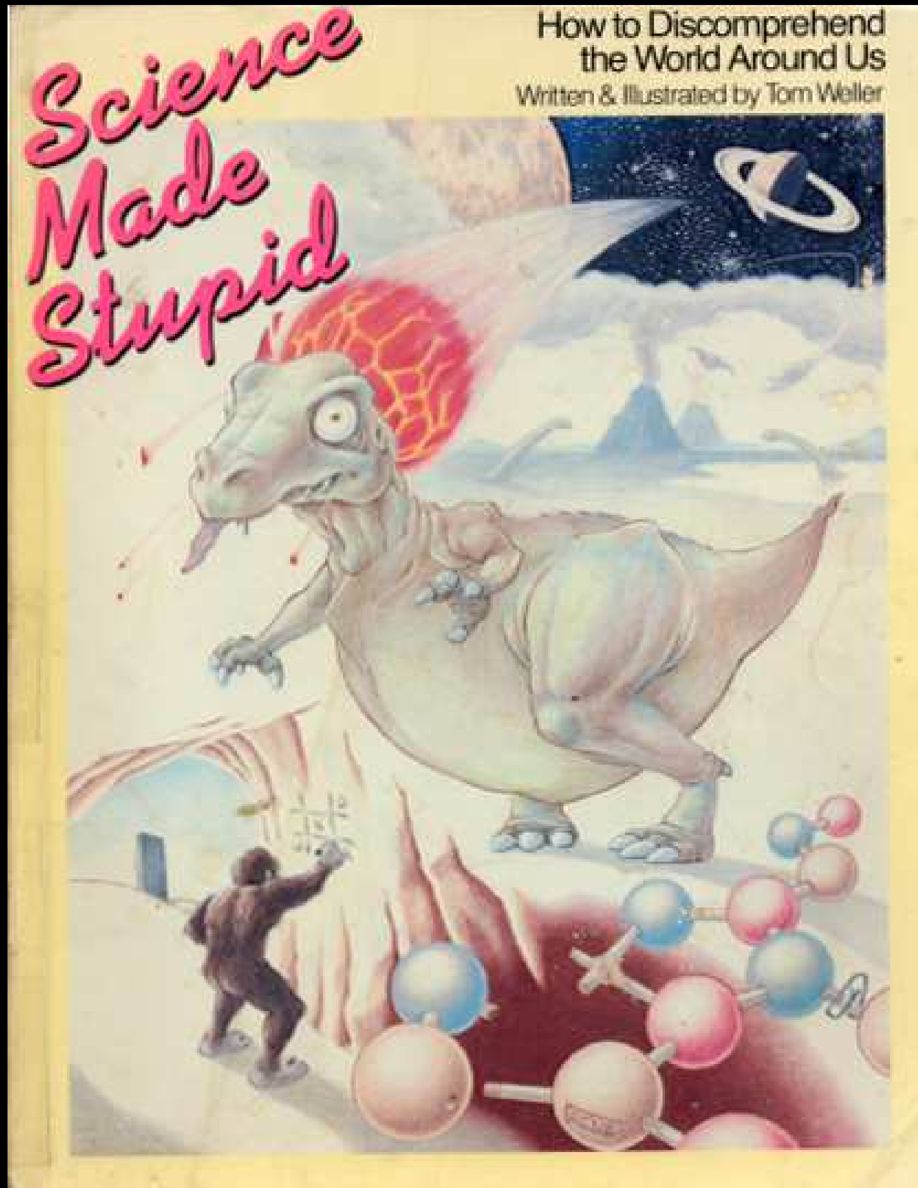
Alvarez et al. (1980)



Weller (1985)

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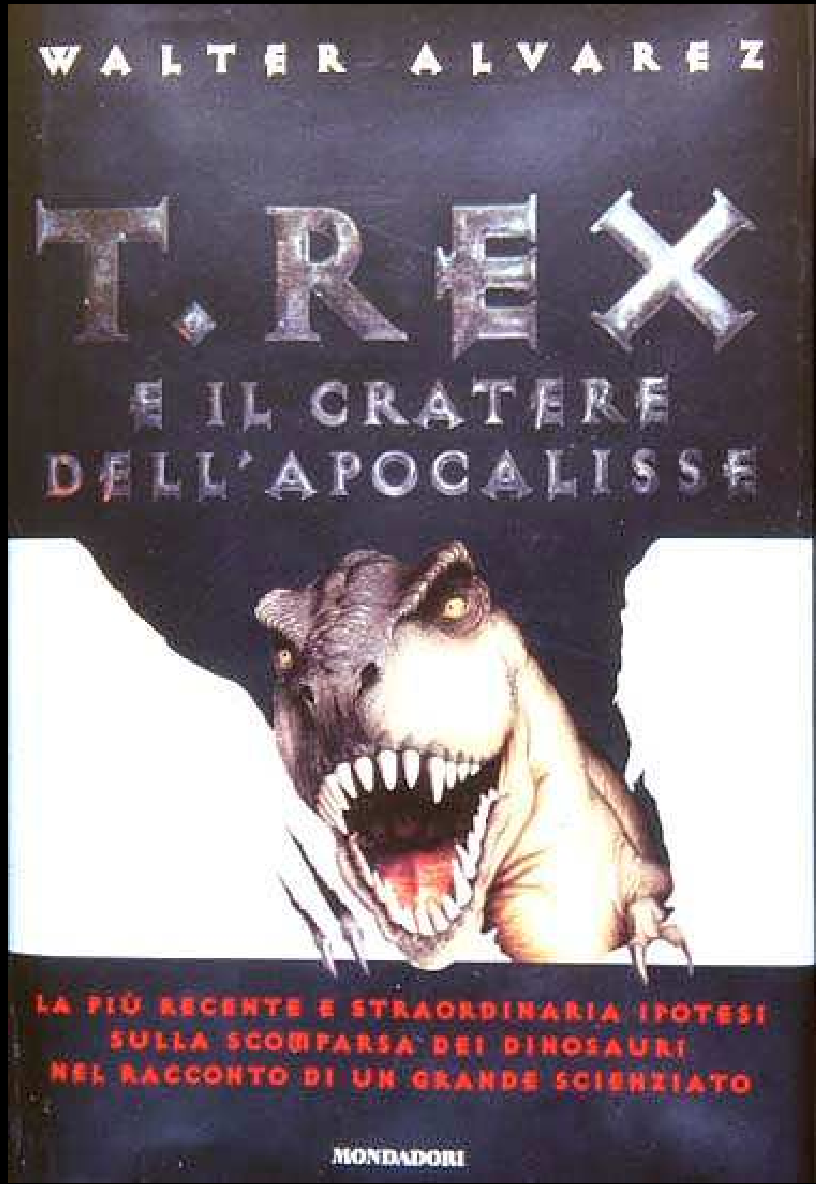
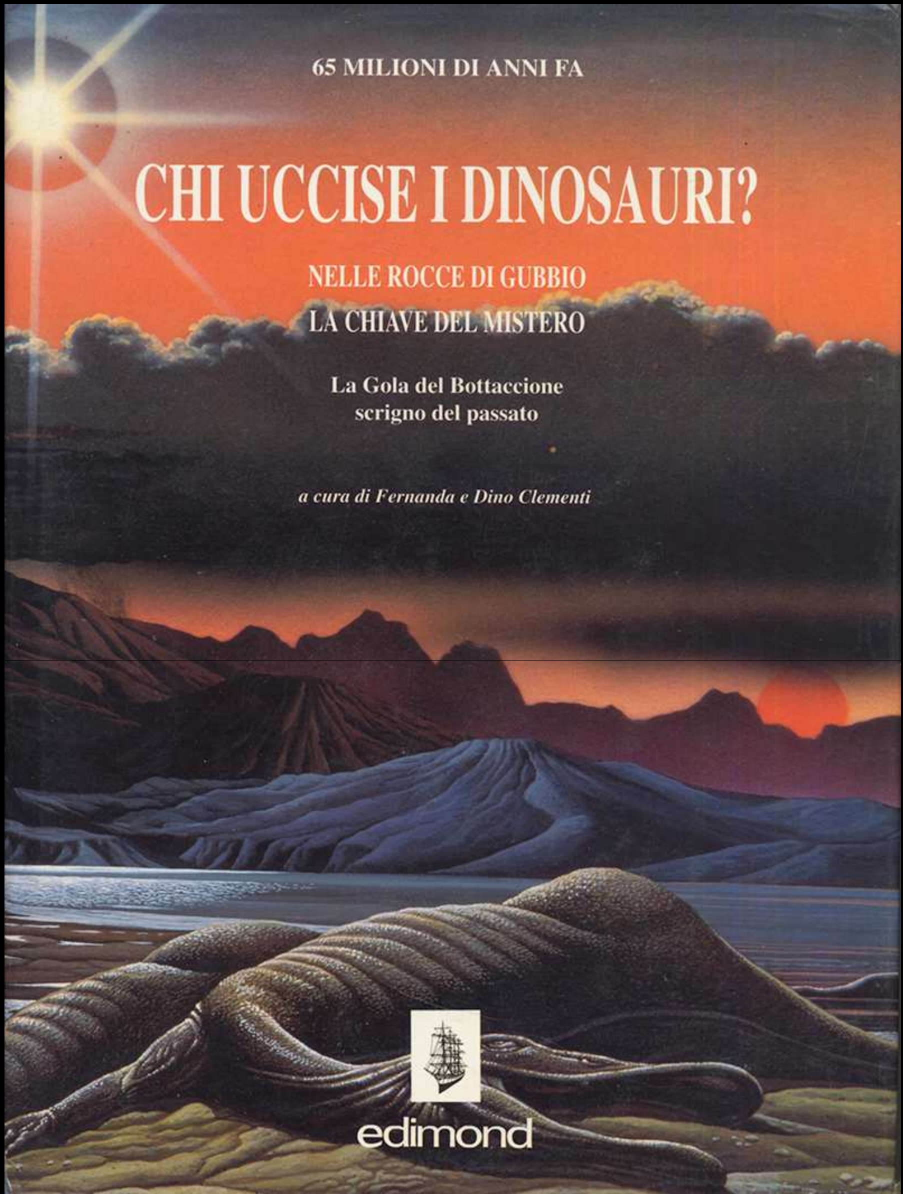
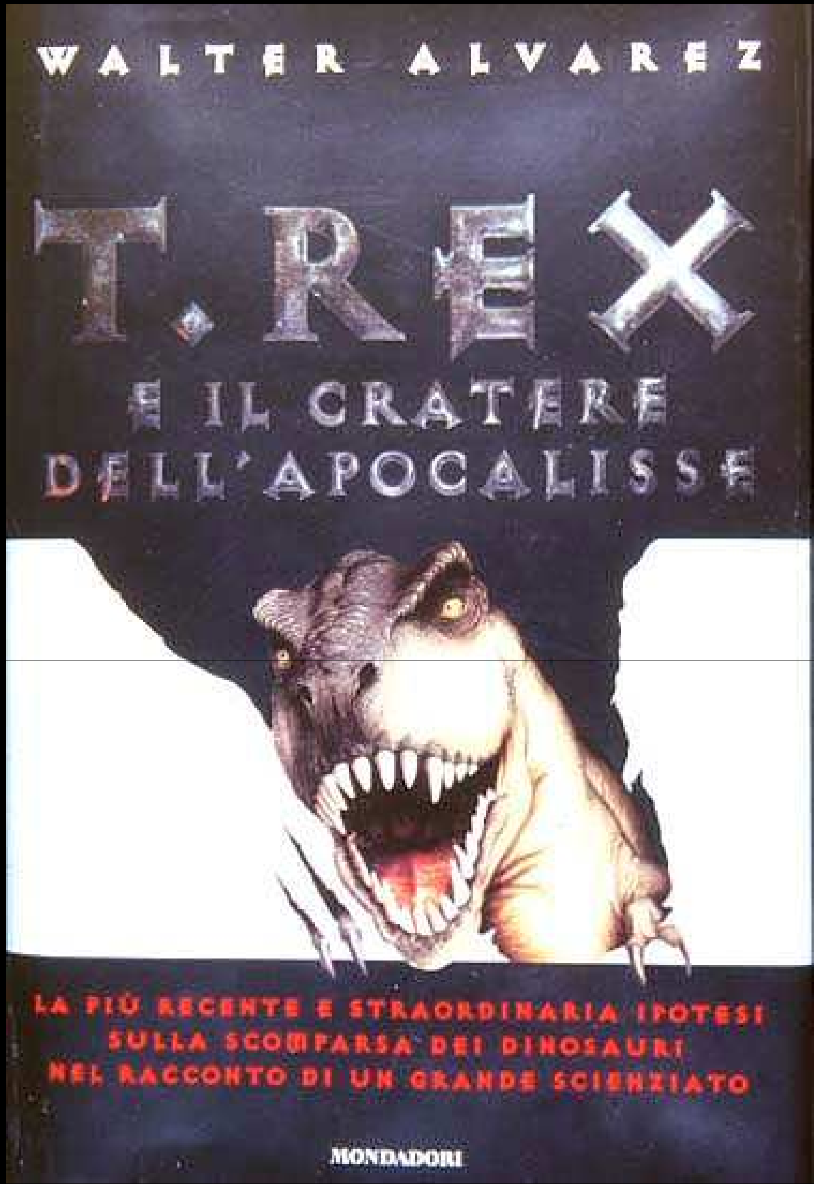


Alvarez (1998)



Fernanda & Dino Clementi (1993)

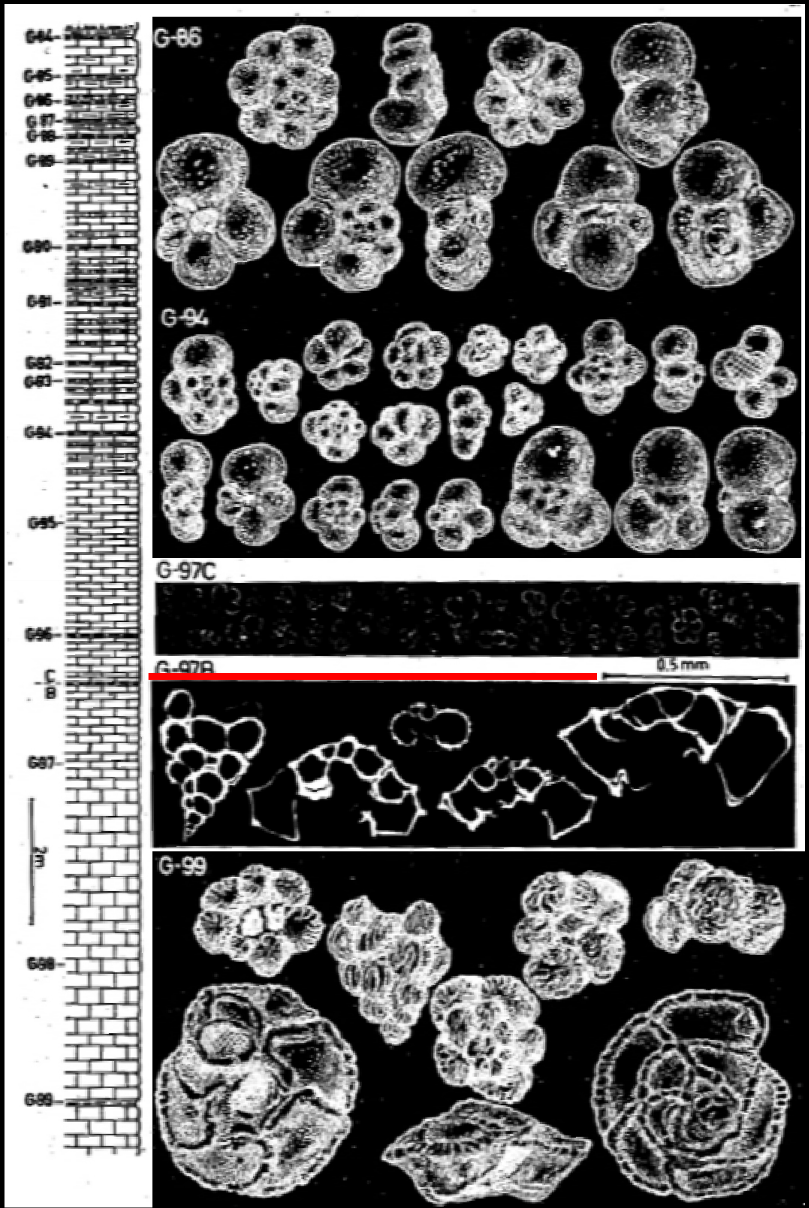


Alvarez (1998)

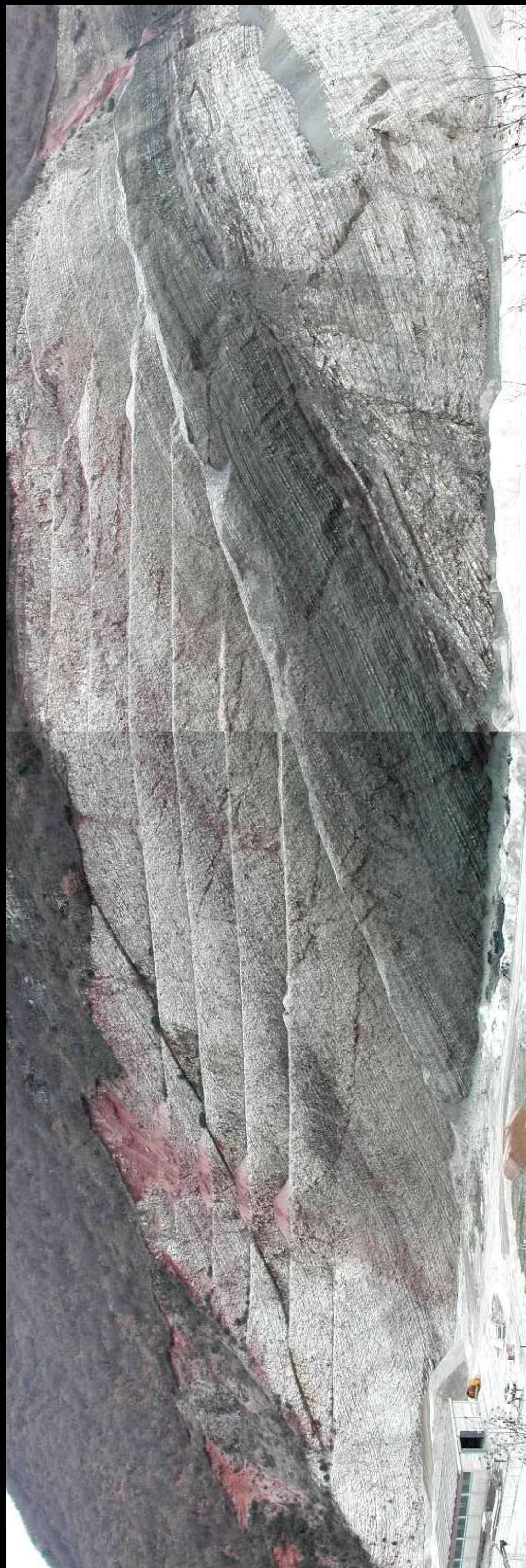

L'Ordine dei Geologi dell'Umbria Inc.
PRESENTA
Dagli Appennini allo Yucatan
sulle tracce di un serial killer
il giallo sulla scomparsa dei dinosauri
con
Walter Alvarez
Luis W. Alvarez
Frank Asaro
Helen Michel
Jan Smit
vetato ai minori
di 6 anni
Un powerpoint panavision show di Alessandro Montanari
Osservatorio Geologico di Coldigioco

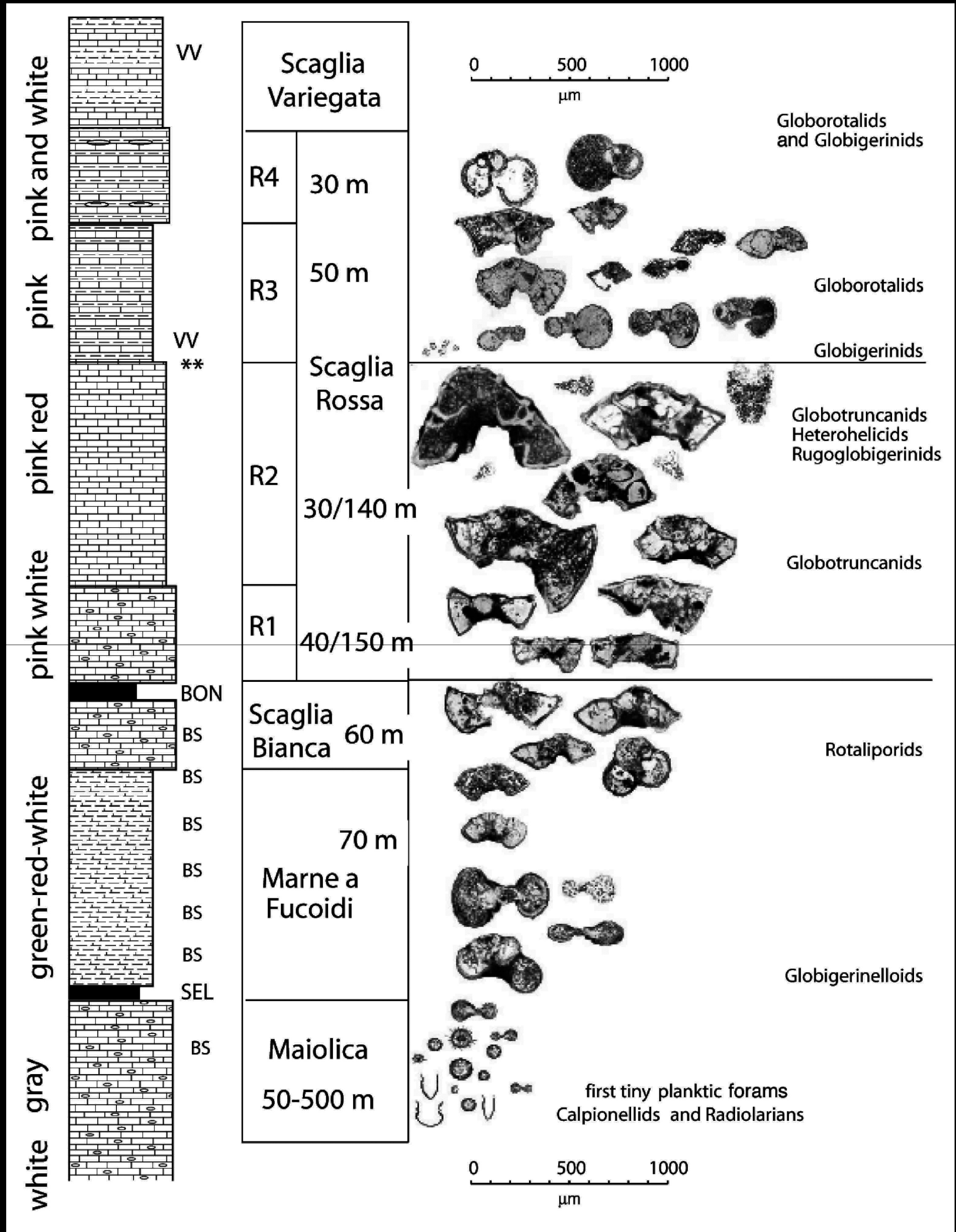
Gubbio - Gola del Bottaccione

Gubbio - Gola del Bottaccione

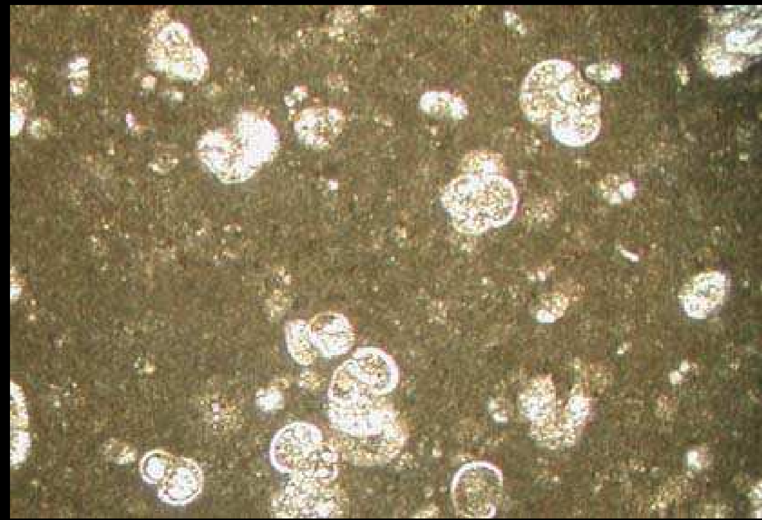


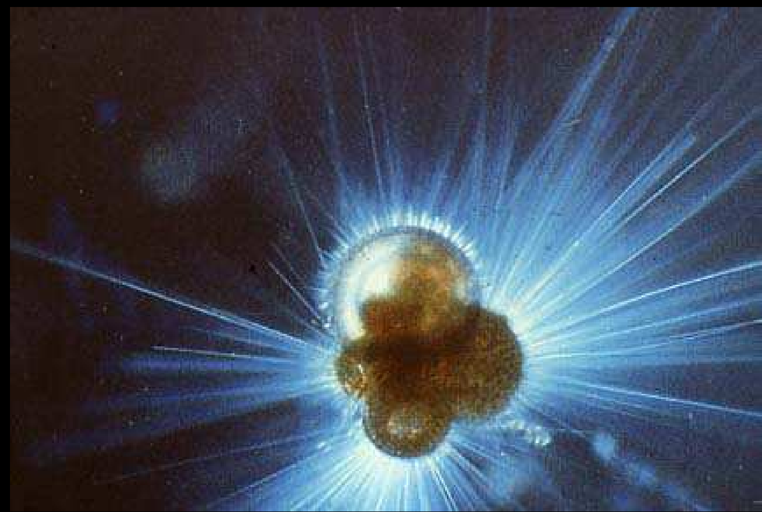
Luterbacher & Premoli Silva (1964)

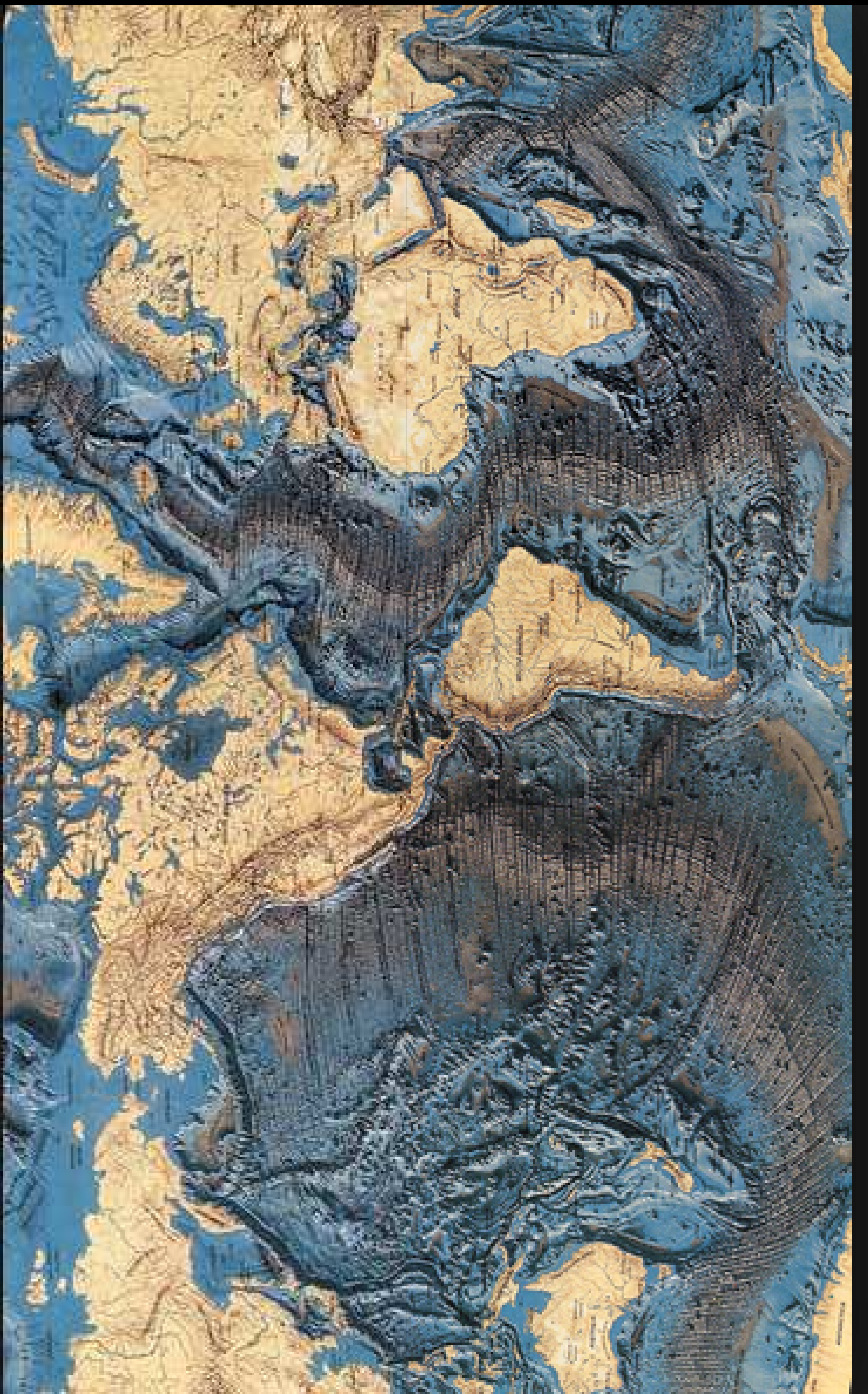




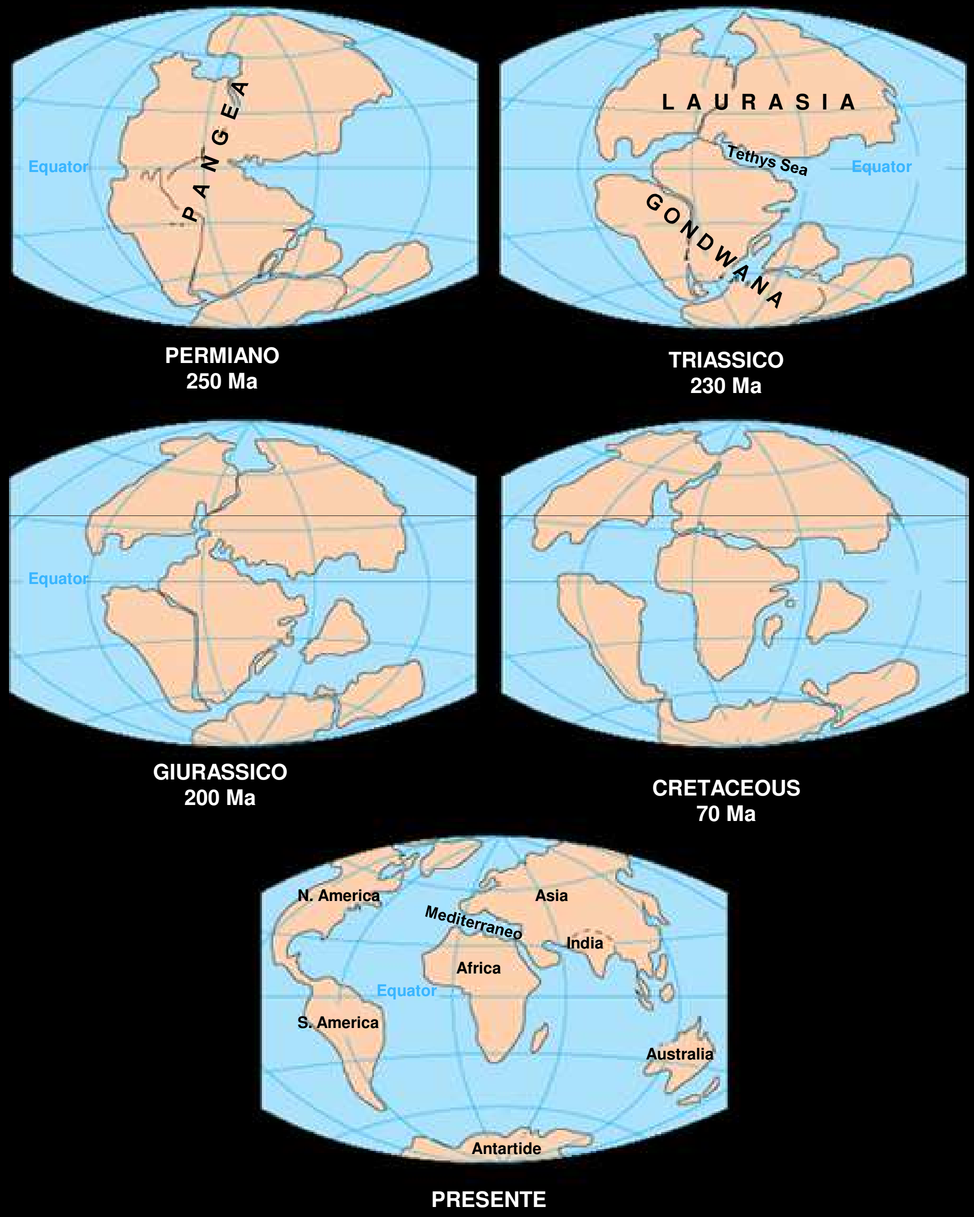
pink and white
pink
pink red
pink white
green-red-white
gray
white
VV
VV
**
BON
BS
BS
BS
BS
BS
BS
SEL
BS
Scaglia Variegata
R4
30 m
R3
50 m
Scaglia Rossa
R2
30/140 m
R1
40/150 m
Scaglia Bianca
60 m
70 m
Marne a Fucoidi
Maiolica
50-500 m
0
500
1000
µm
Globorotalids and Globigerinids
Globorotalids
Globigerinids
Globotruncanids
Heterohelicids
Rugoglobigerinids
Globotruncanids
Rotaliporids
Globigerinelloids
first tiny planktic forams
Calpionellids and Radiolarians
0
500
1000
µm

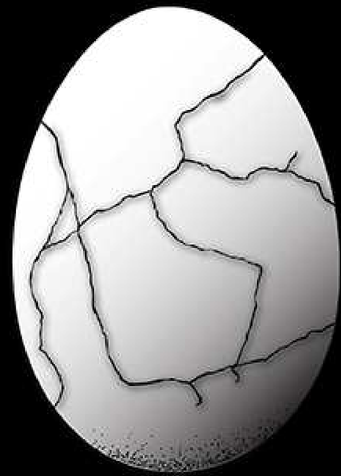


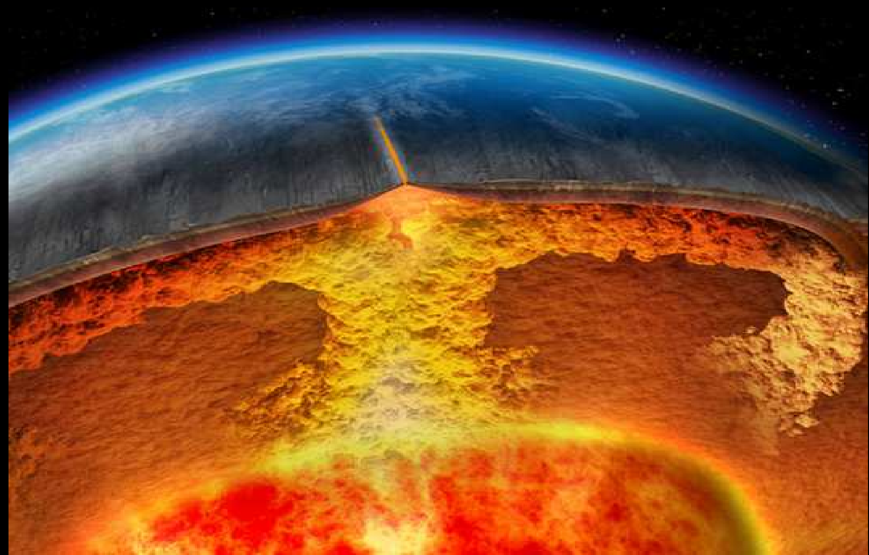




Tettonica delle placche







Tettonica delle placche

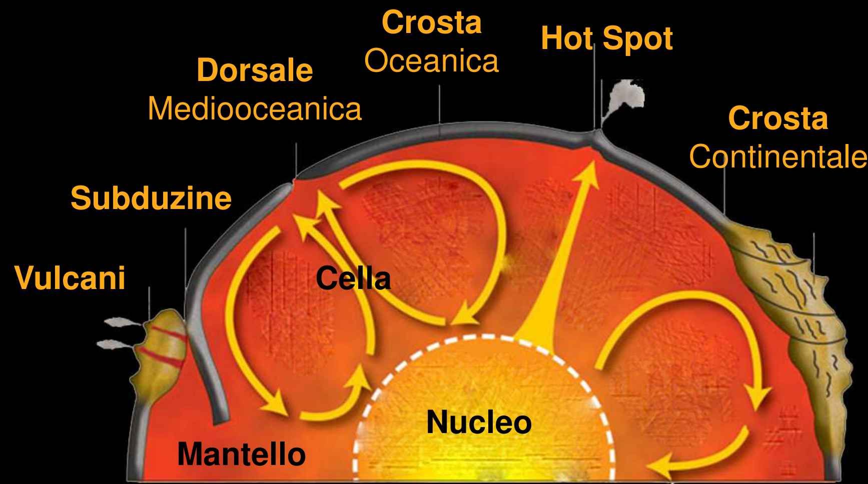
PERMIANO
250 Ma

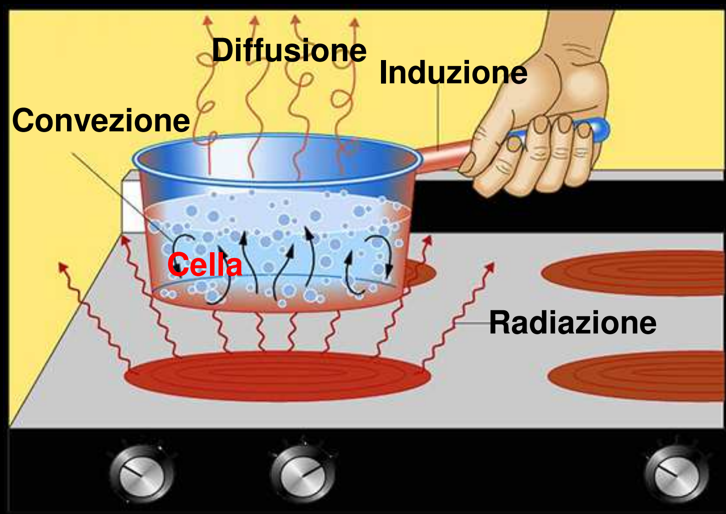
TRIASSICO
230 Ma

GIURASSICO
200 Ma

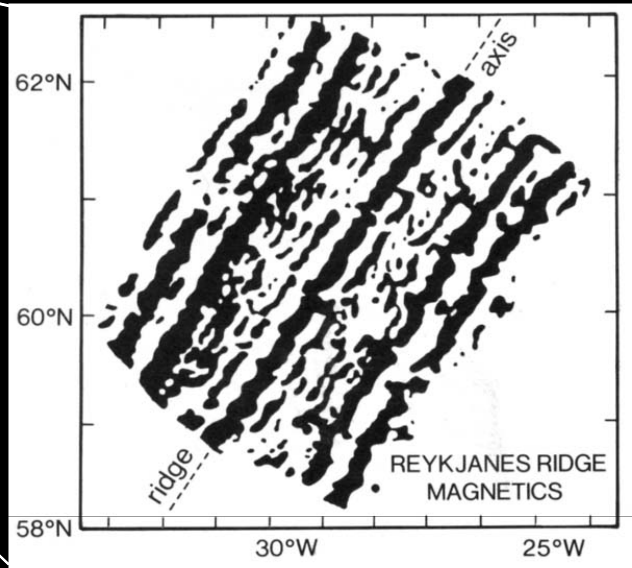
CRETACEOUS
70 Ma

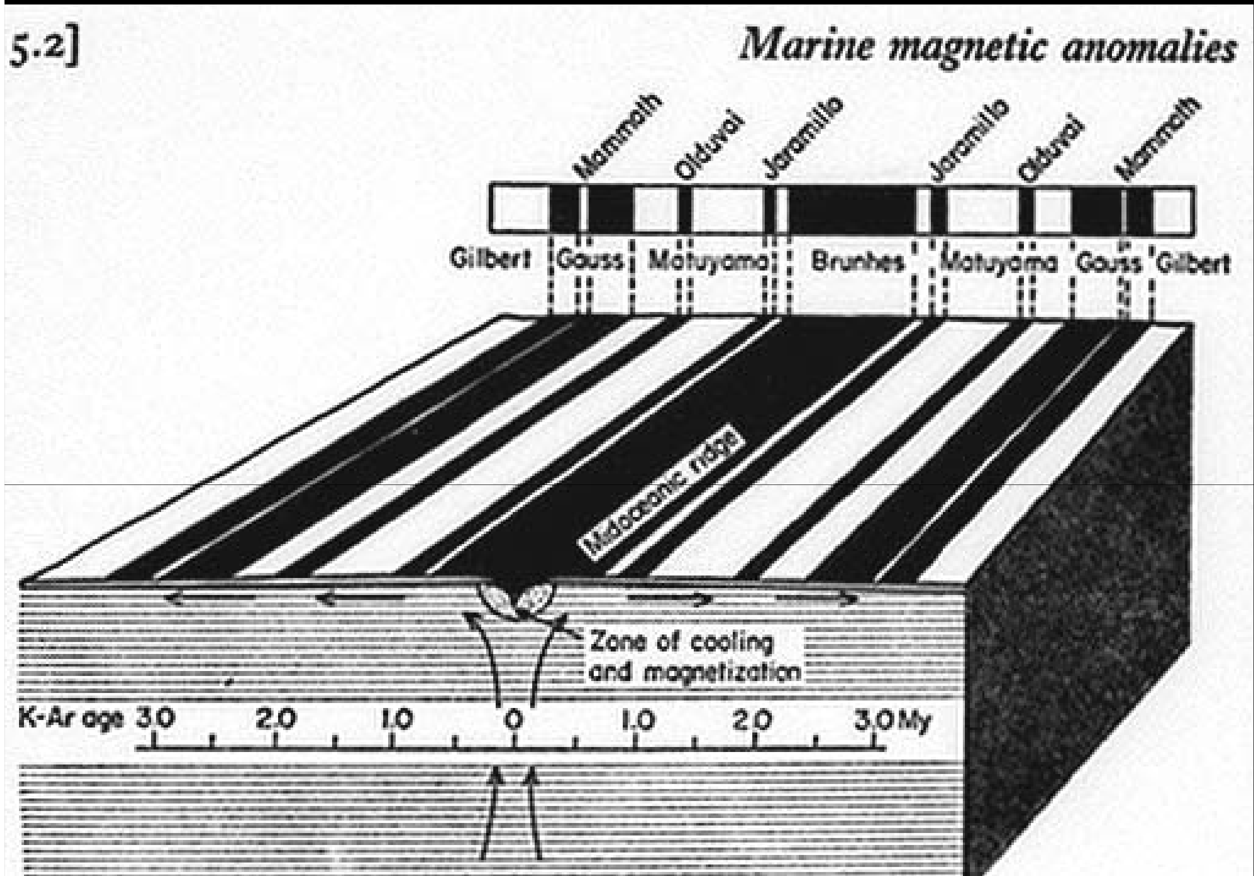
PRESENTE

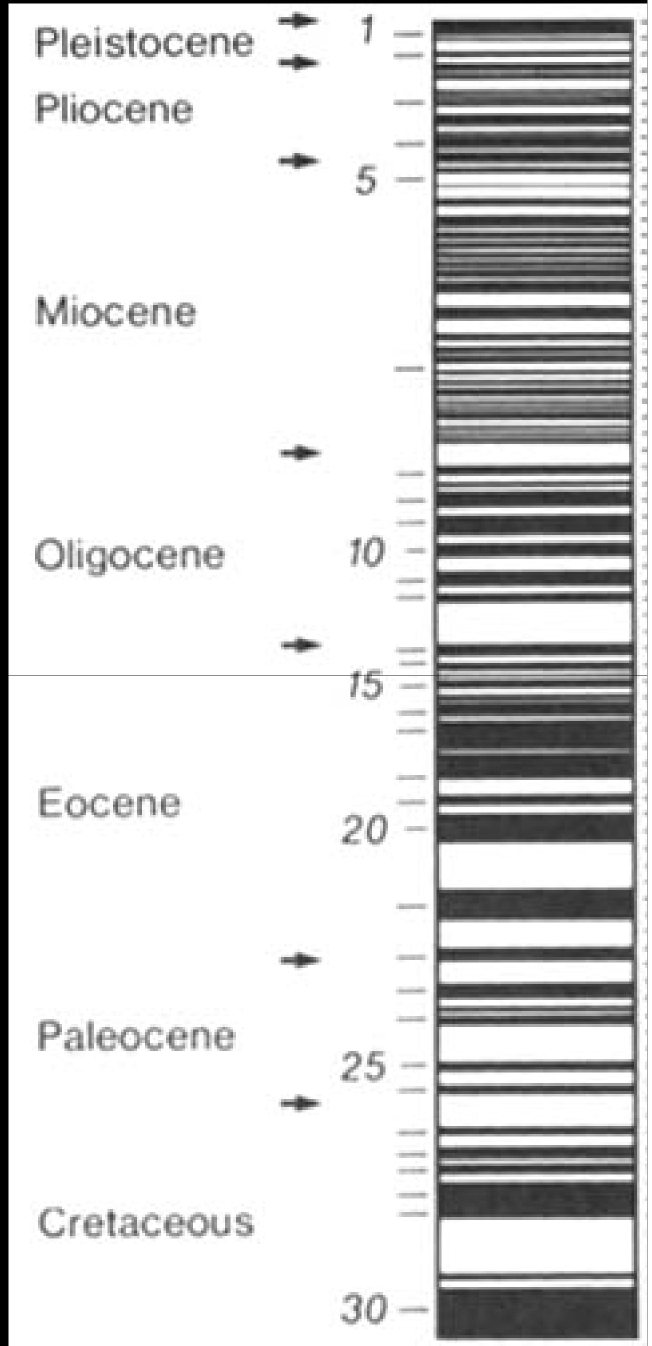


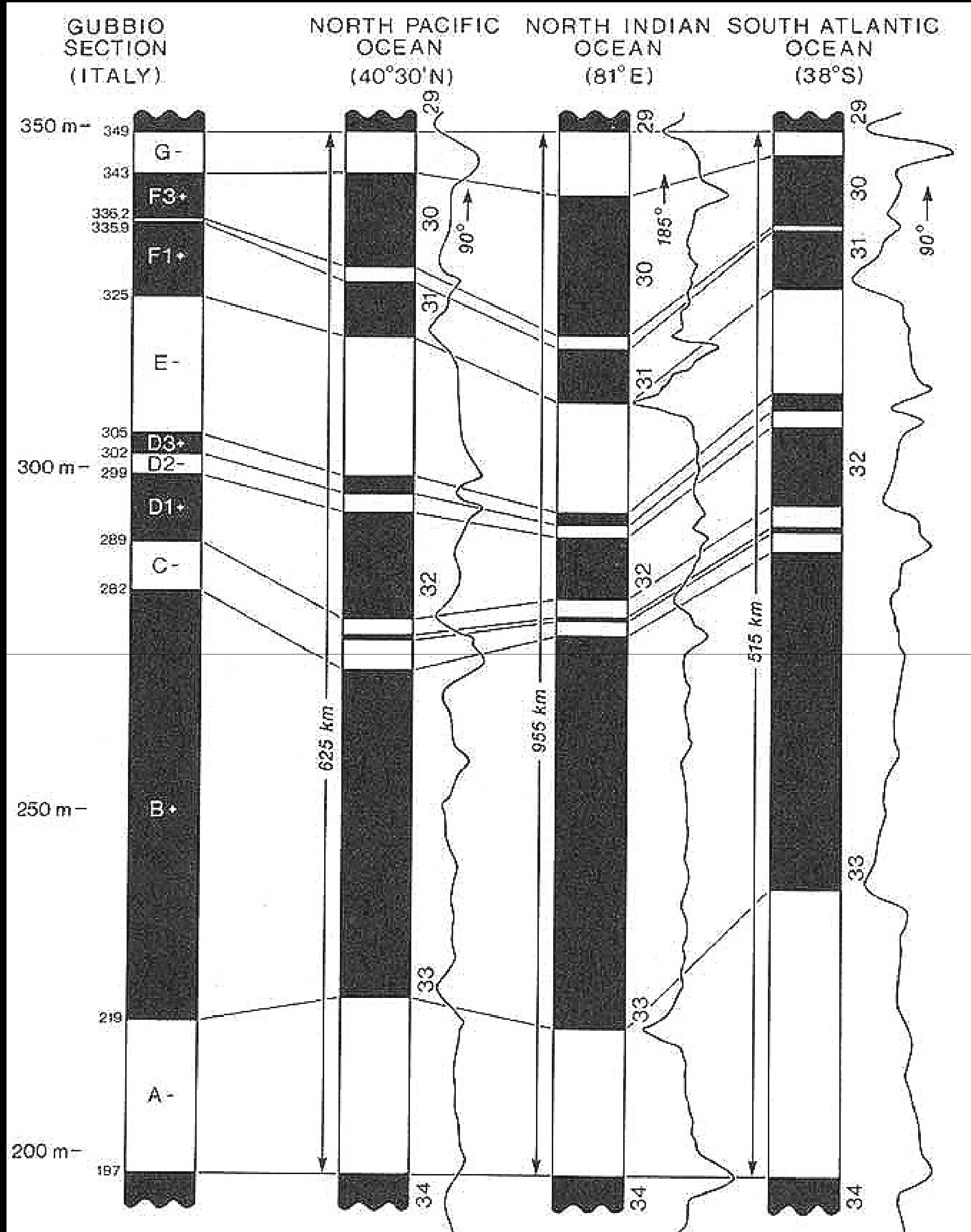


Anomalie magnetiche marine



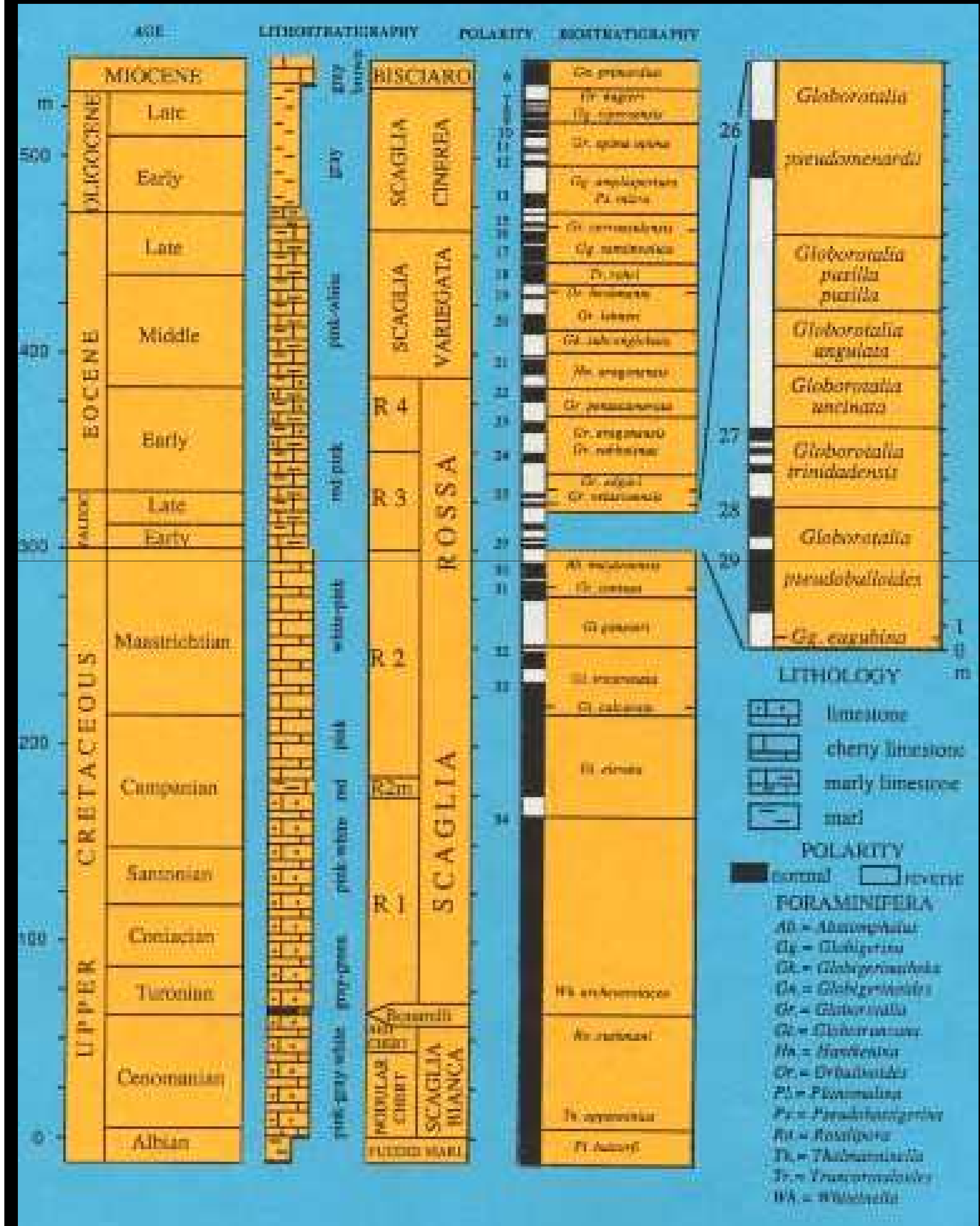

5.2]
Marine magnetic anomalies
Mammoth
Olduvai
Jaramillo
Jaramillo
Olduvai
Mammoth
Gilbert
Gauss
Matuyama
Brunhes
Matuyama
Gauss
Gilbert
Midoceanic ridge
Zone of cooling and magnetization
K-Ar age 3.0 2.0 1.0 0 1.0 2.0 3.0 My

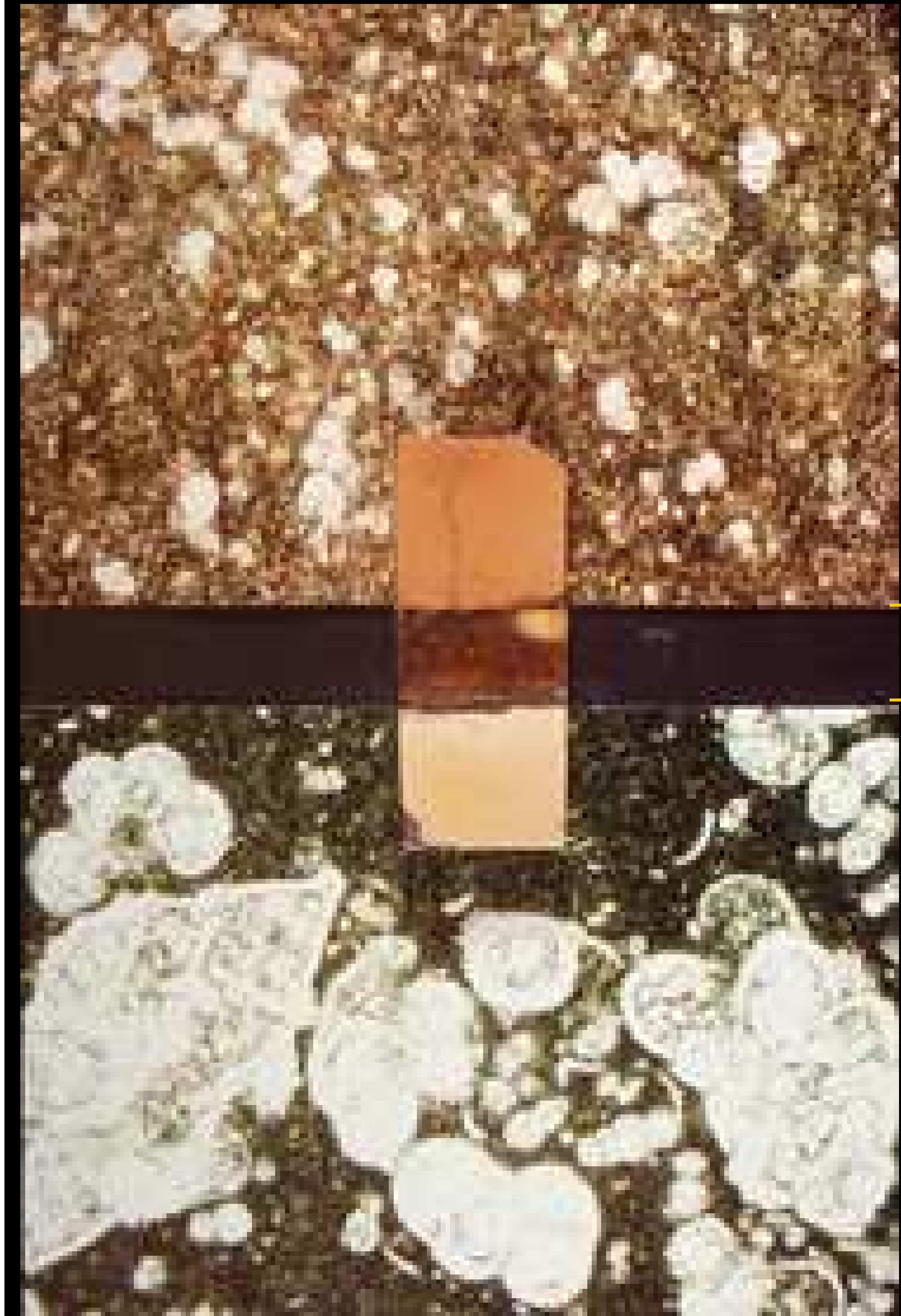

Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene
Cretaceous
1
5
10
15
20
25
30



Alvarez et al. (1977)

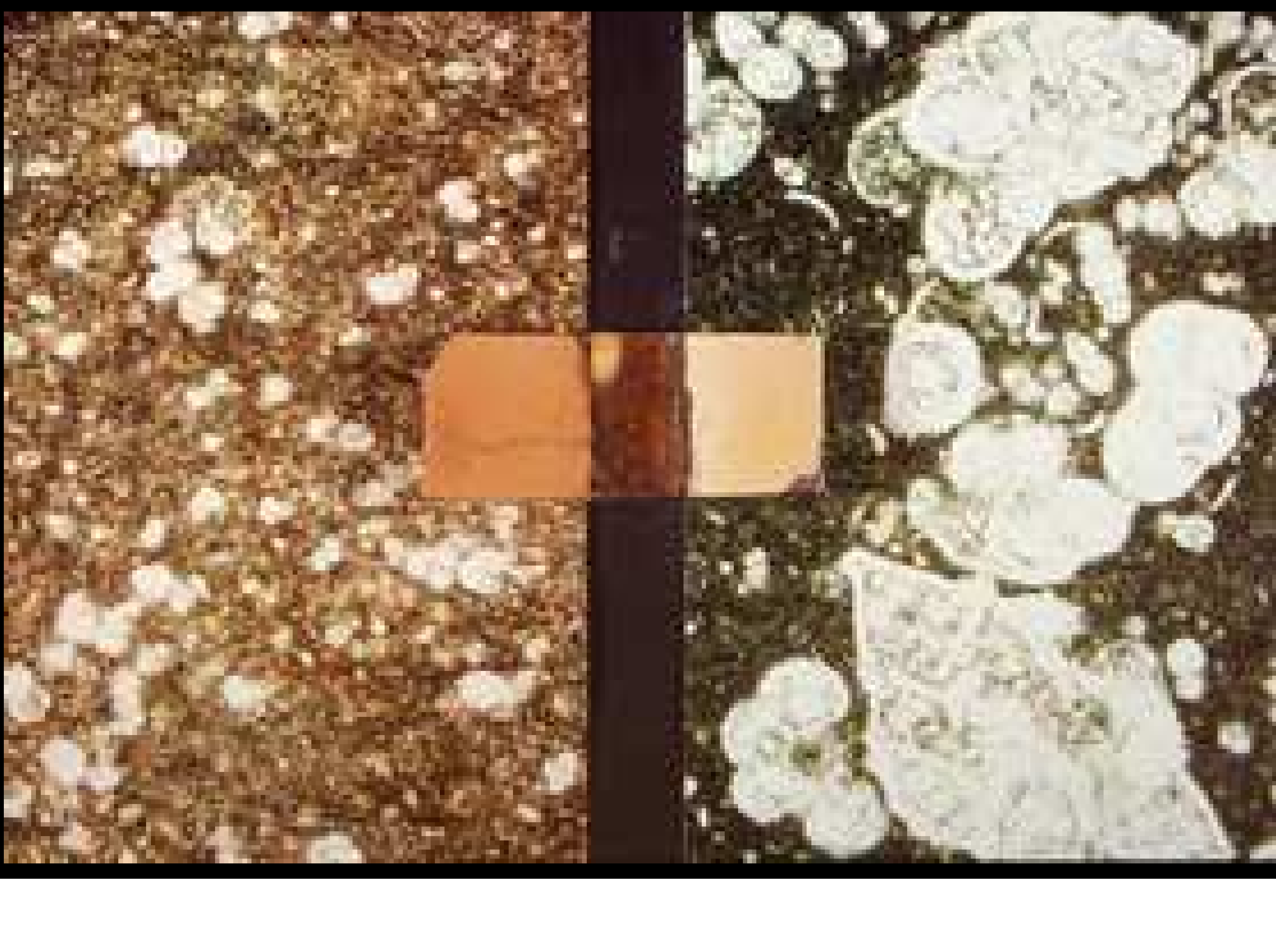
L’ottava tavola eugubina

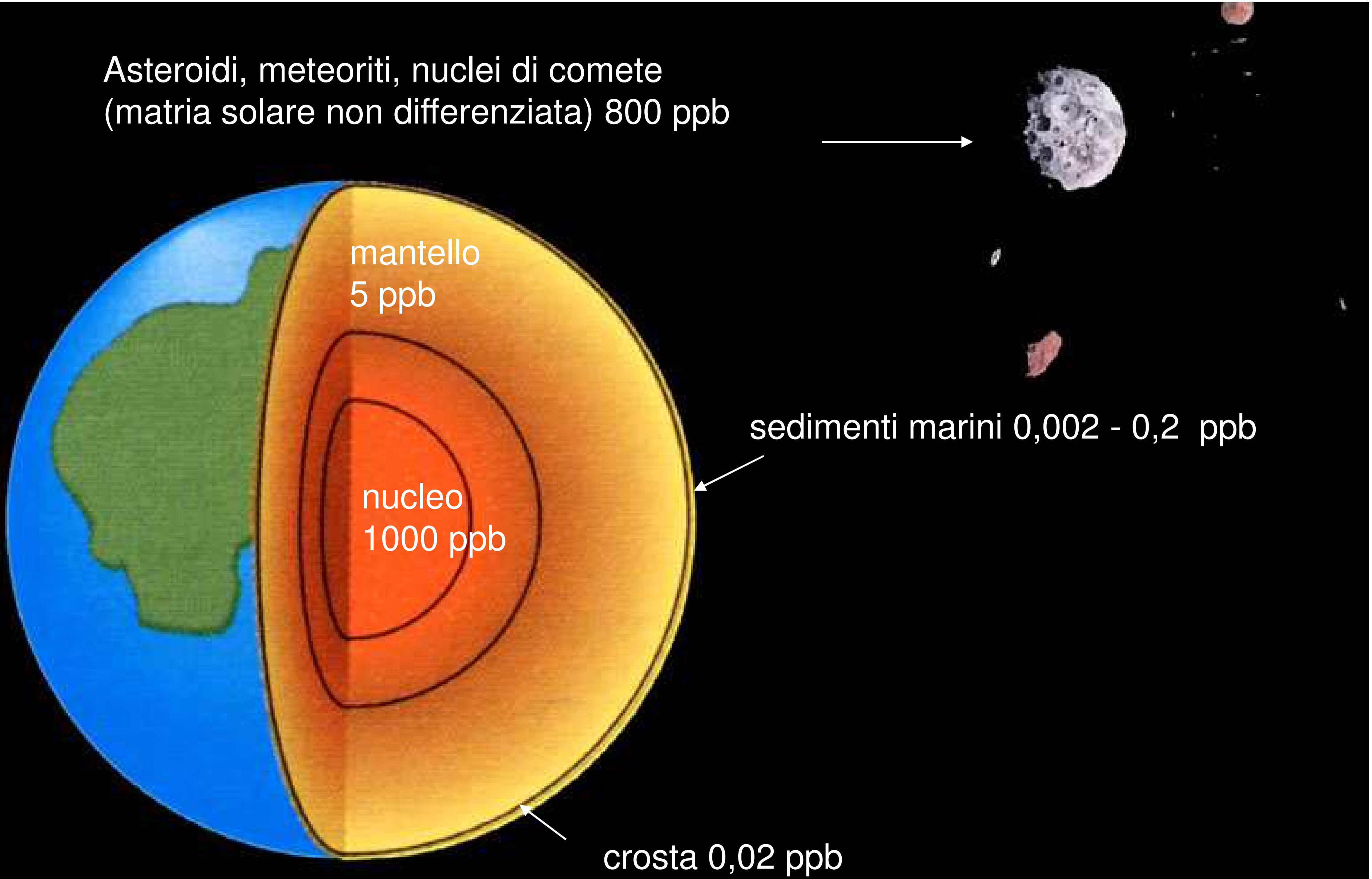




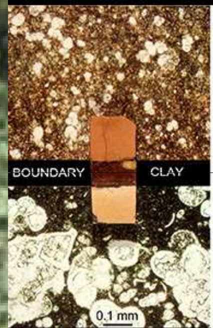
HIATUS

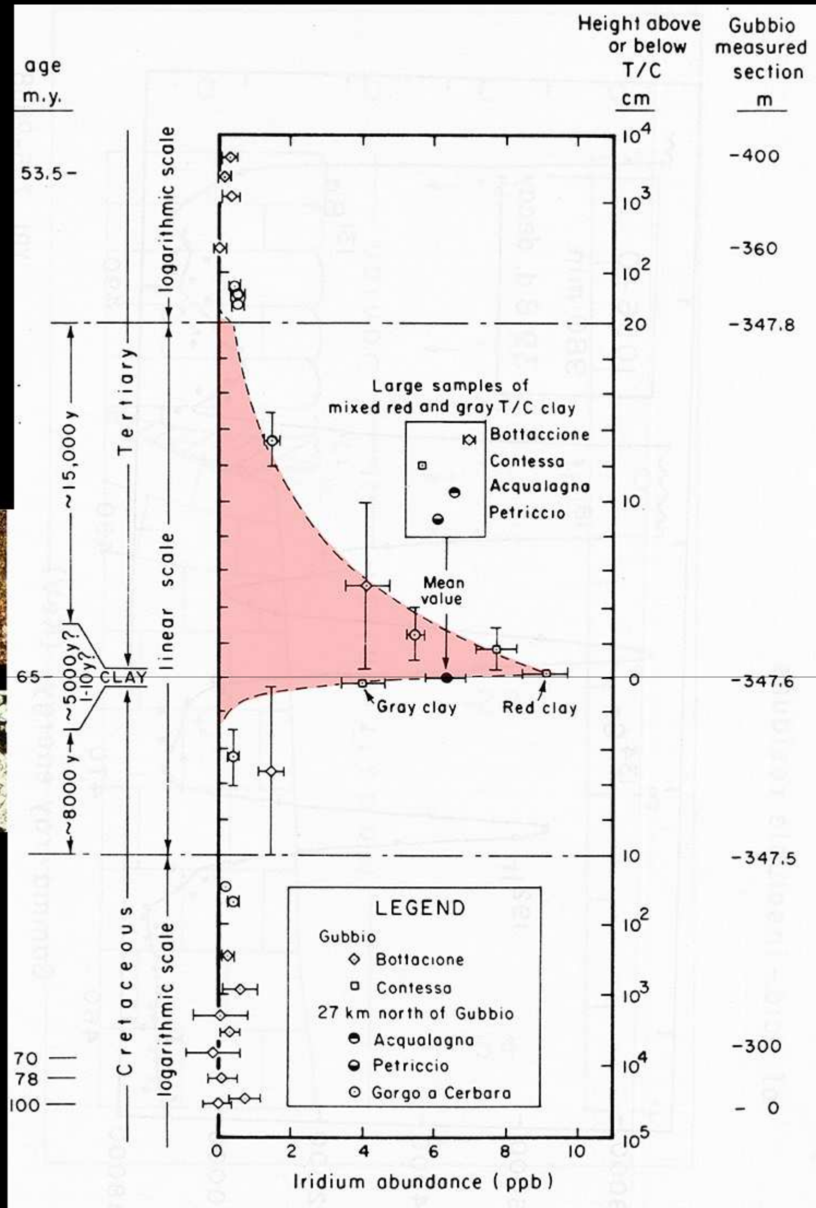
Quanto tempo?





Concentrazioni di iridio in parti per miliardo (ppb)





Alvarez, L.W., Alvarez, W., Asaro, F., & Michel, H.V. (1980) Extraterrestrial cause for the Cretaceous-Tertiary mass extinction: Science, v. 208; p. 1095-1108.

Il killer

IDENTIKIT

Oggetto roccioso ET
Dimensioni: 10 km
Velocità: 30 km/sec
Energia: 100.000.000 Mt

EFFETTI IMMEDIATI

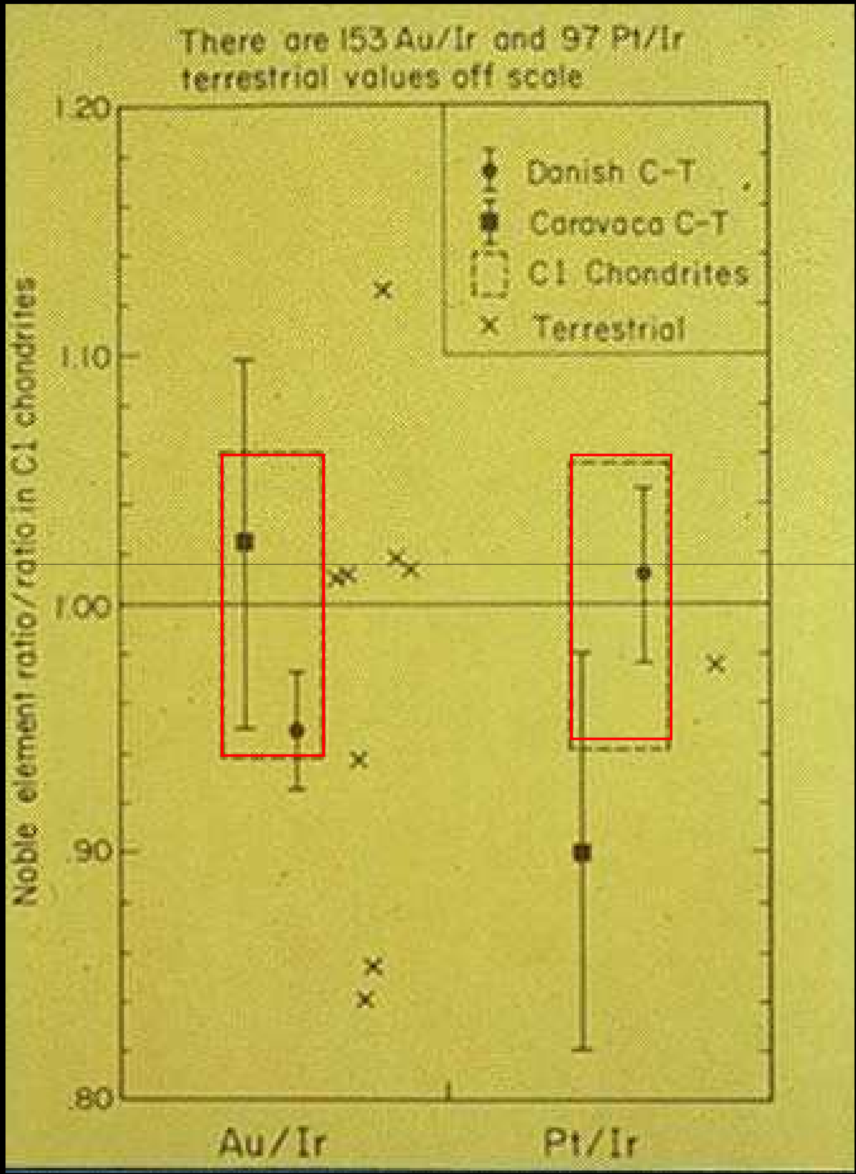
Cratere da 200 km di diametro
Devastazione locale 2000 km
(megatsunami, palla di fuoco, incendi per infrarosso)
Incendi a scala continentale
(fallout iniziale, effetto Shuttle)
Abbassamento temperatura globale e soppressione fotosintesi
(oscurazione solare per polveri fini)
Aumento temperatura globale
(effetto serra prolungato per vapore H_2O, CO_2, S, NOx)
Piogge acide

RISULTATO

Estinzione di massa
90% della biomassa annientata
50% dei generi marini estintio
75% delle specie eliminato

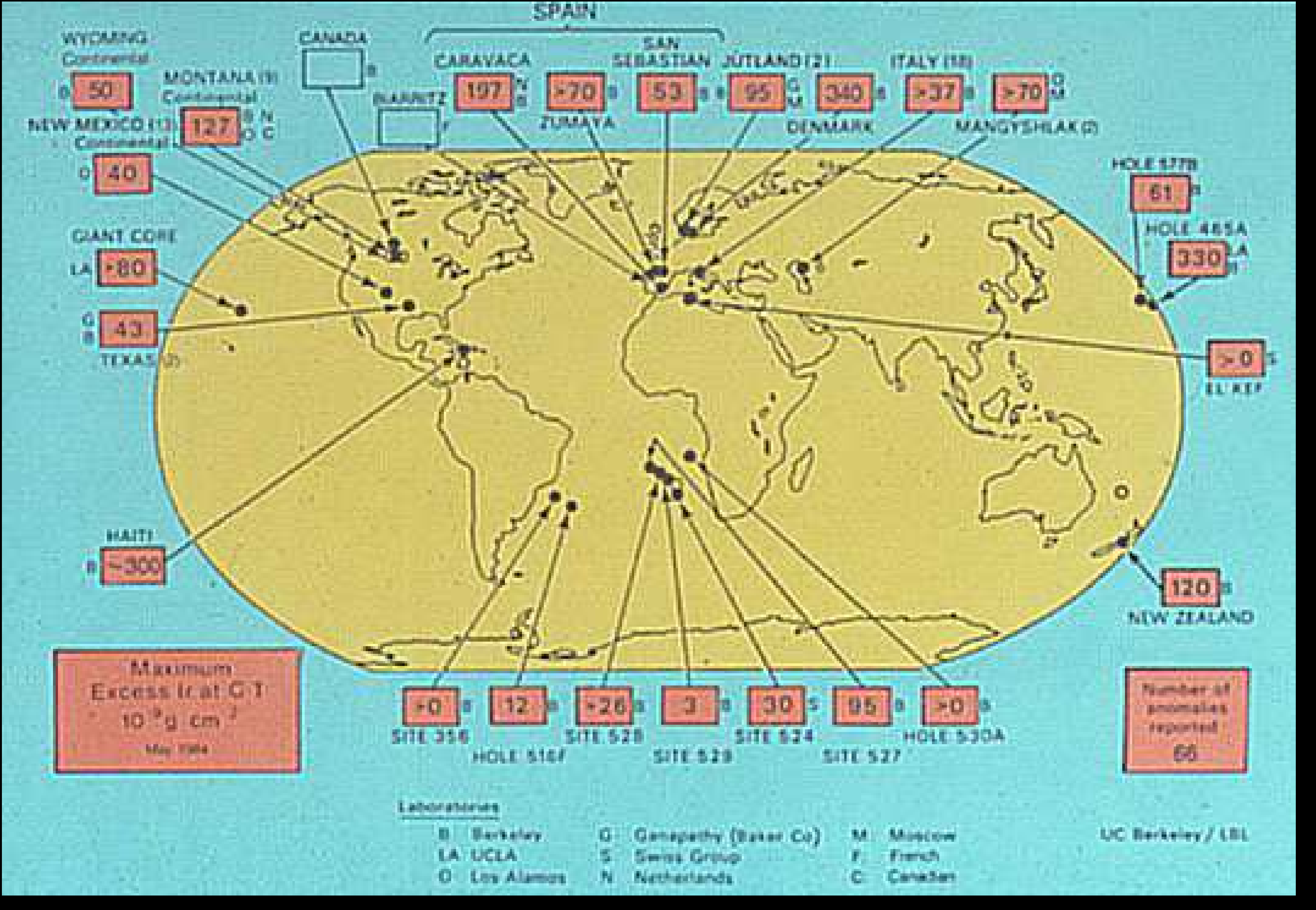
New York 65.999.796 BC - ore 19:15

Test n. 1: Origine extraterrestre?

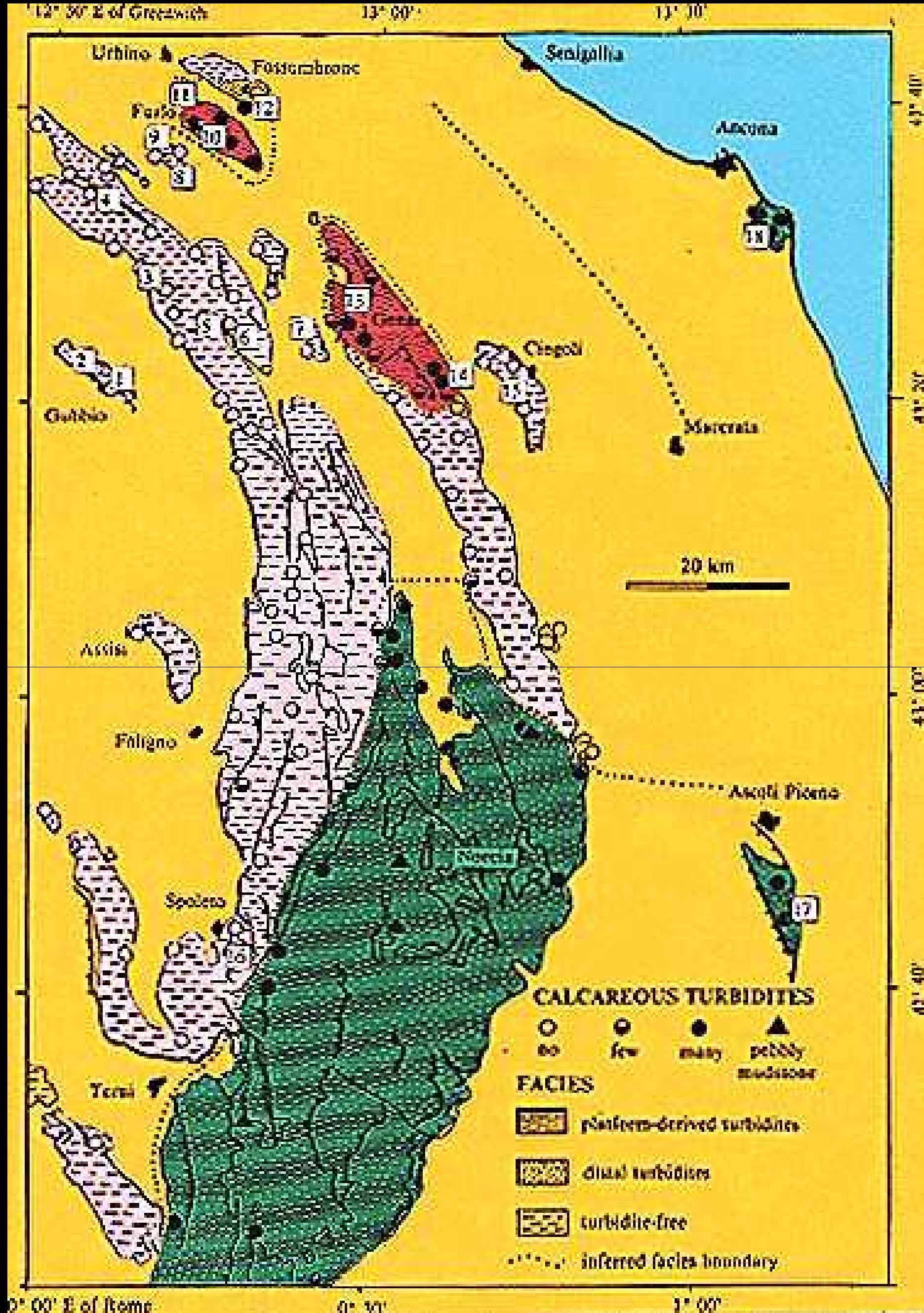


Alvarez et al. (1981)

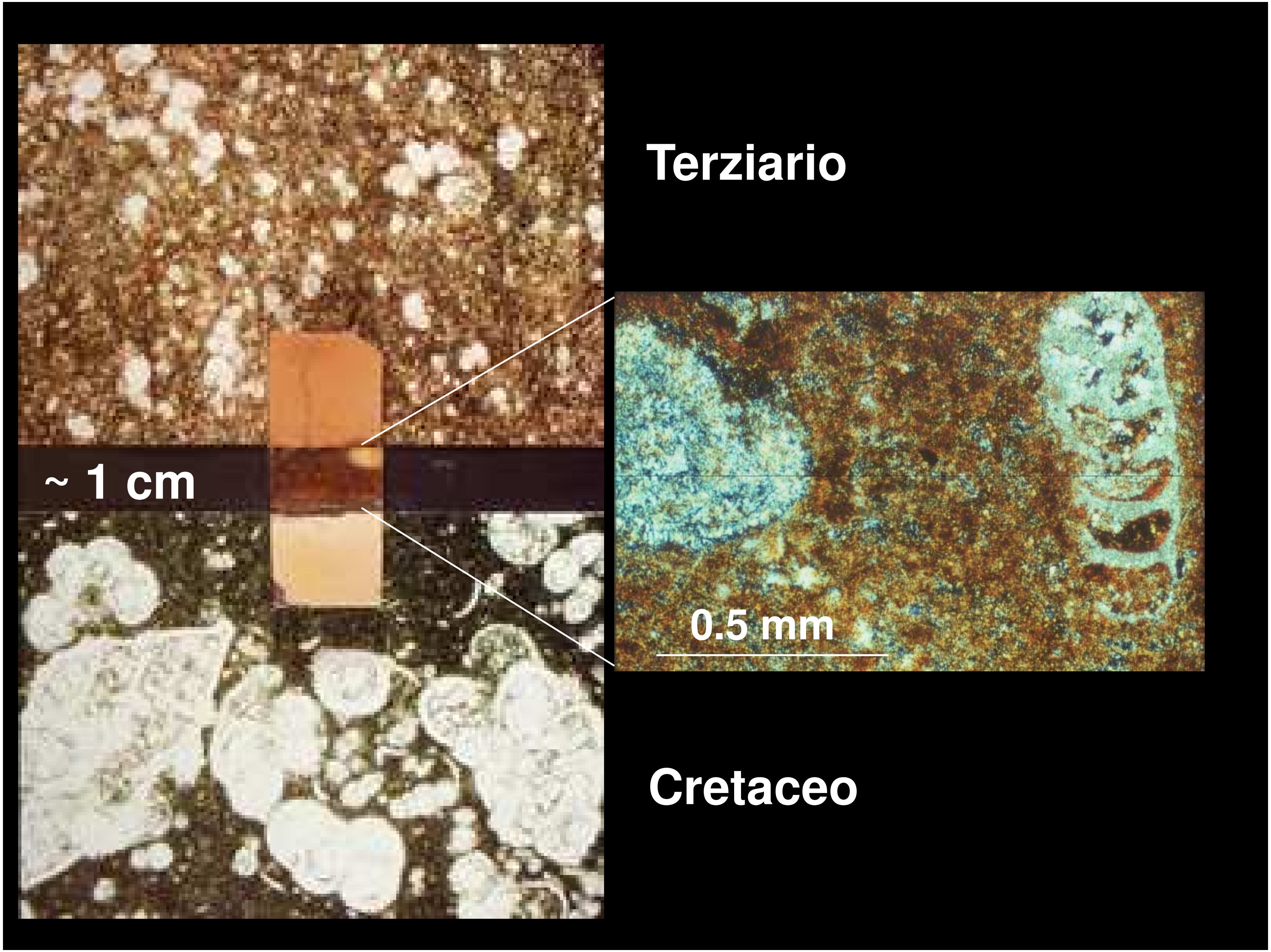
Test n. 2: Distribuzione globale?



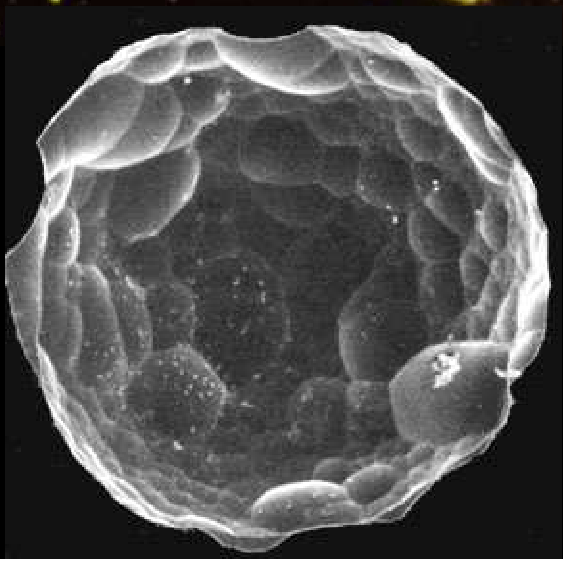
Alvarez et al. (1984)


12° 30' E of Greenwich
13° 00'
13° 30'
Urbino
Fossombrone
Fano
Senigallia
Ancona
Cingoli
Macerata
Gubbio
Assisi
Foligno
Spoleto
Terni
Ascoli Piceno
20 km
43° 40'
43° 20'
43° 00'
42° 40'
CALCAREOUS TURBIDITES
no
few
many
pebbly mudstone
FACIES
platform-derived turbidites
distal turbidites
turbidite-free
inferred facies boundary
0° 00' E of Rome
0° 30'
1° 00'

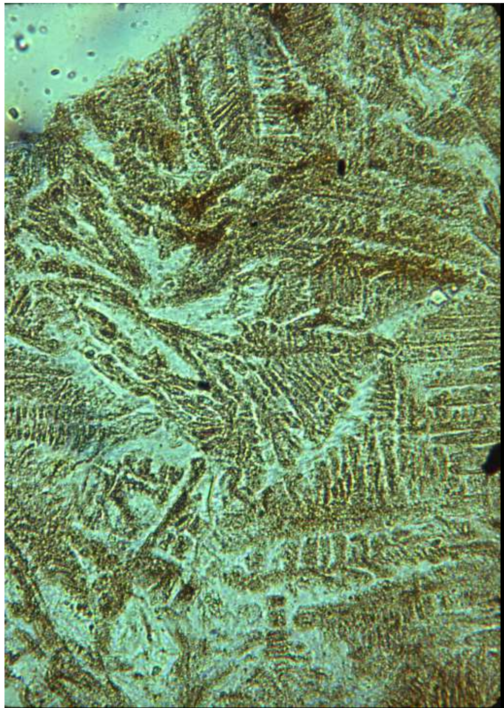

T
K
IL DINOSAURO
T
K


Terziario
~ 1 cm
0.5 mm
Cretaceo

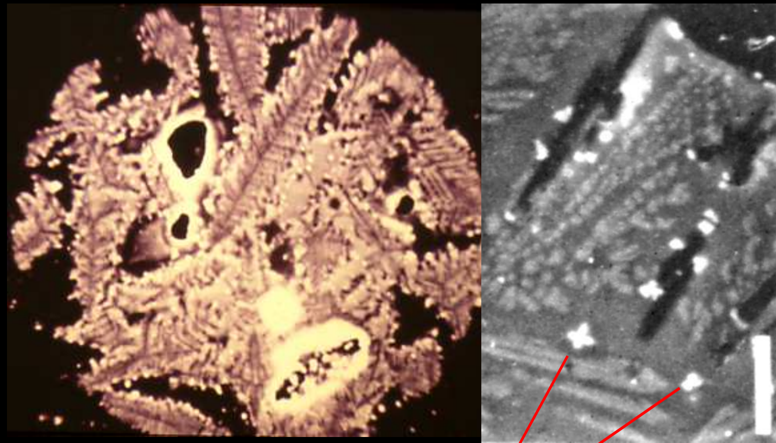
Microtectiti e microcristiti



Microcristite di pirosseno
Eocene Superiore (Caraibi)



Sferula di K-feldspato
K/T Caravaca (Spagna)



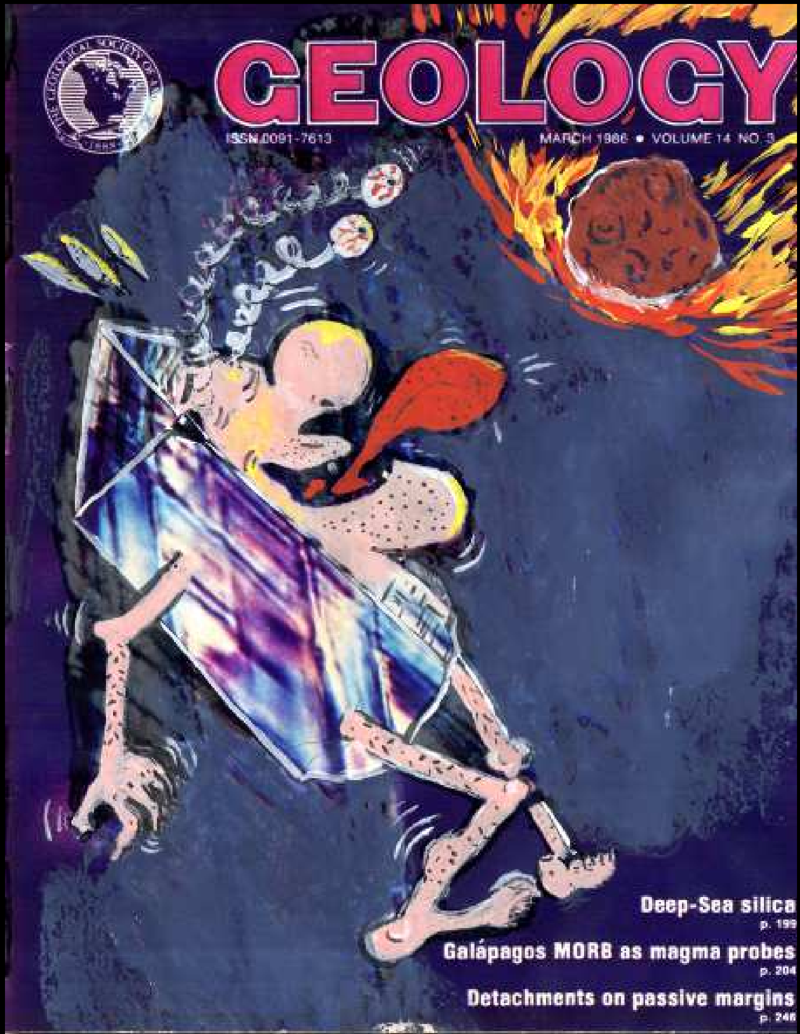
Spinelli $(MgFe)_2O_4$

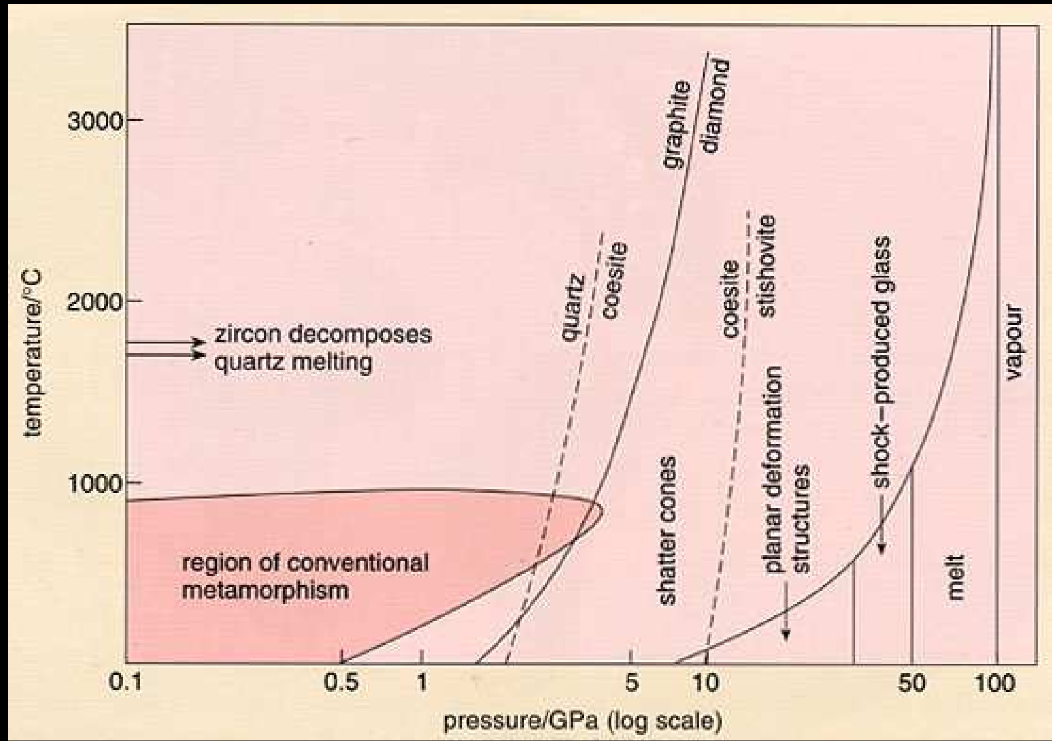
Sferula di glauconite
K/T M. Cònero (Italia)

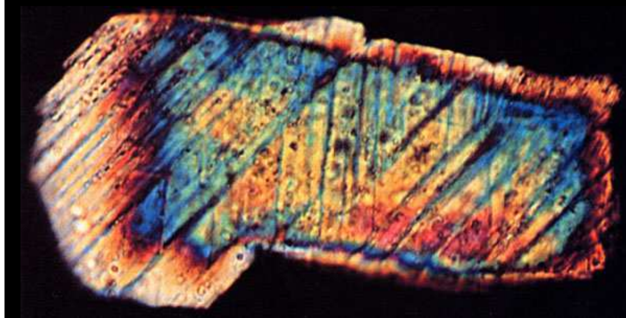
Sferule di goetite
K/T Furlo (Italia)

Spinello scheletrico
$(MgFe)_2O_4$

Quarzo shockato

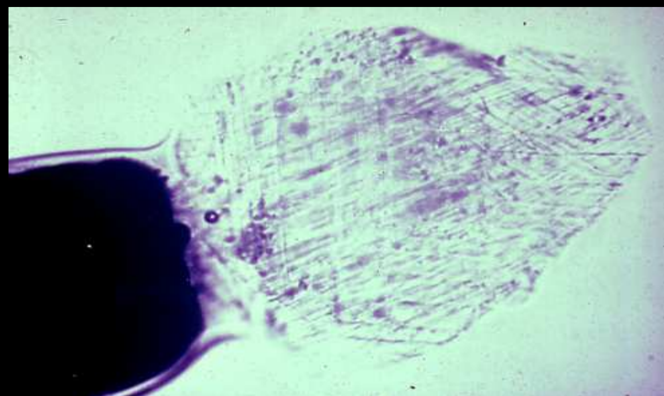




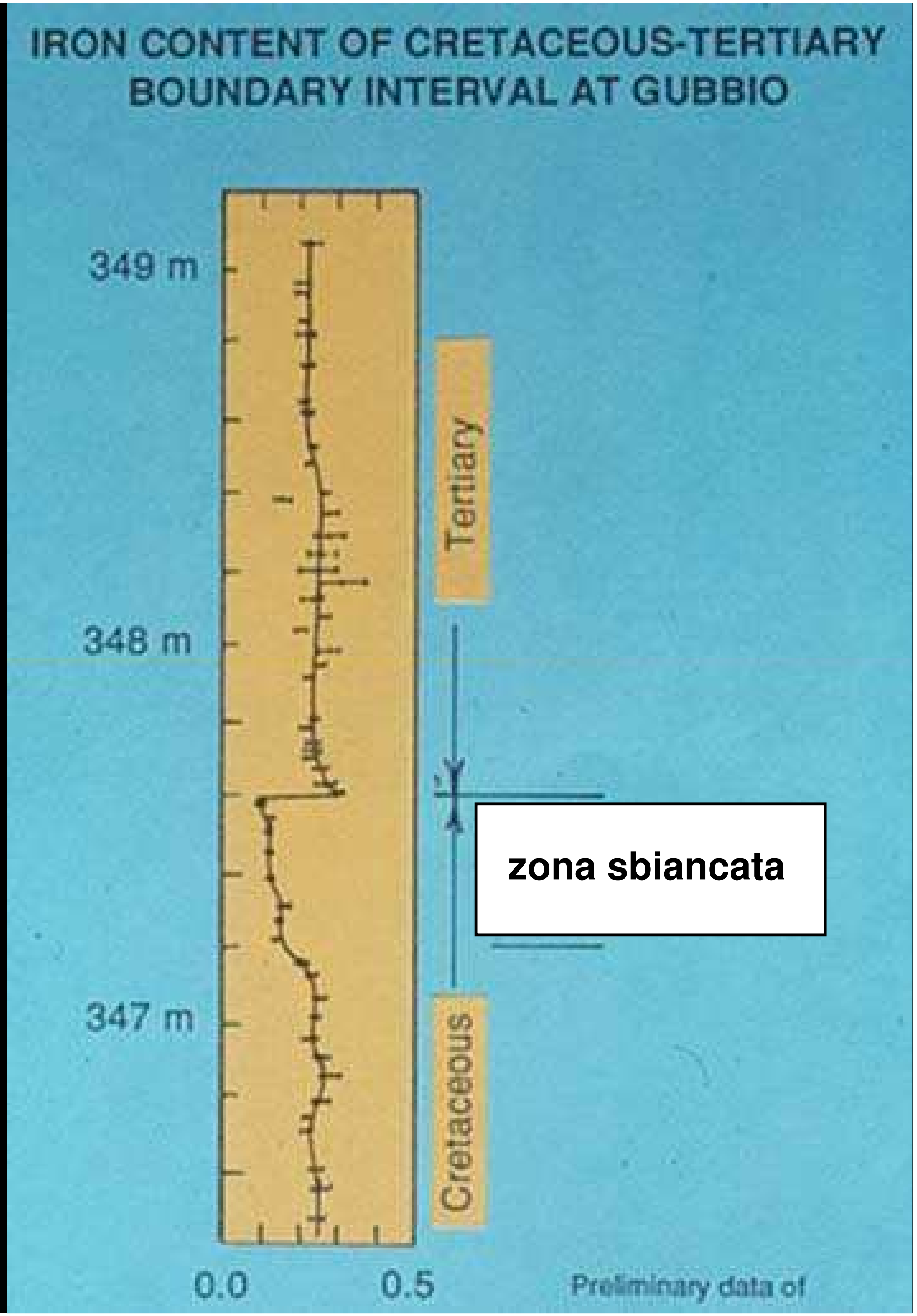


0.1 mm

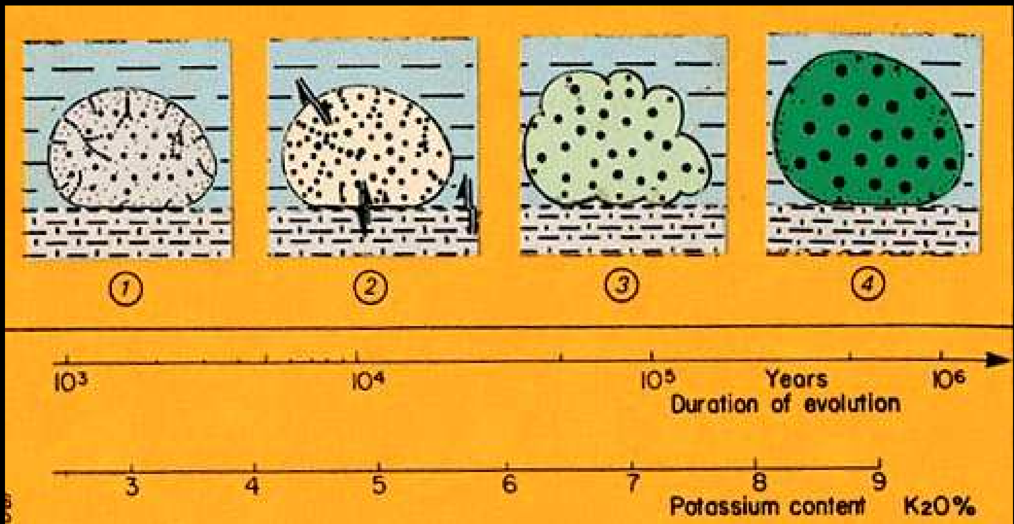
Bohor & Izet (1986)

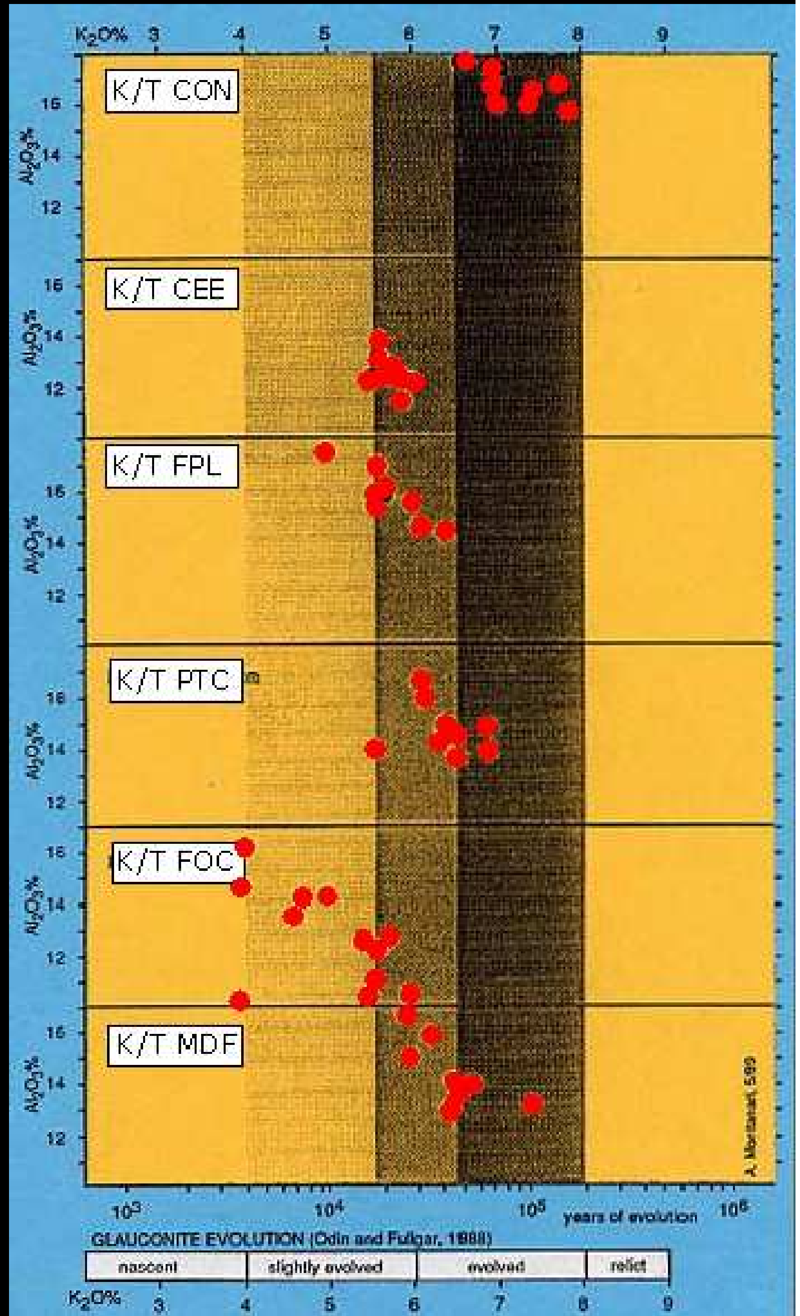



T
K

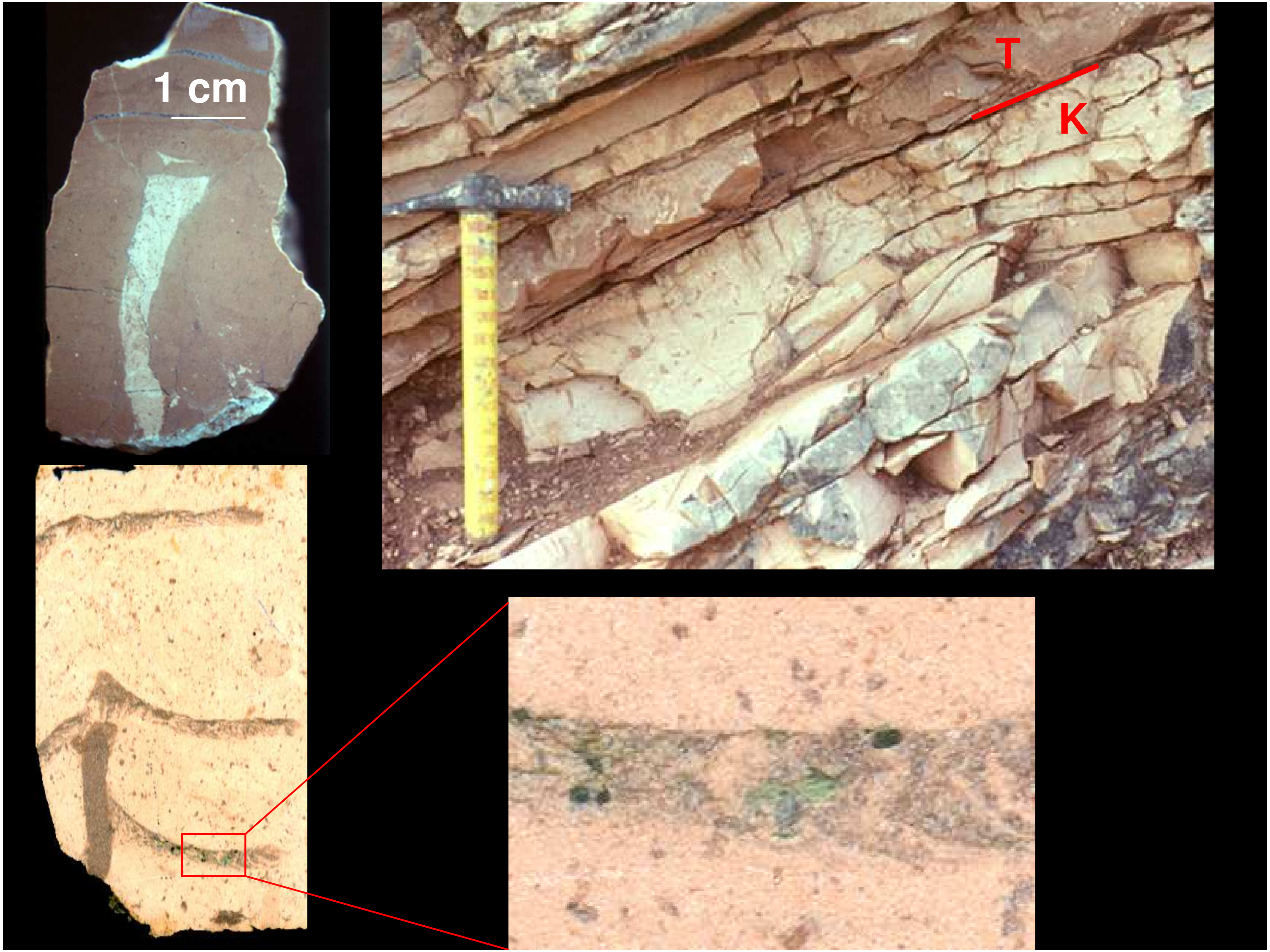

IRON CONTENT OF CRETACEOUS-TERTIARY
BOUNDARY INTERVAL AT GUBBIO
349 m
348 m
347 m
Tertiary
Cretaceous
zona sbiancata
0.0
0.5
Preliminary data of

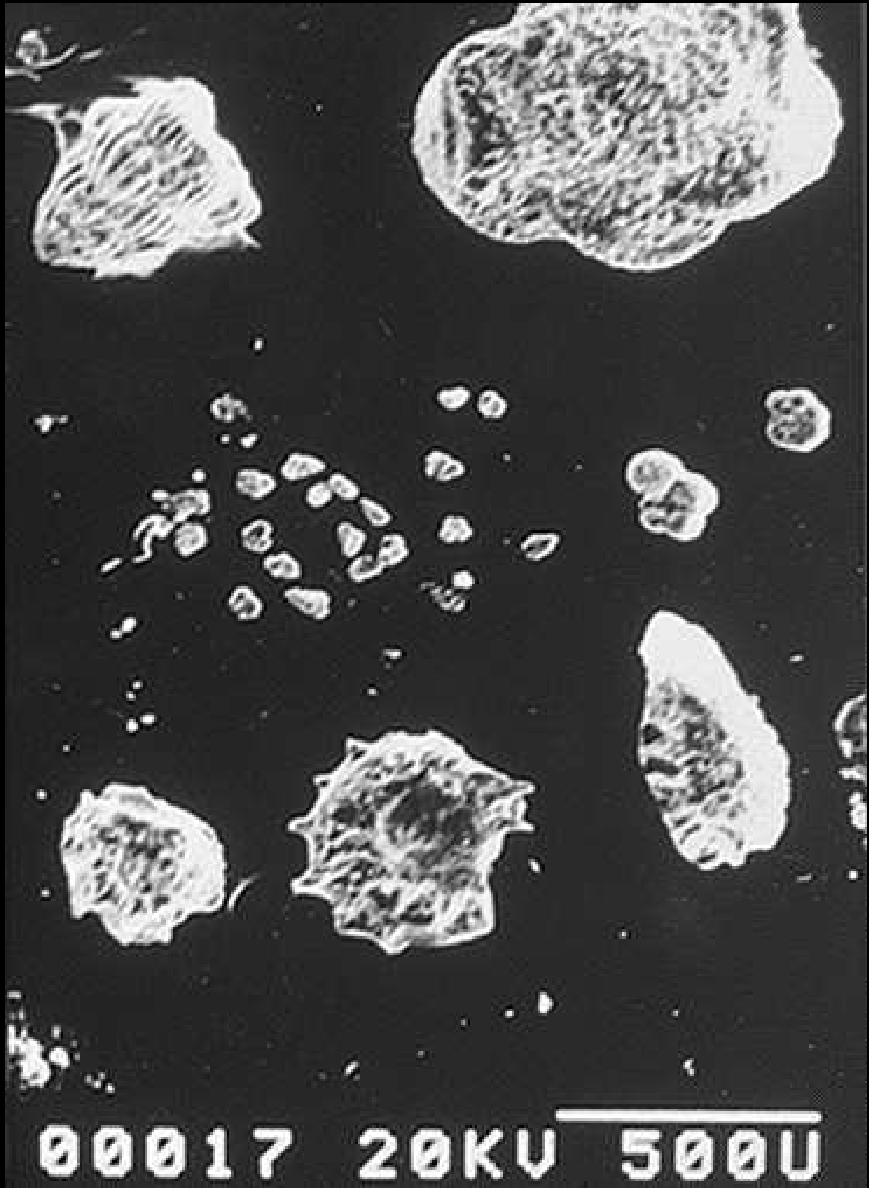
Evoluzione della glauconite

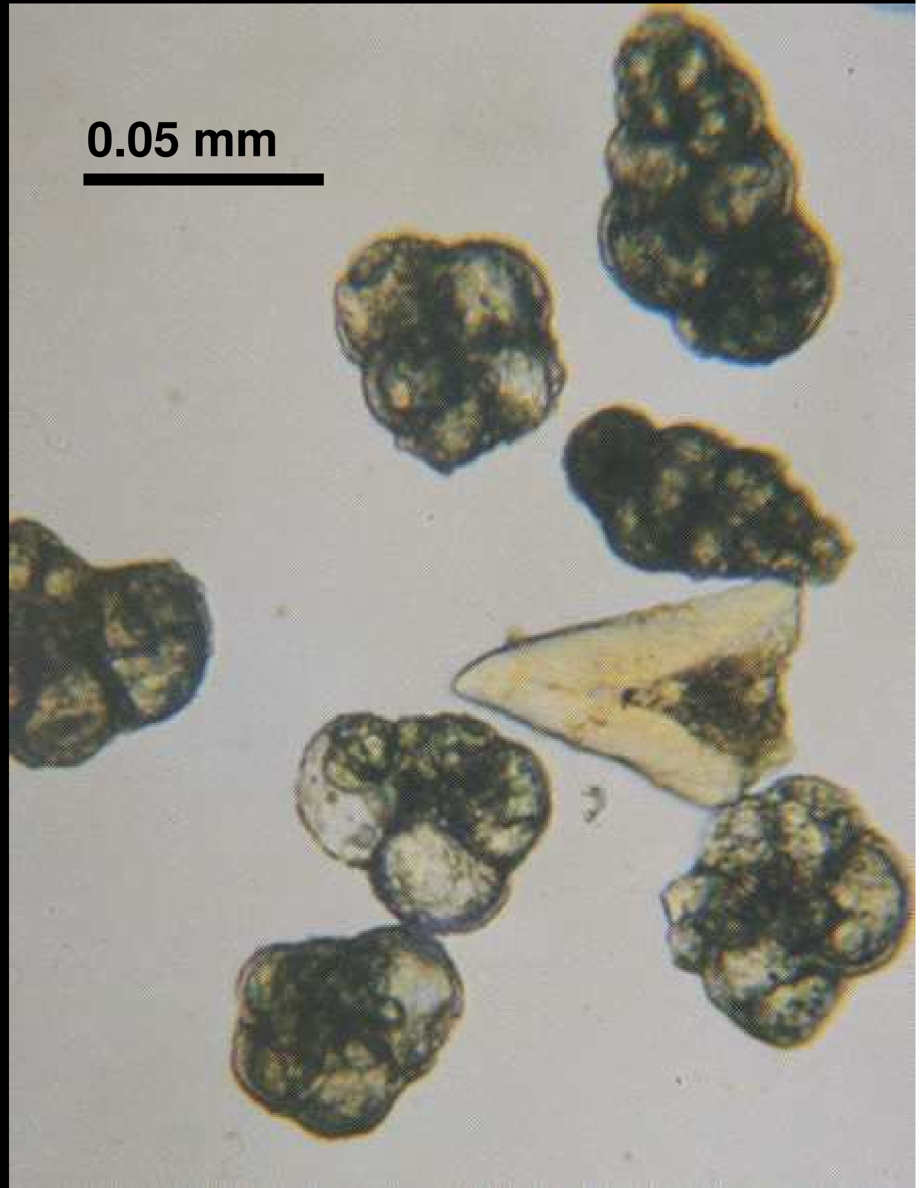


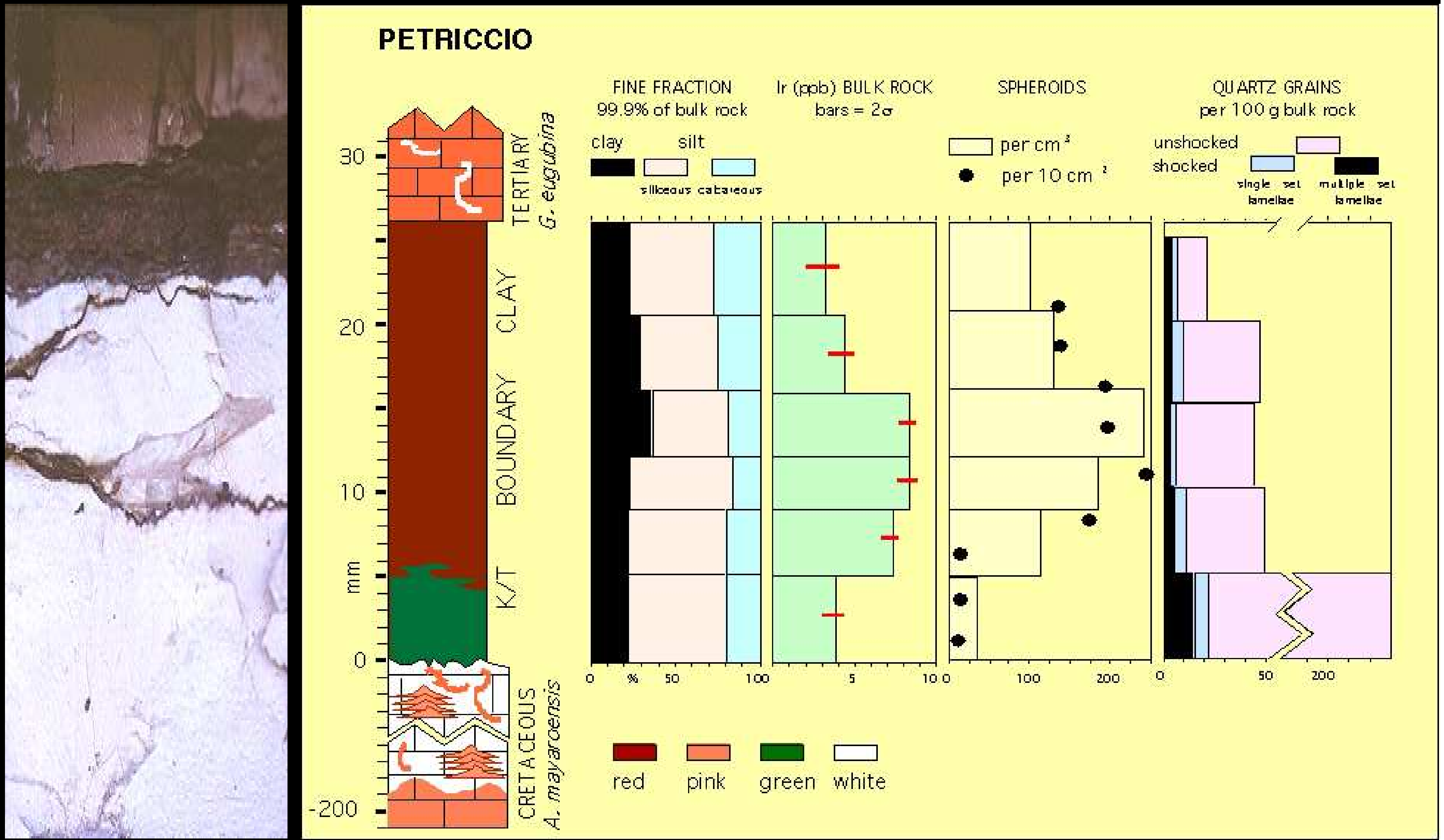


Odin & Fullagar (1988)

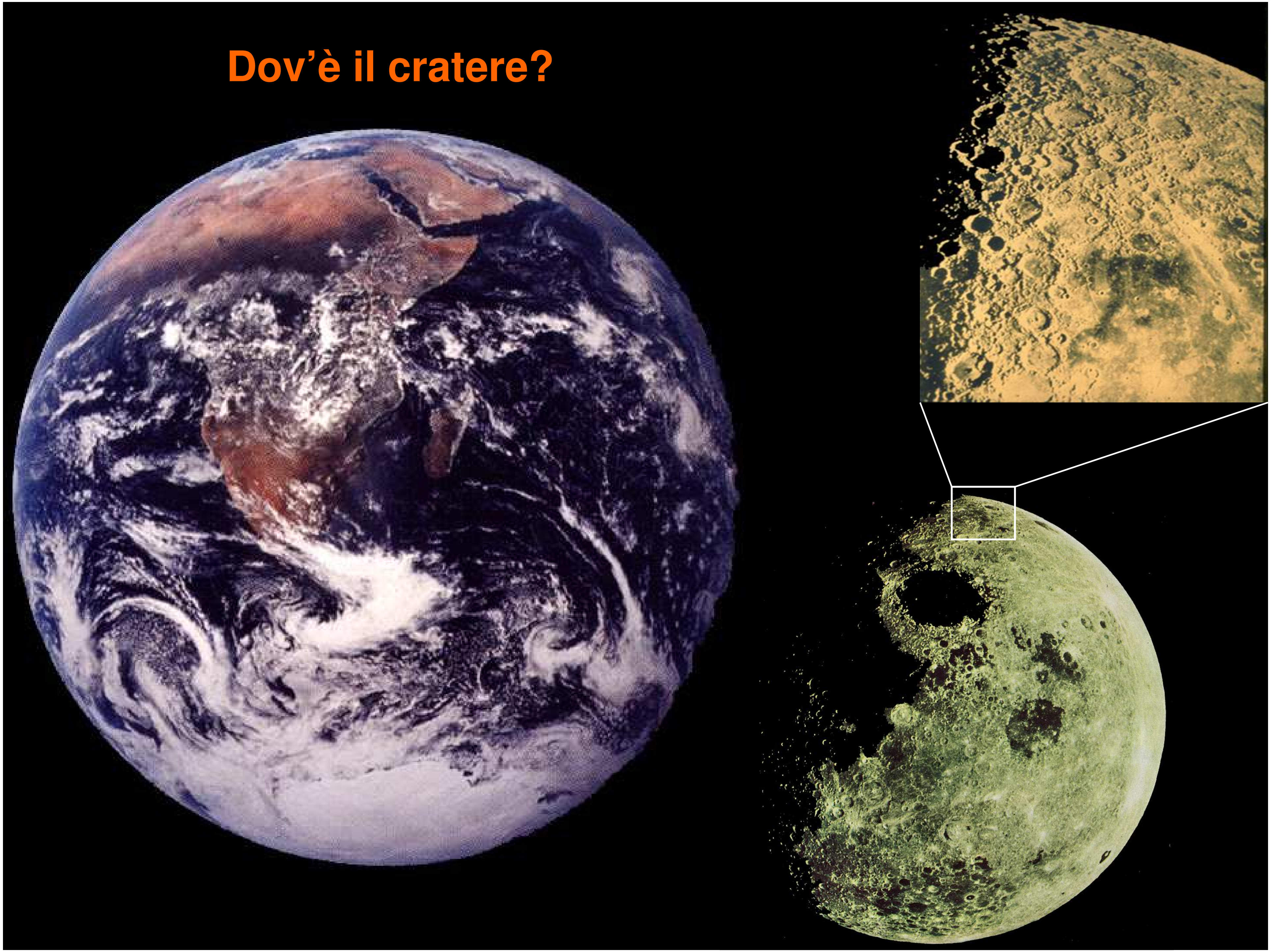

1 cm
T
K

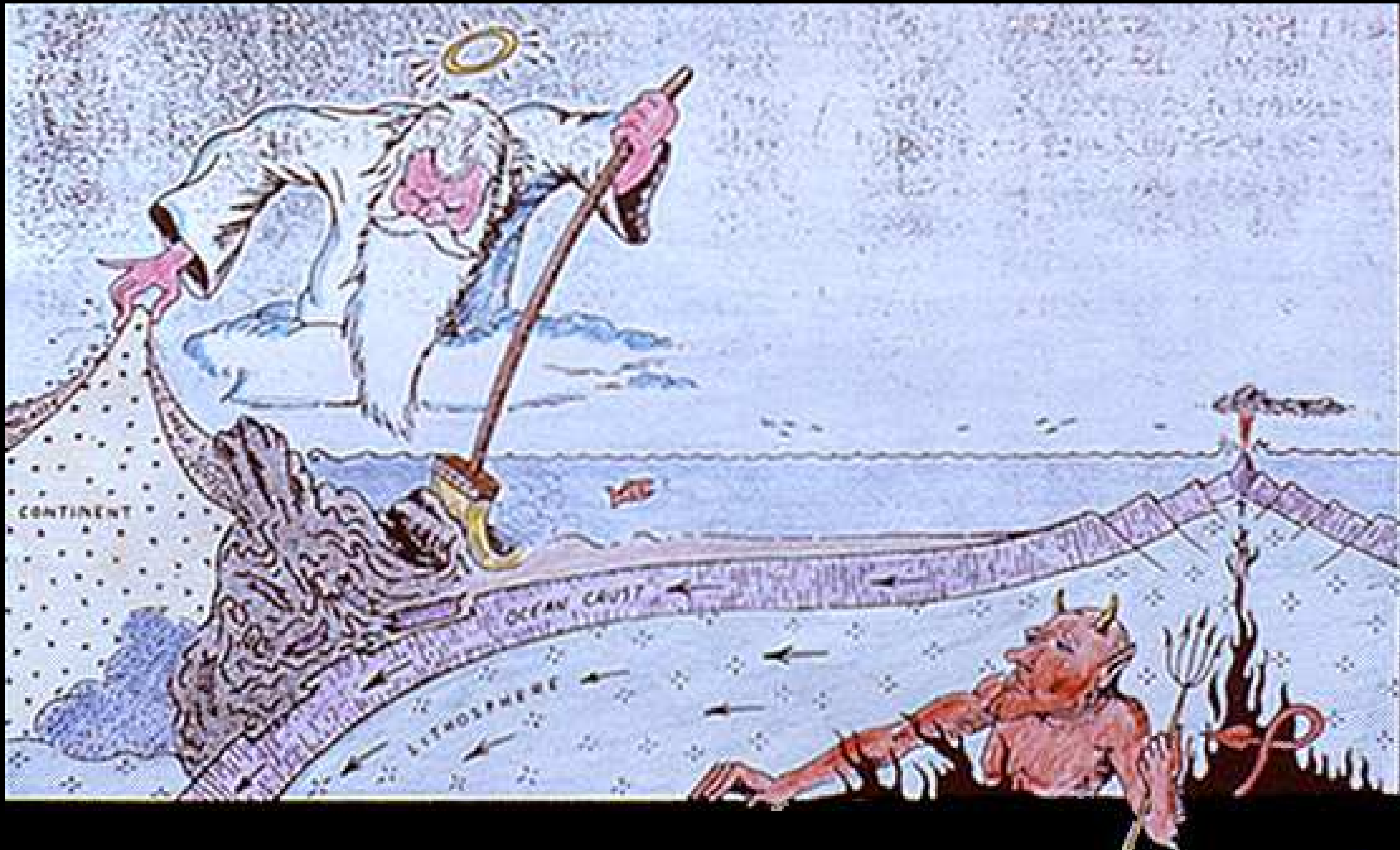

00017 20KV 500U


0.05 mm

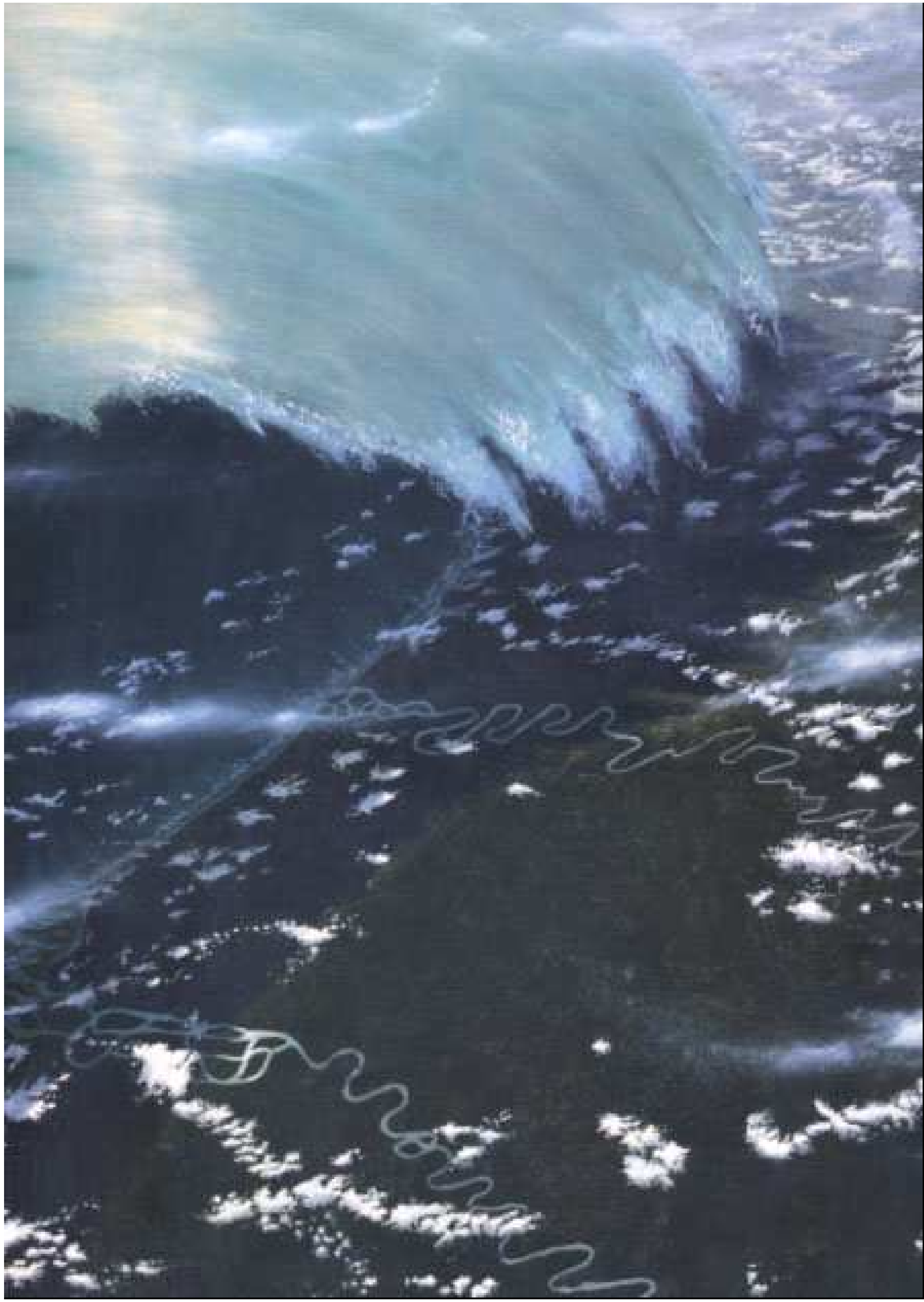

PETRICCIO
FINE FRACTION
99.9% of bulk rock
clay
silt
siliceous
calcareous
Ir (ppb) BULK ROCK
bars = 2σ
SPHEROIDS
per cm³
per 10 cm²
QUARTZ GRAINS
per 100 g bulk rock
unshocked
shocked
single set lamellae
multiple set lamellae
TERTIARY
G. eugubina
CLAY
BOUNDARY
K/T
CRETACEOUS
A. mayaroensis
mm
30
20
10
0
-200
0
%
50
100
5
10
200
red
pink
green
white

Dov’è il cratere?

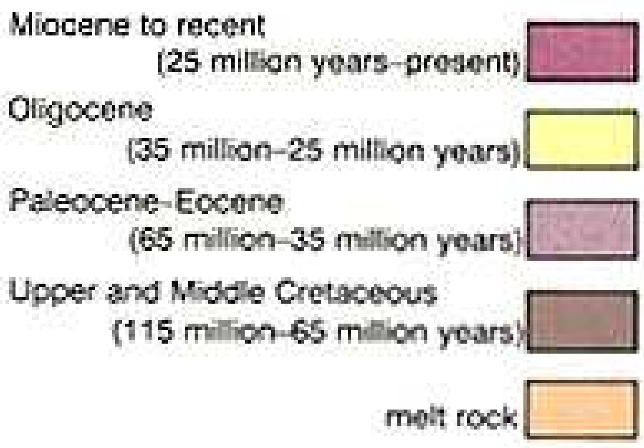




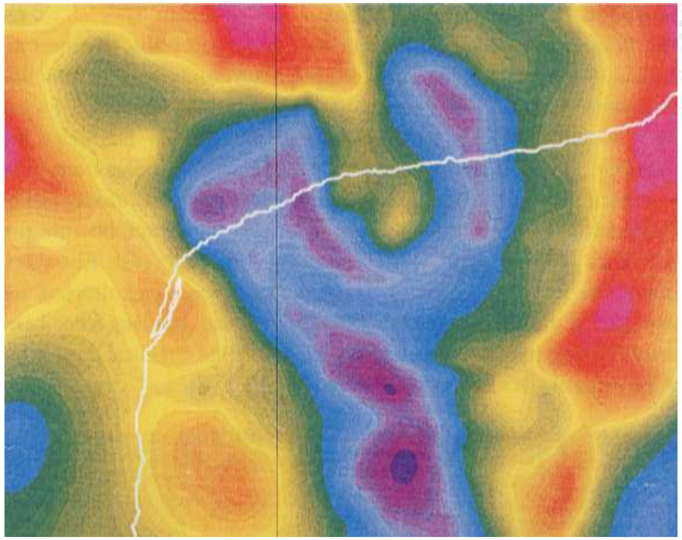
CONTINENT
OCEAN CRUST
LITHOSPHERE

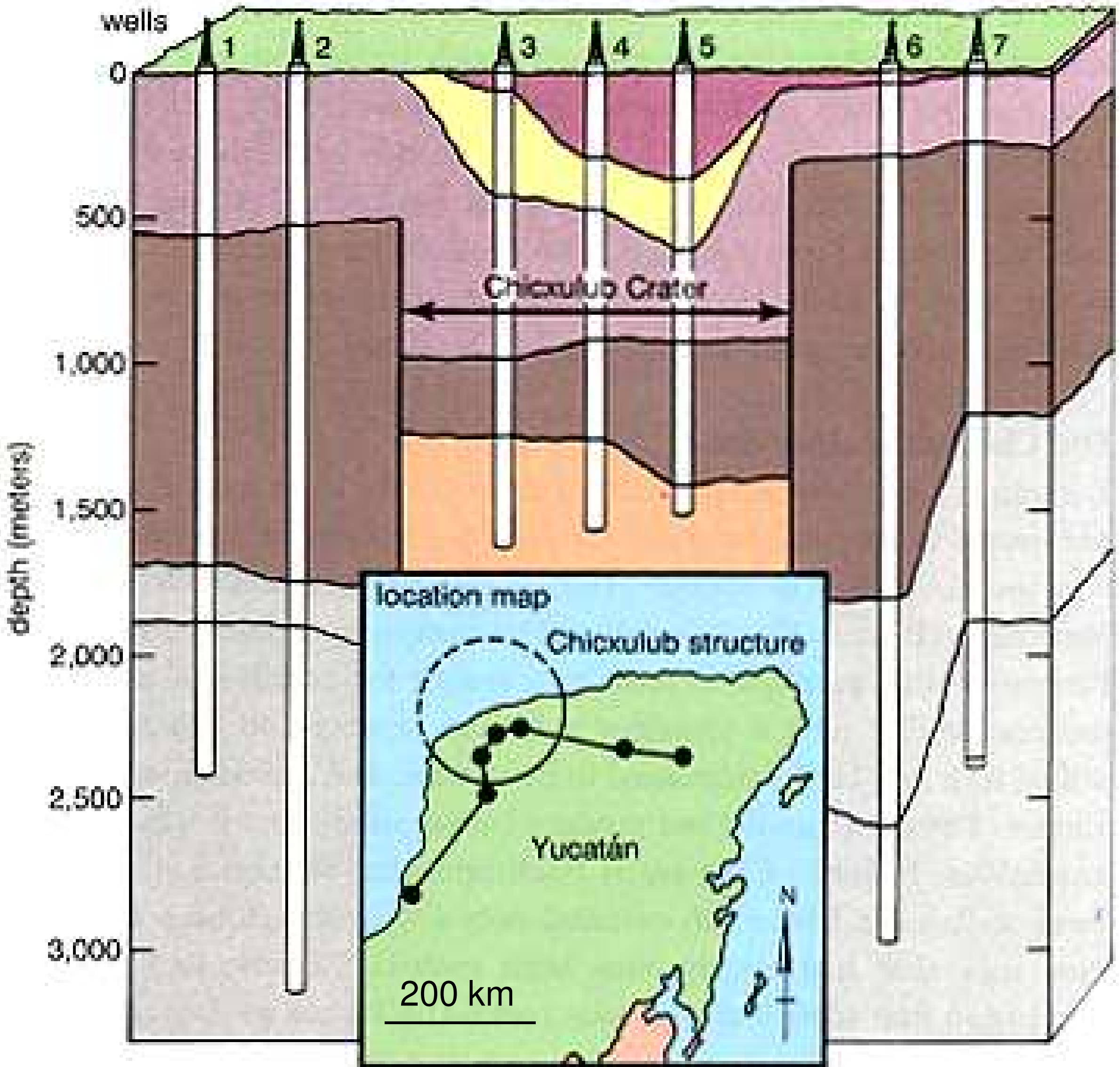



K/T boundary
Beloc section (Haiti)

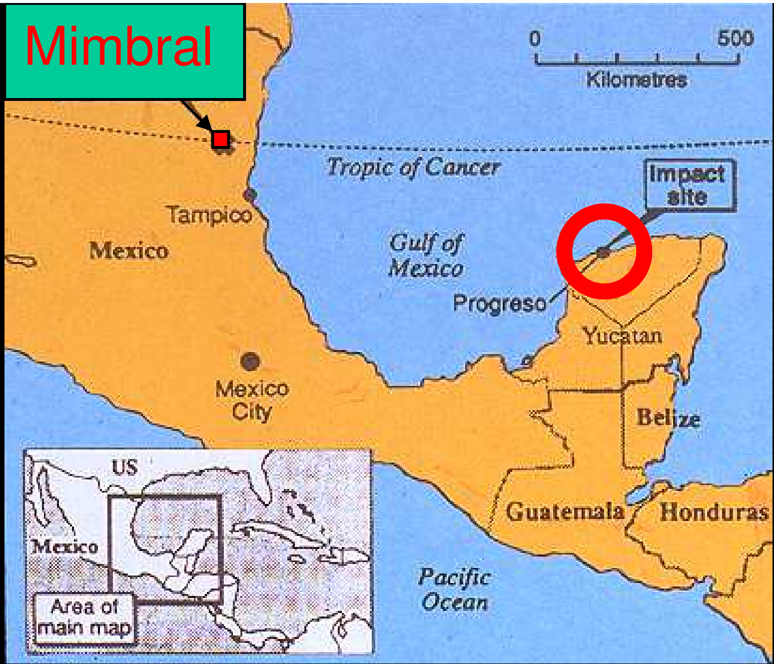


Miocene to recent
(25 million years–present)
Oligocene
(35 million–25 million years)
Paleocene–Eocene
(65 million–35 million years)
Upper and Middle Cretaceous
(115 million–65 million years)
melt rock

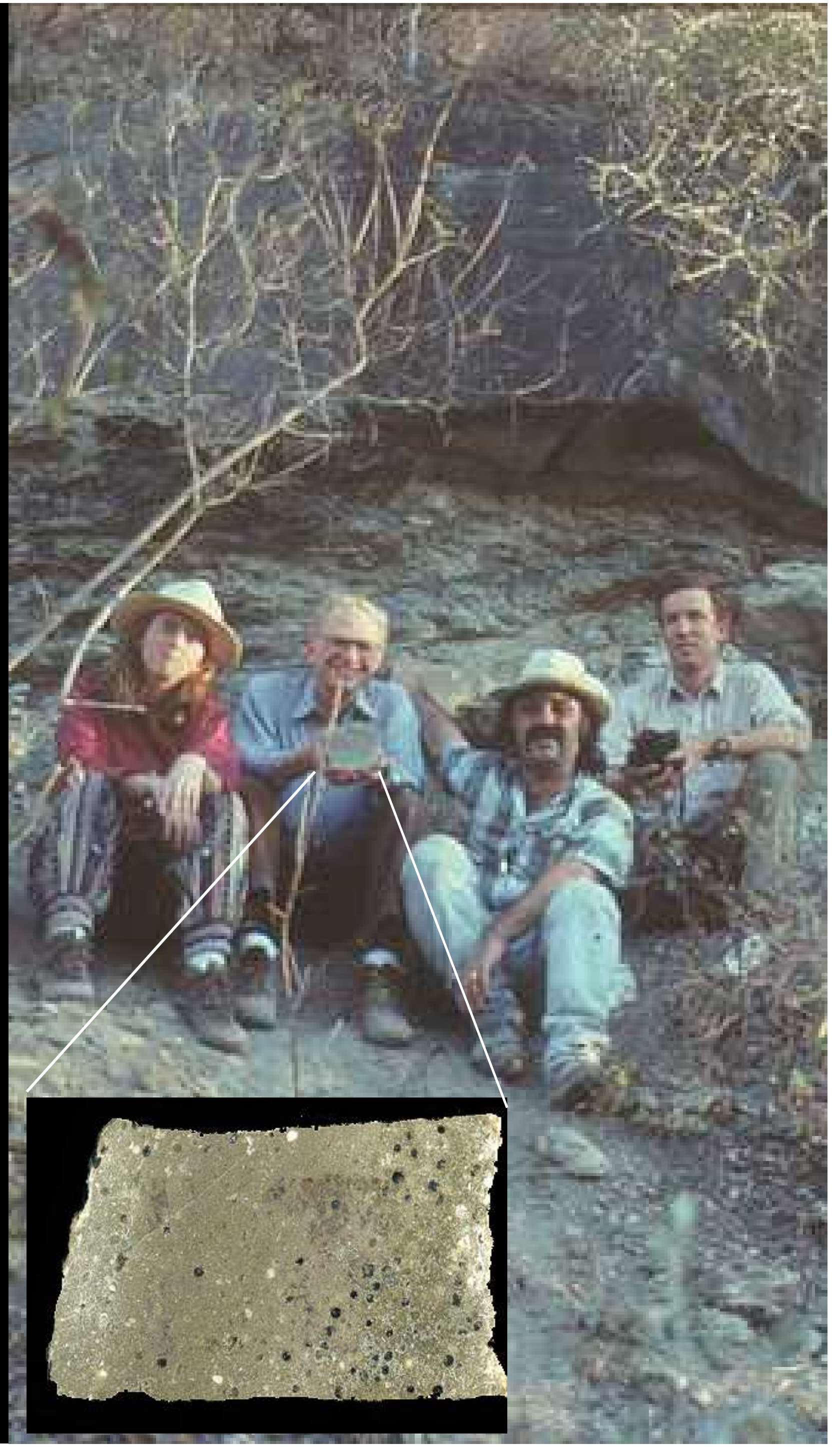




wells
1
2
3
4
5
6
7
0
500
1,000
1,500
2,000
2,500
3,000
depth (meters)
Chicxulub Crater
location map
Chicxulub structure
Yucatán
N
200 km

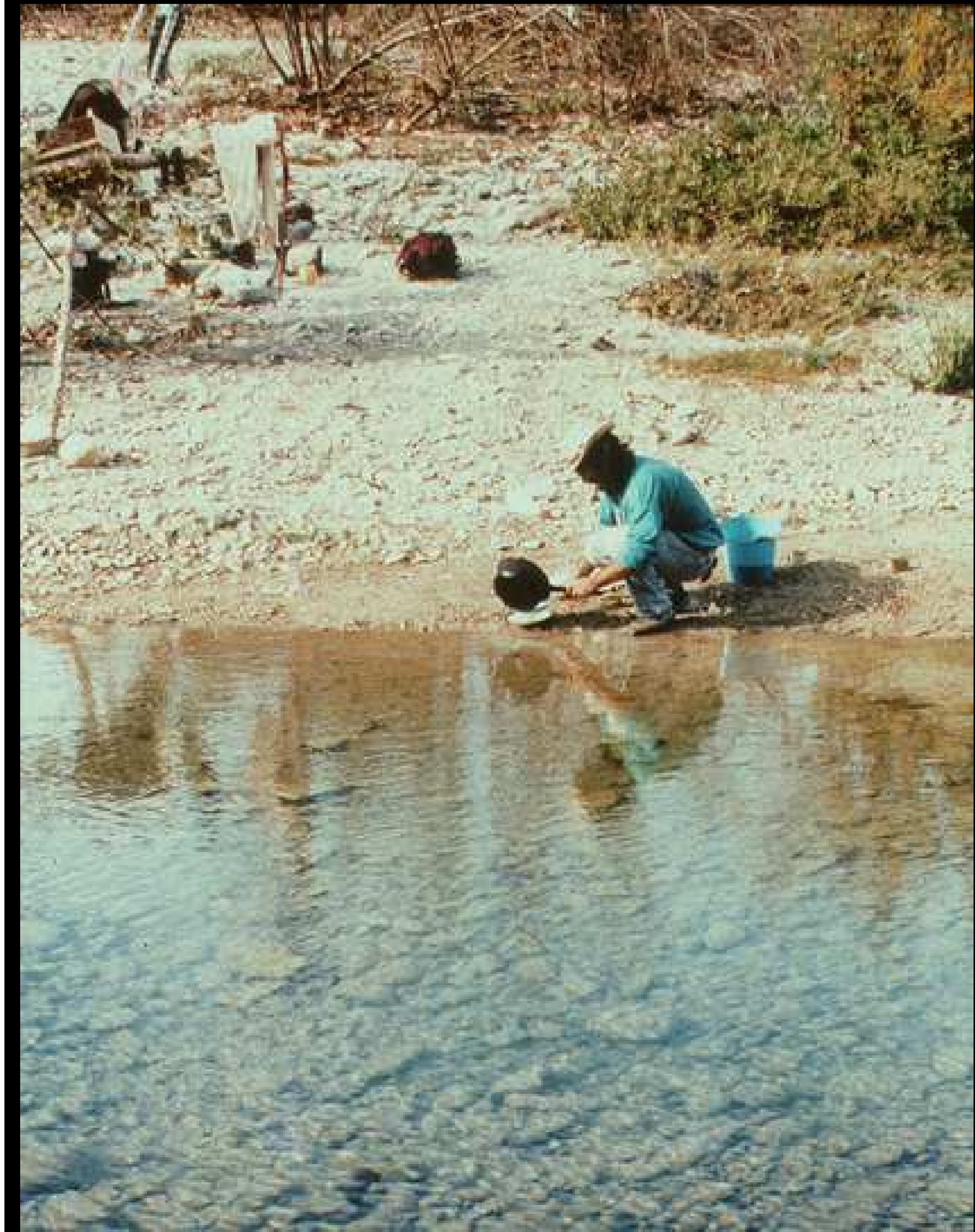


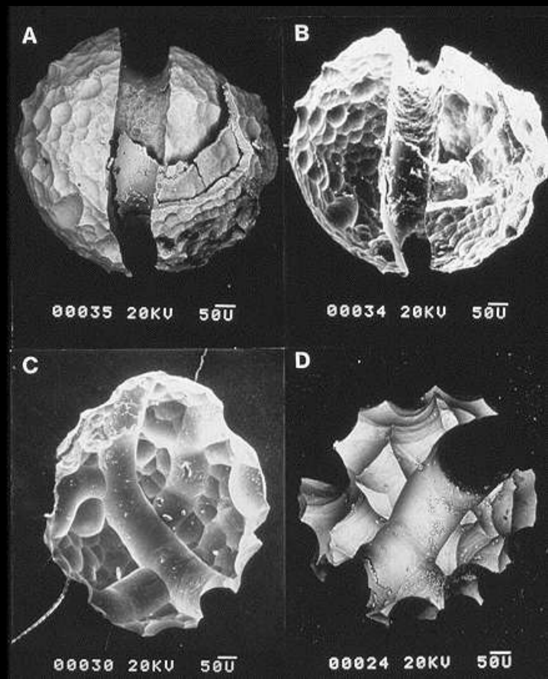
Arroyo El Mimbral (1991)

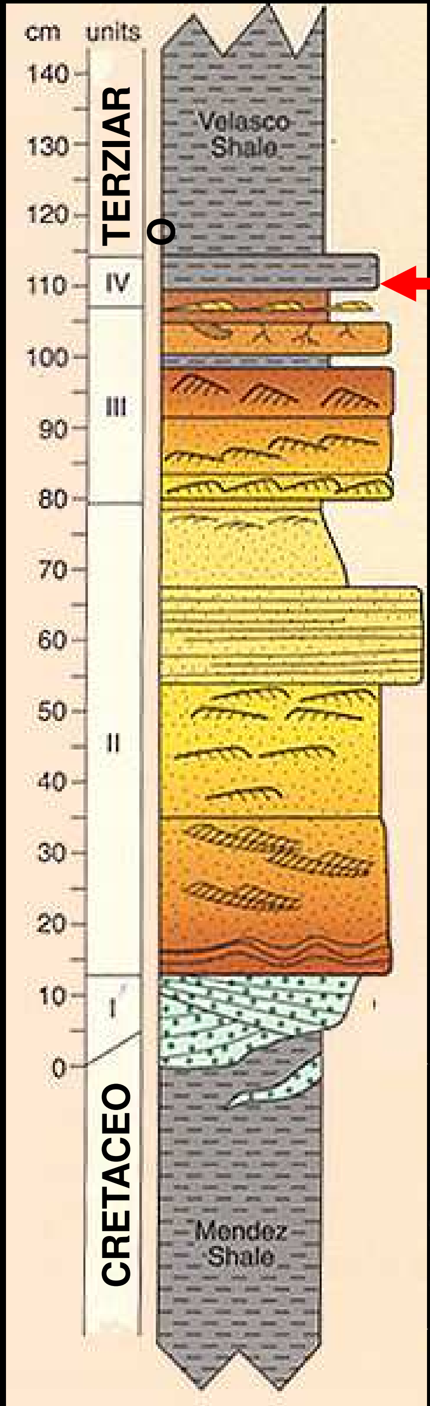


Arroyo El Mimbral - Lo strato del tsunami al K/T

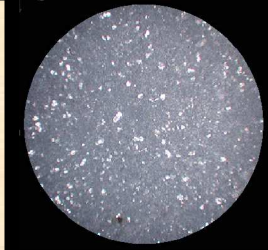
Il Tesoro della Sierra Madre

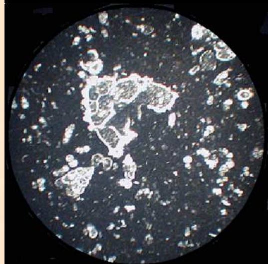




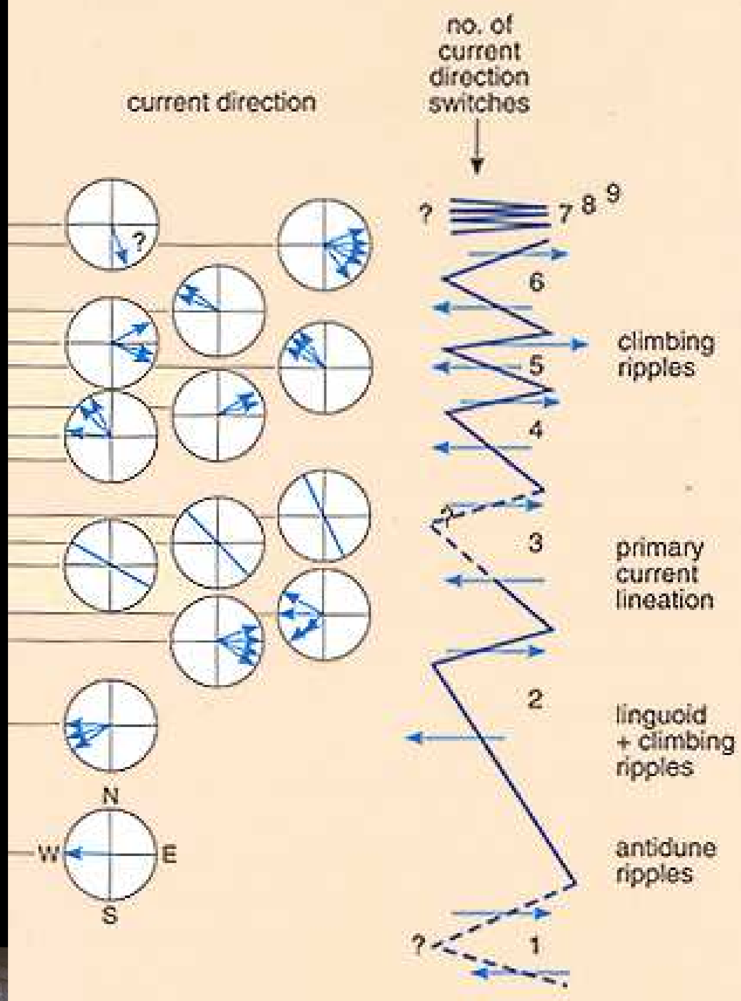


Anomalia di iridio

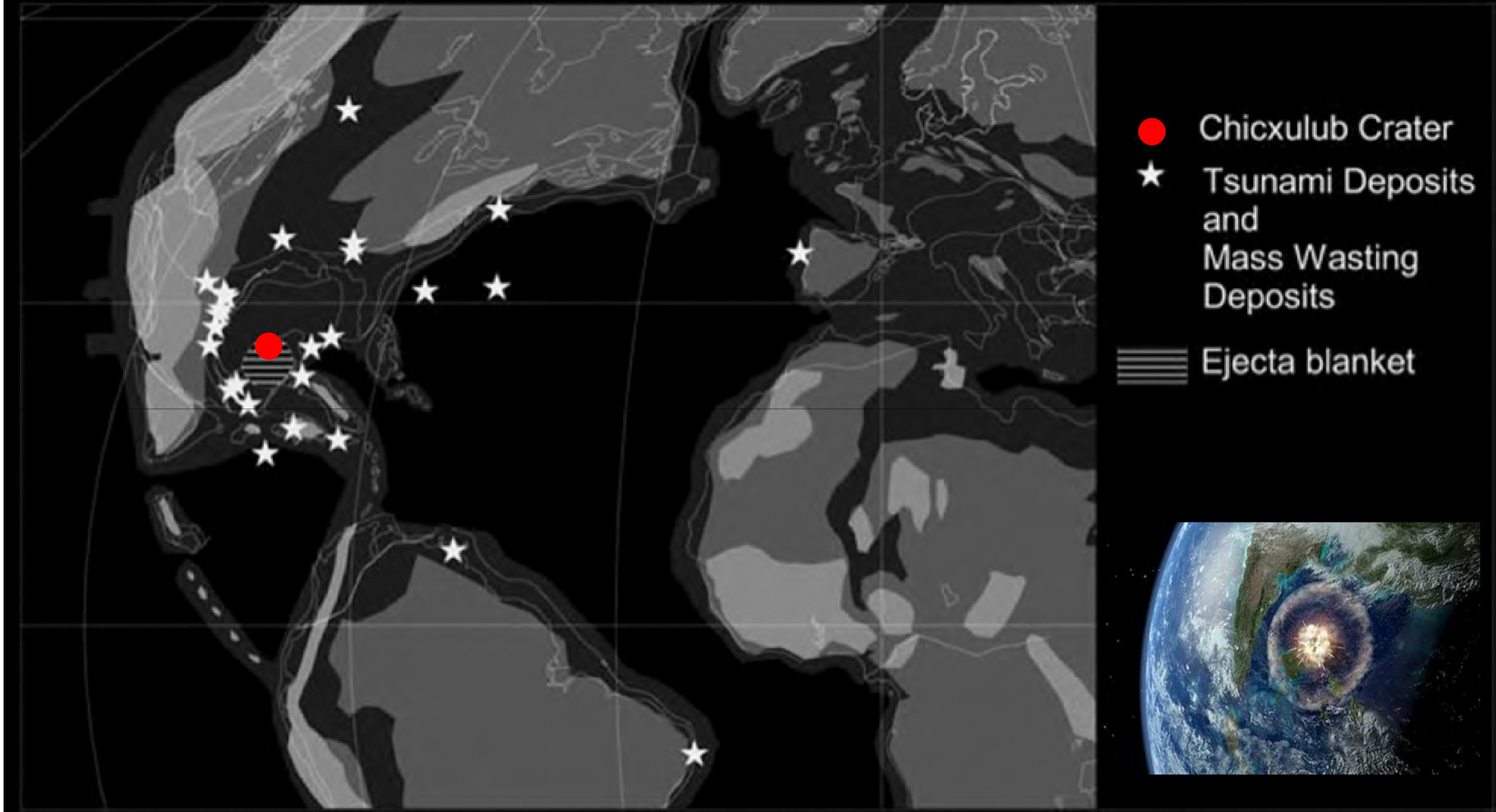




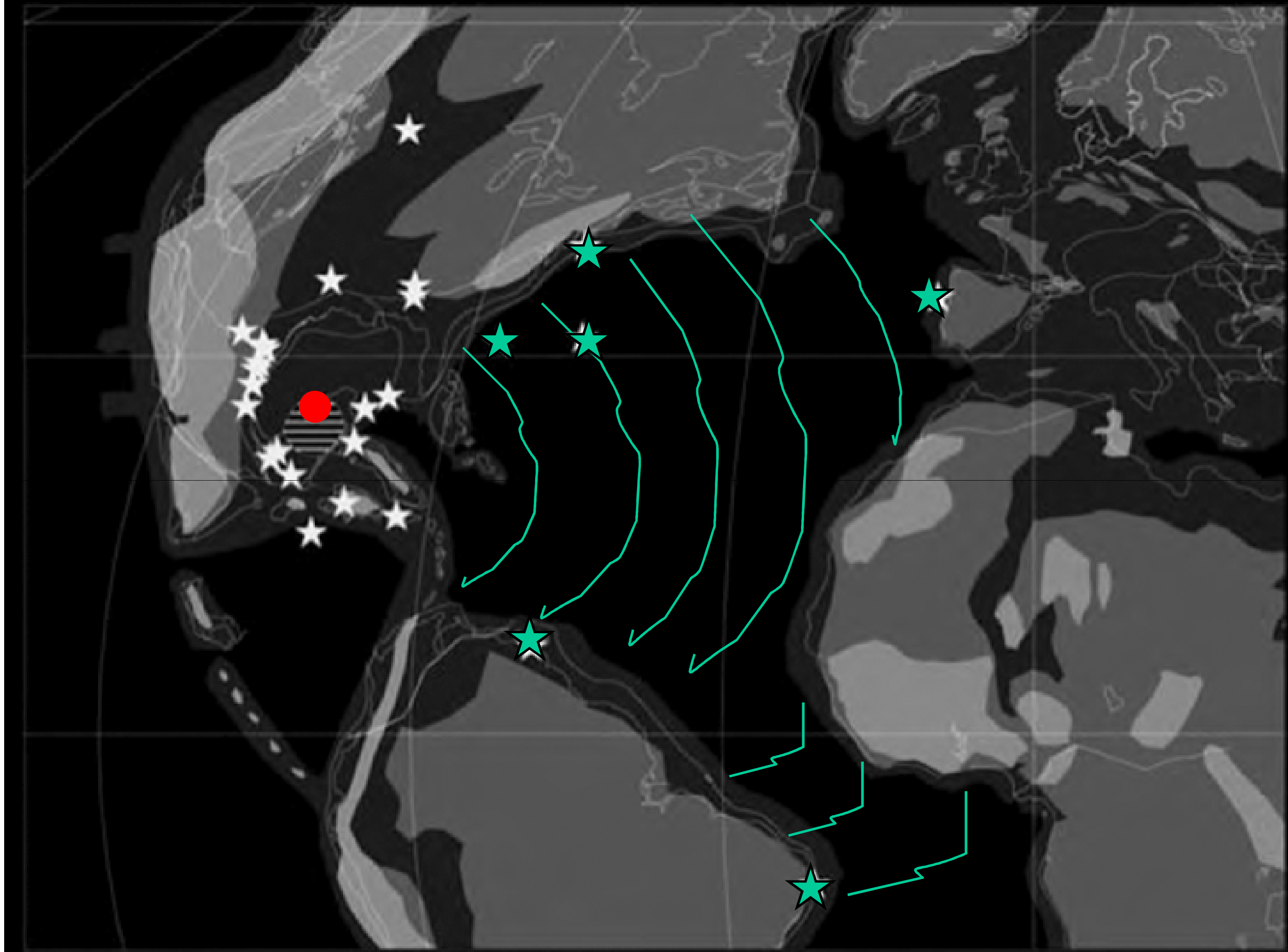
Arroyo el Mimbral



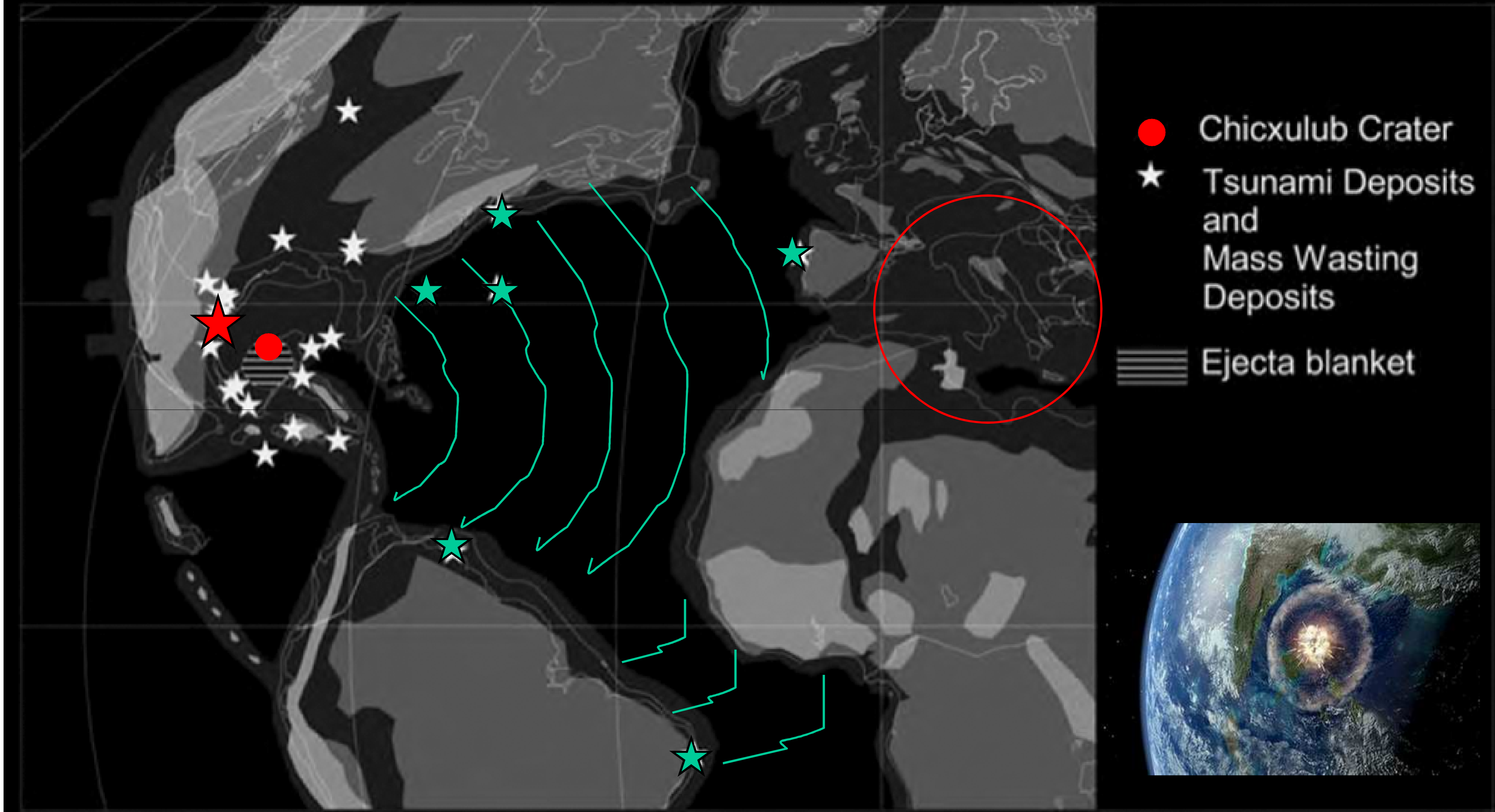
El Terminador de los dinosauros



Claeys et al. (2002)



Claeys et al. (2002)

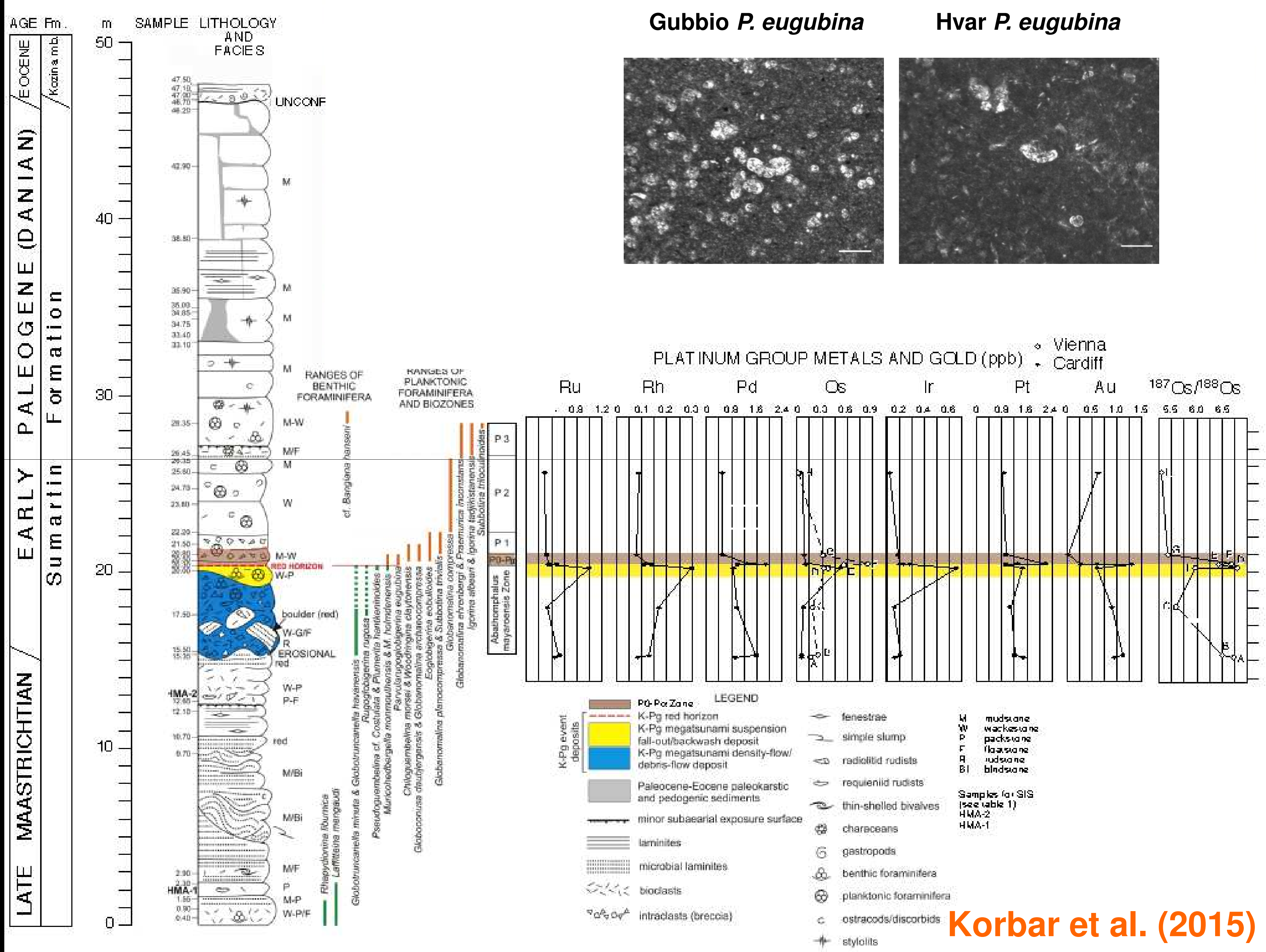


Claeys et al. (2002)

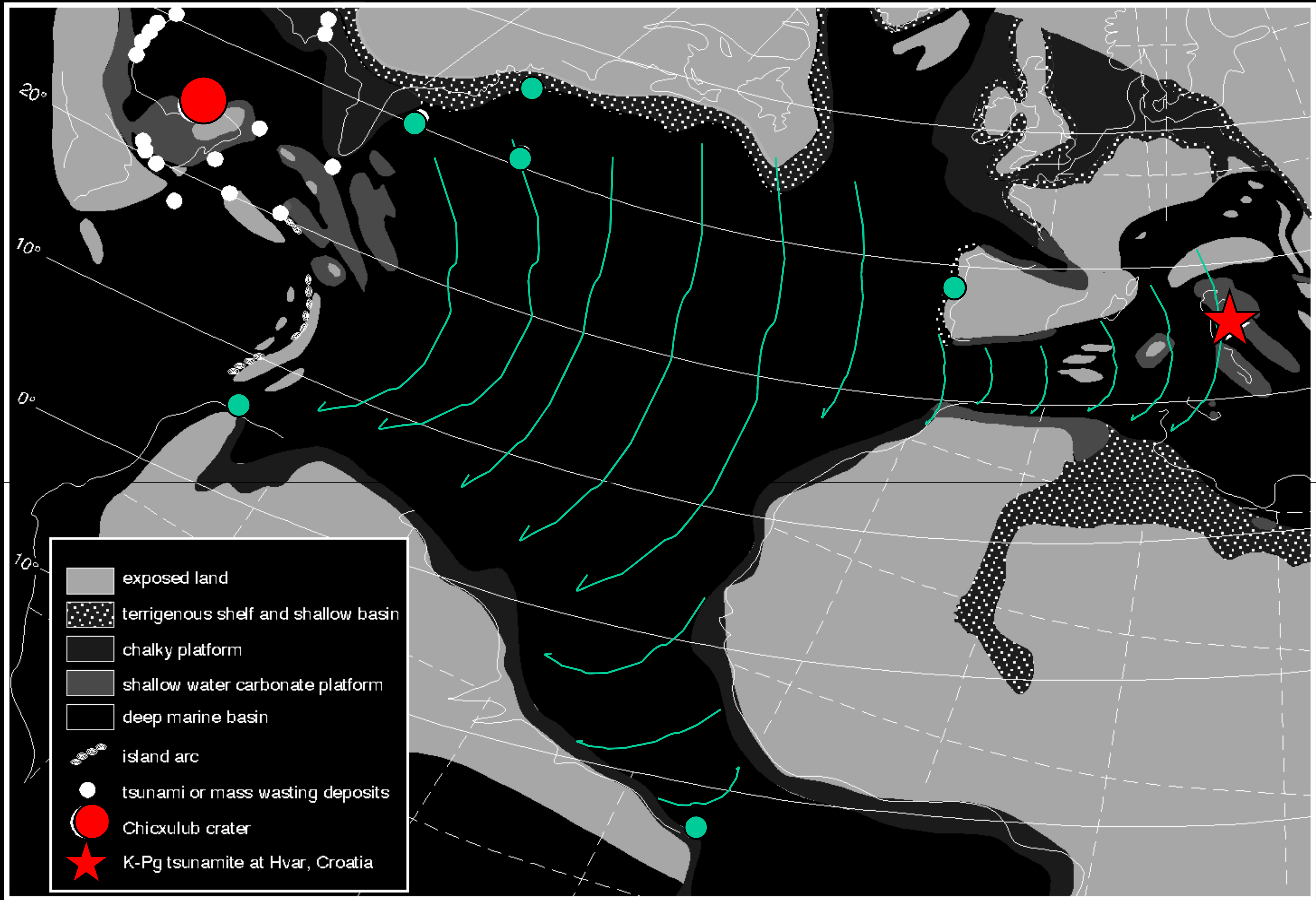
Hvar


Majerovica
K/T Section
Cretaceous
Sandro's
House
Eocene
Cretaceous

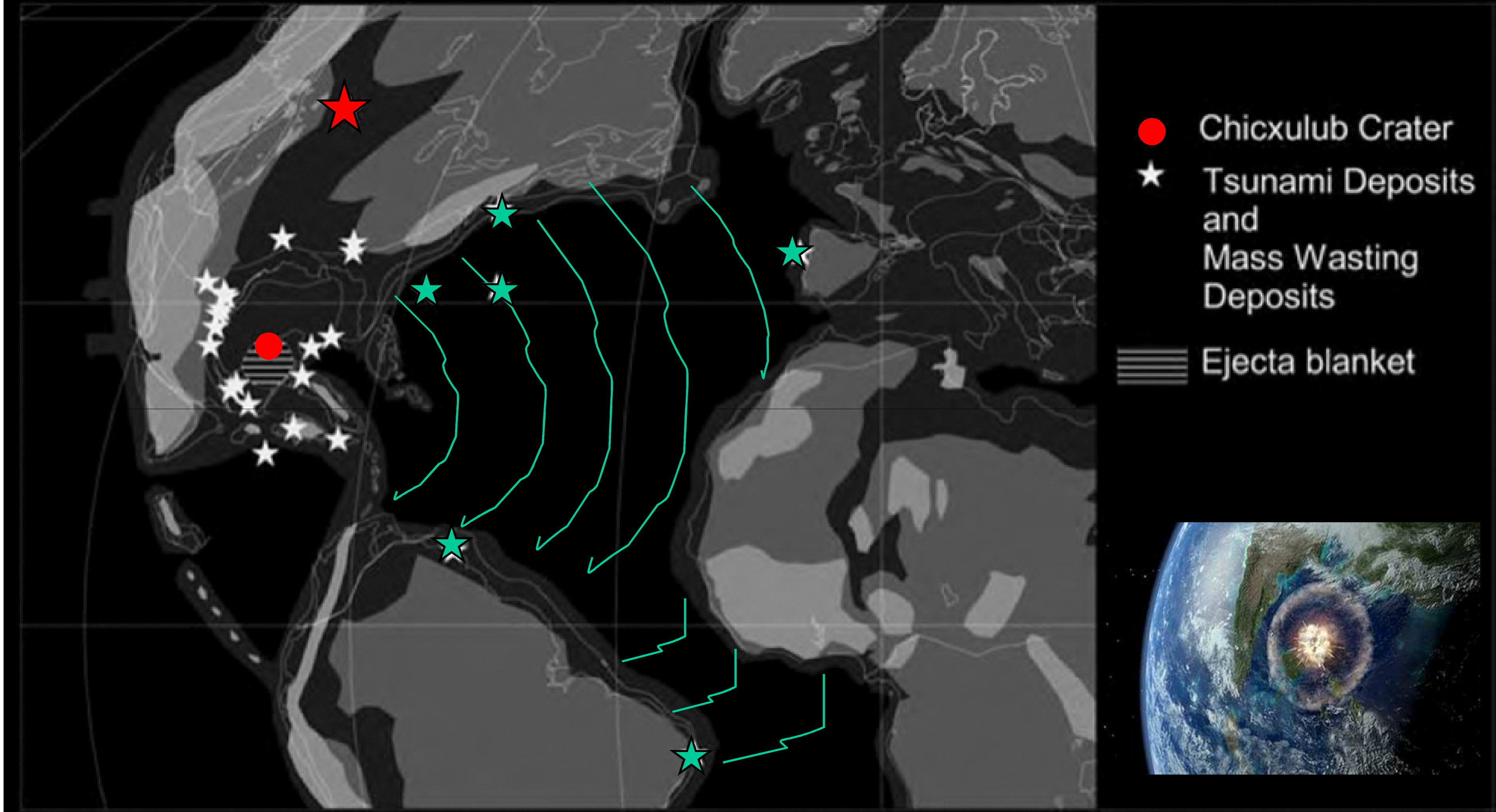
Majorica Section (Hvar, Croatia)



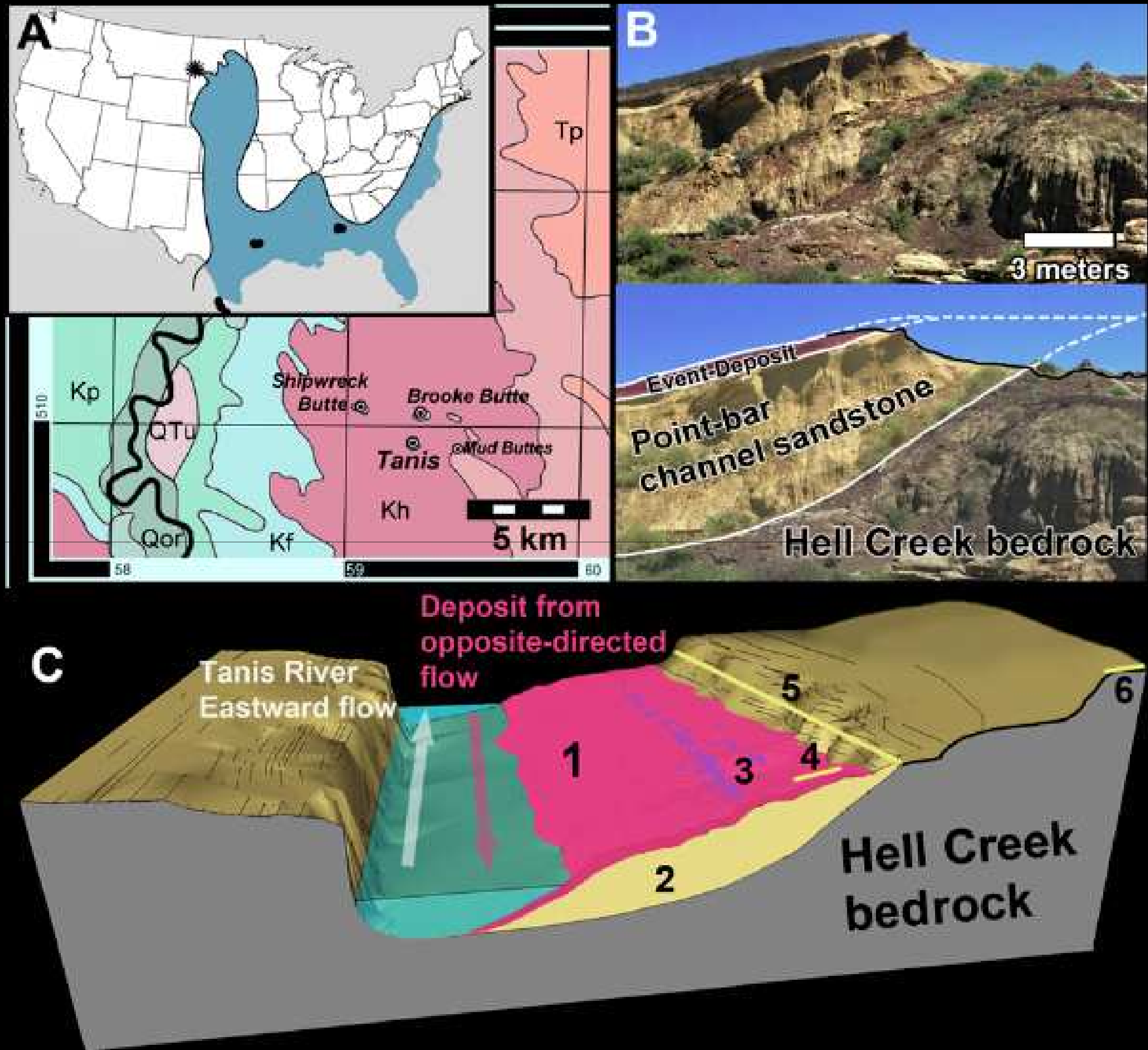
Korbar et al. (2015)



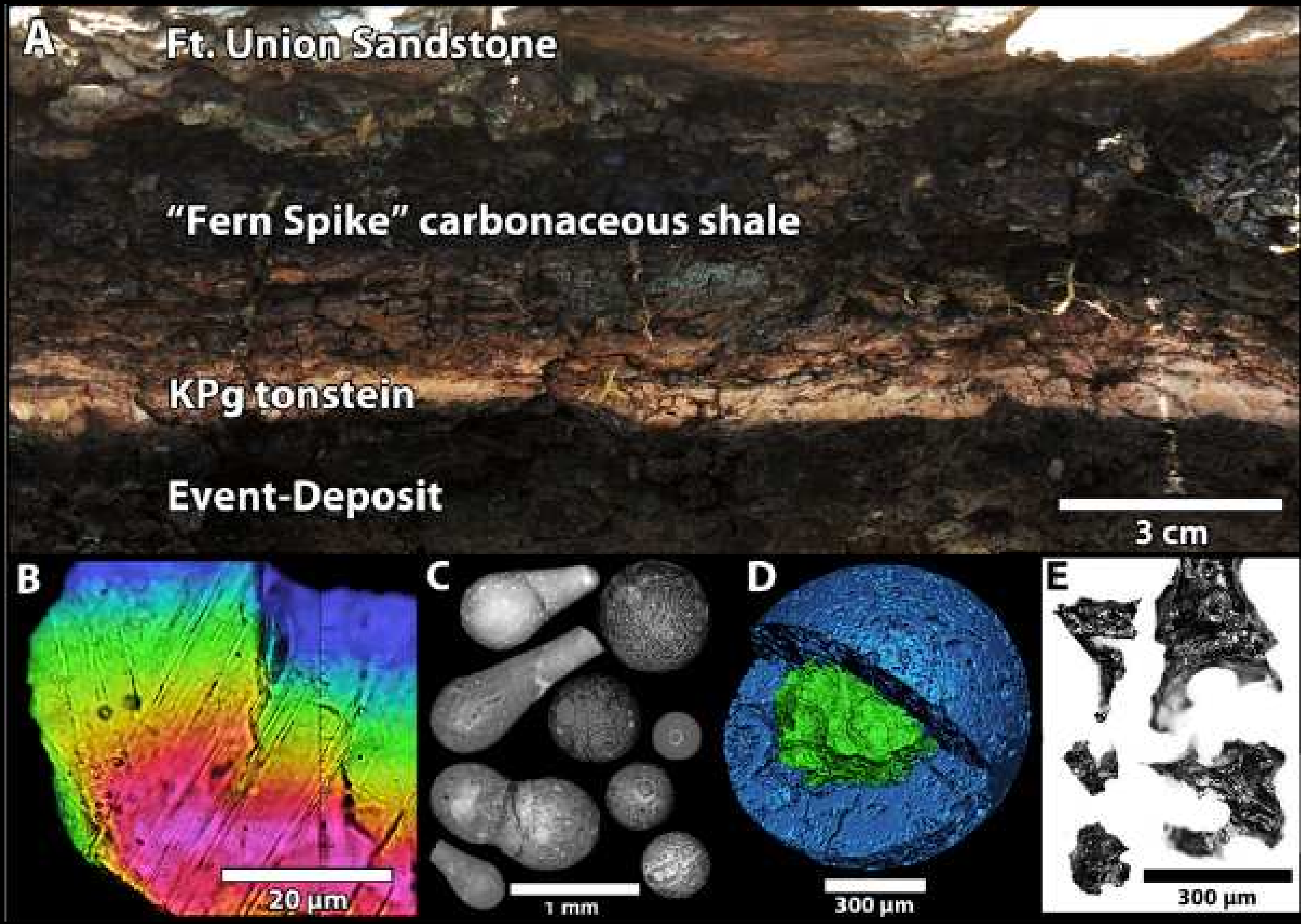
Korbar et al. (2015)



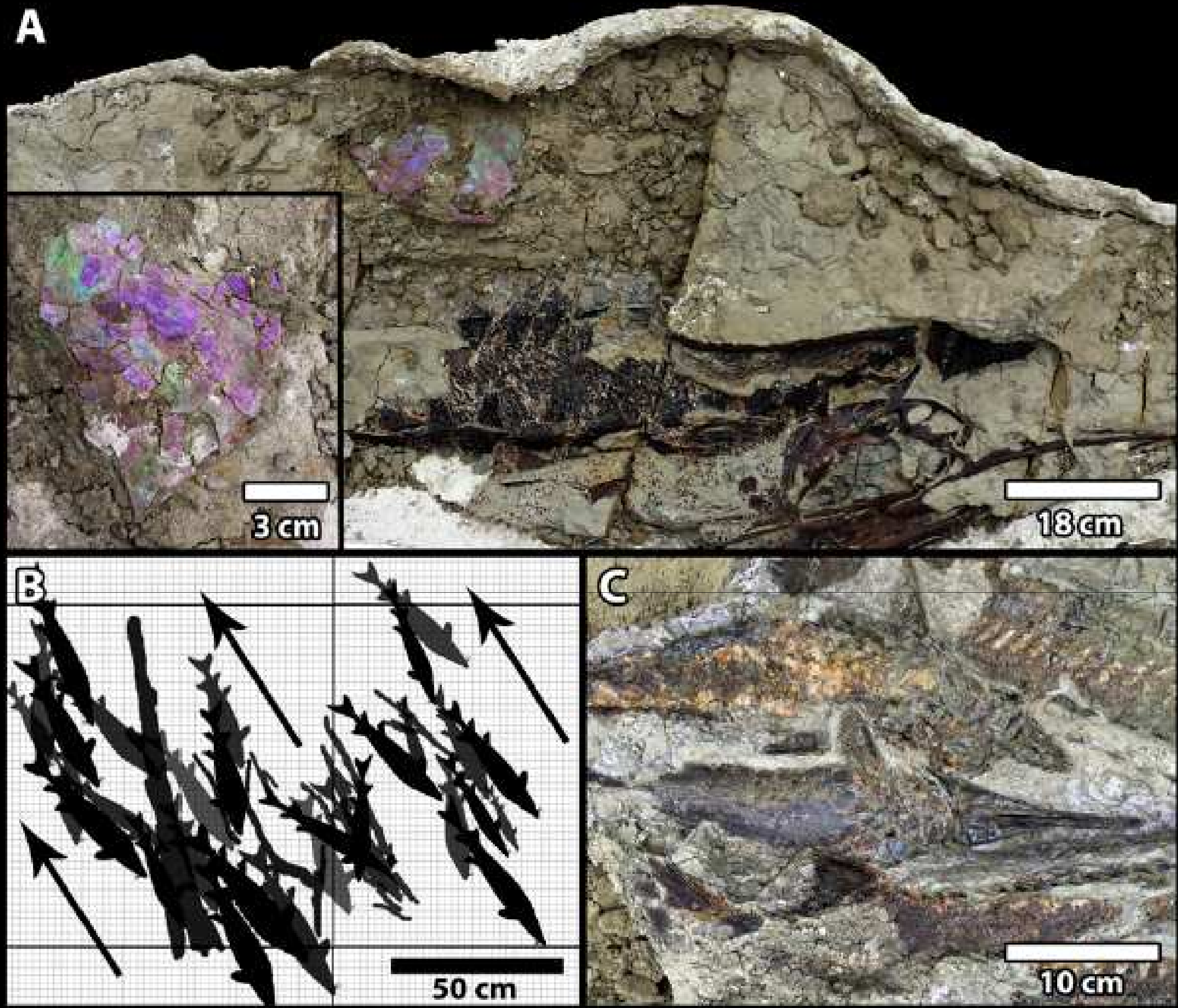
Claeys et al. (2002)



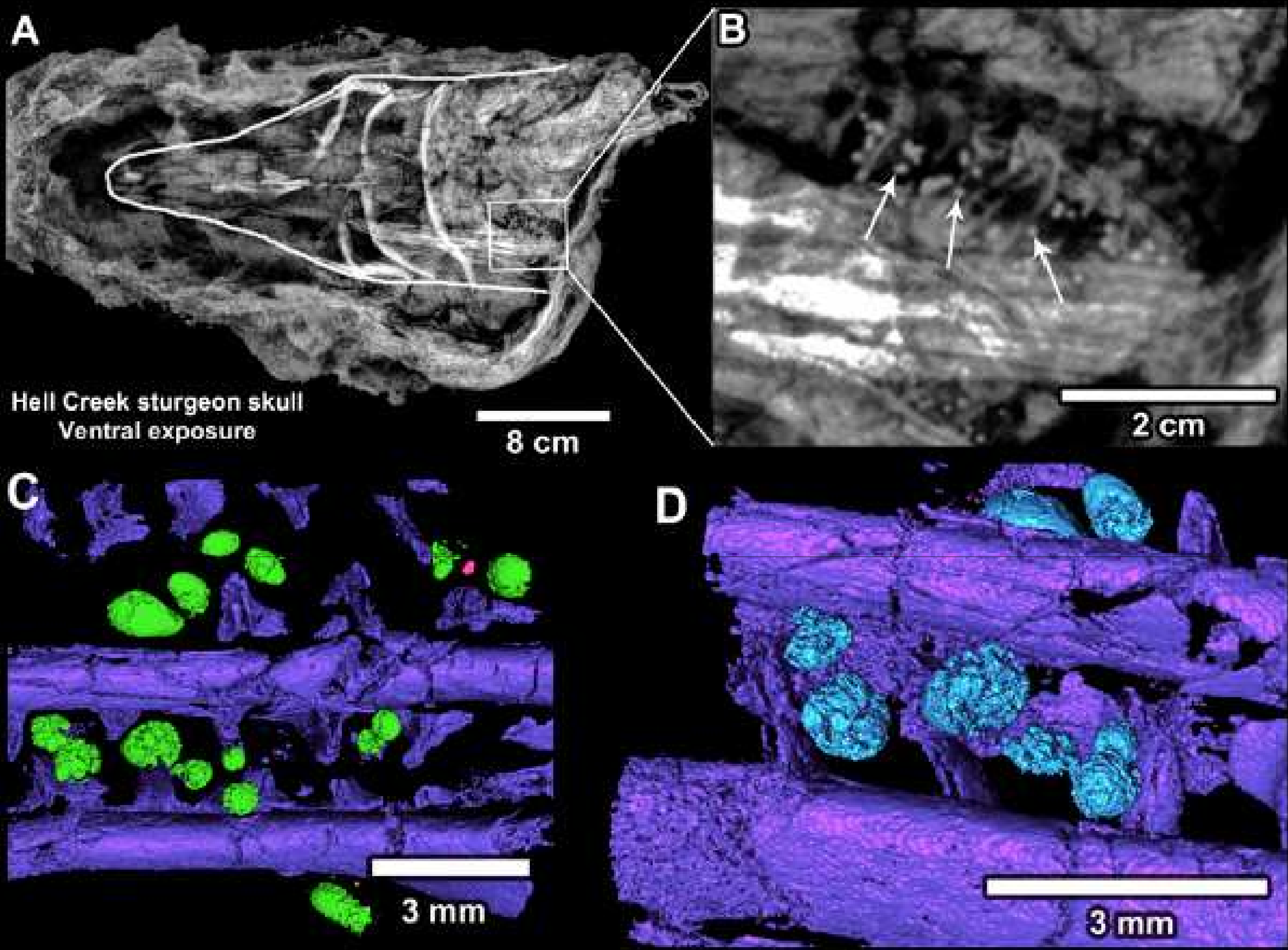
DePalma et al. (2019)



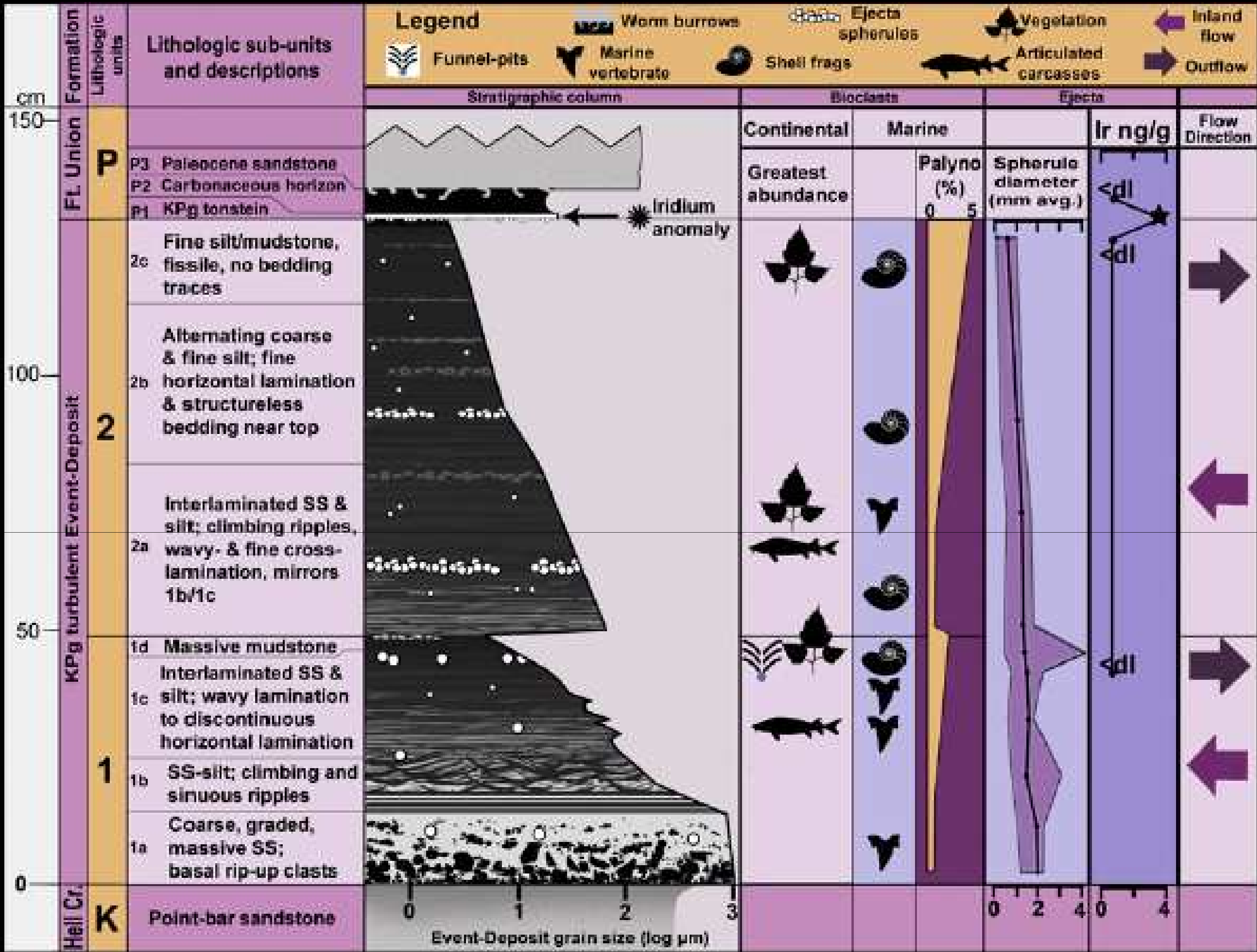
DePalma et al. (2019)



DePalma et al. (2019)

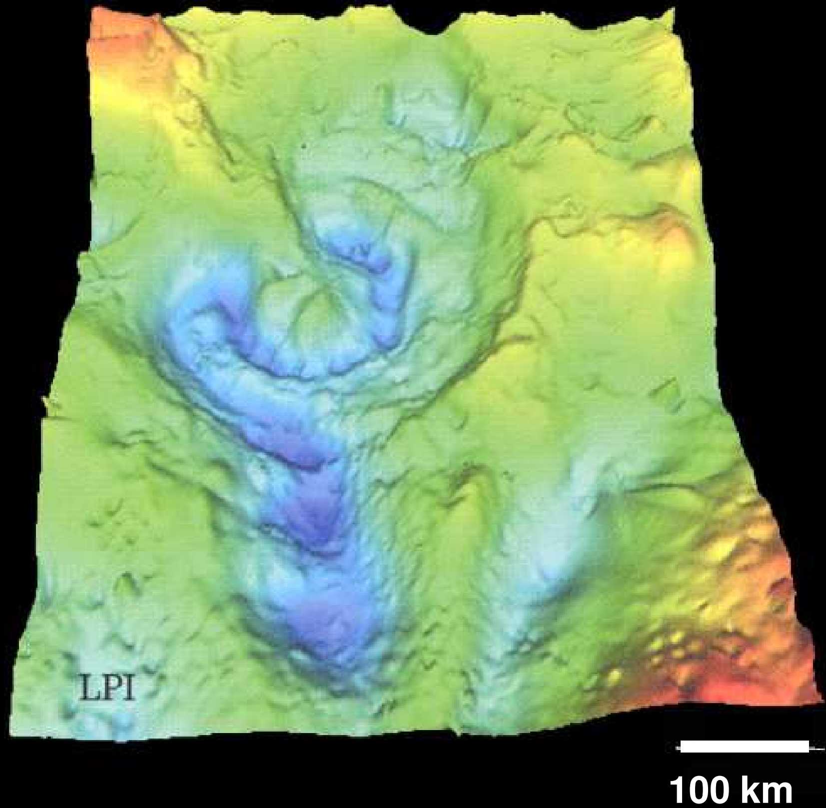


DePalma et al. (2019)



DePalma et al. (2019)

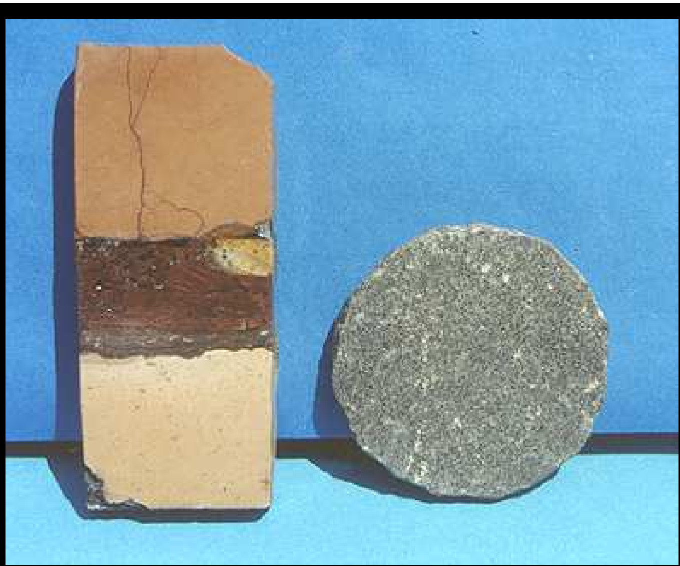
La pistola fumante



L’alibi dei dinosauri

… Non c’eravamo. Ci siamo estinti 65 milioni di anni fa, prima del plancton marino, quindi per cause diverse ...

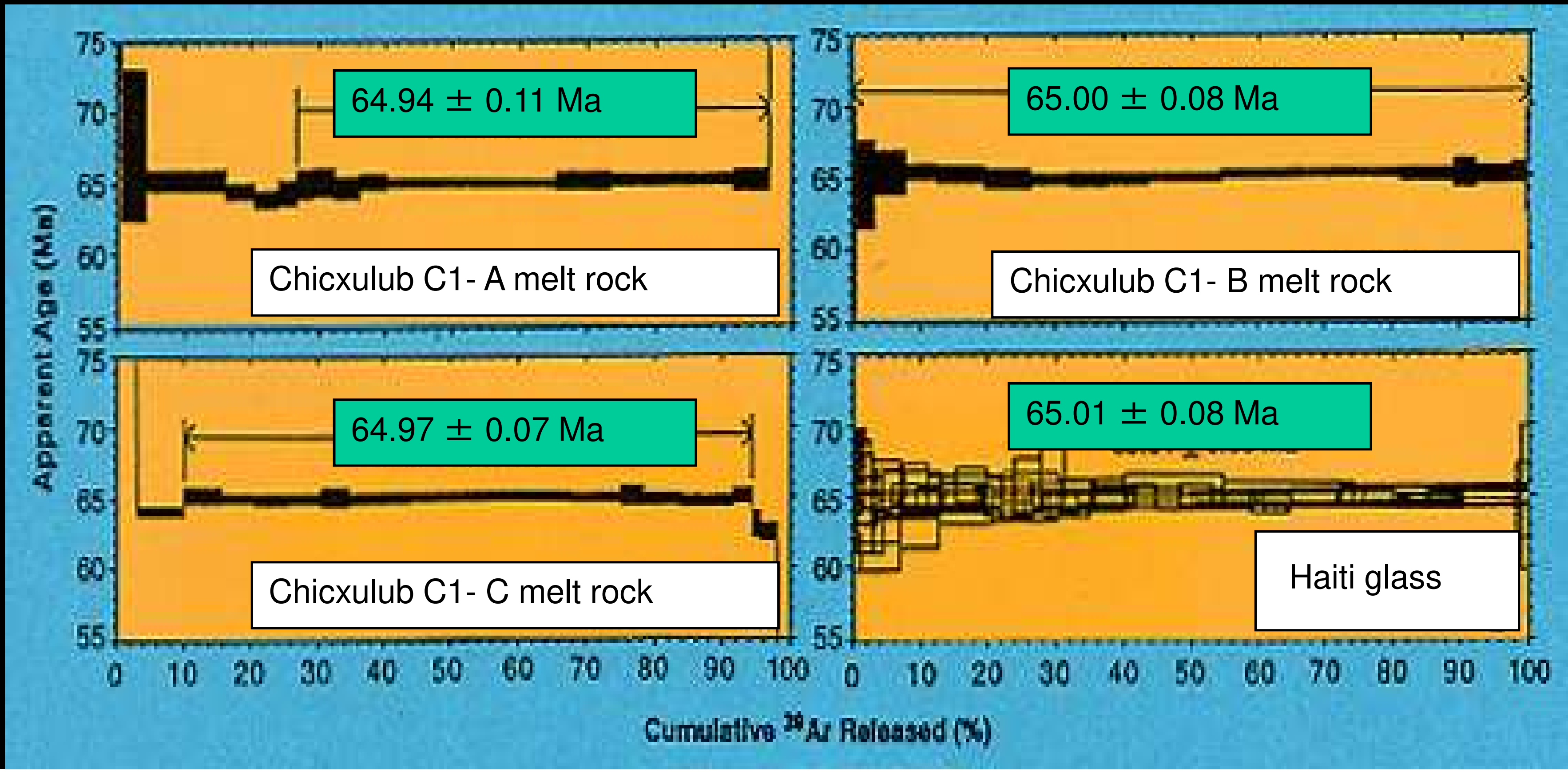
L'ora del delitto



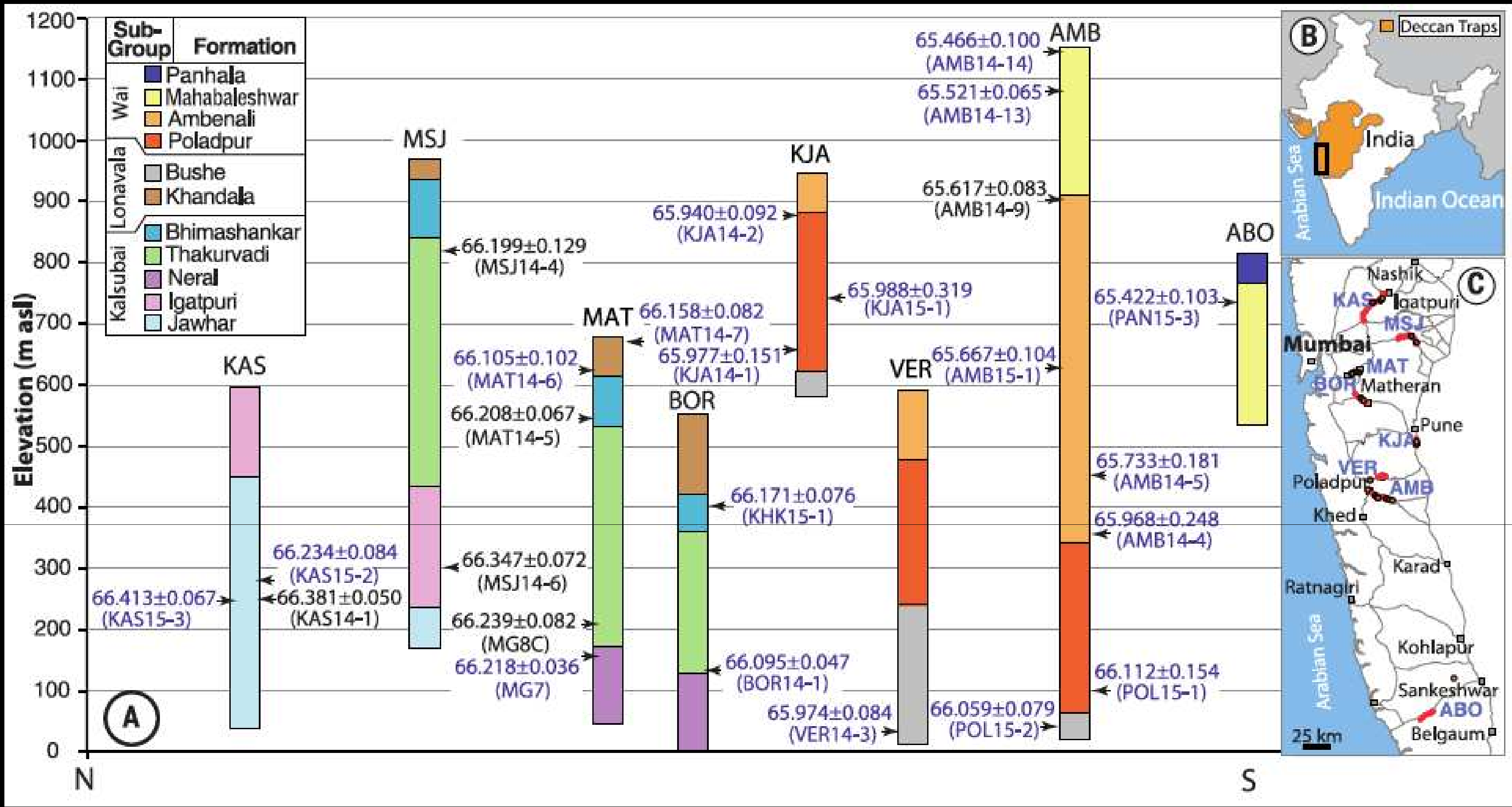
Mimbral glass

65.07 ± 0.17
65.10 ± 0.19
65.03 ± 0.21

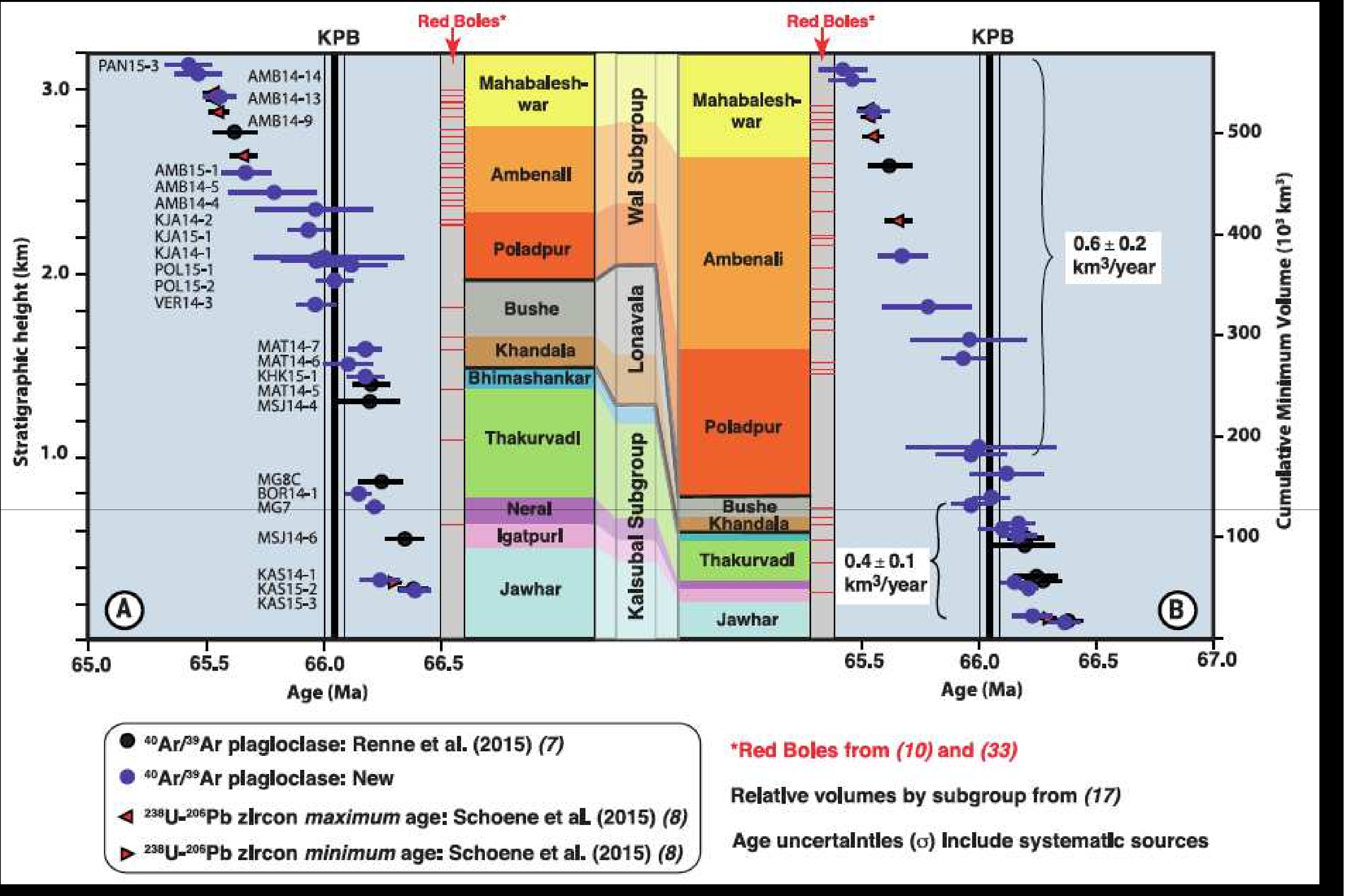
65.05 ± 0.30
65.09 ± 0.45
65.07 ± 0.10†
65.07 ± 0.03



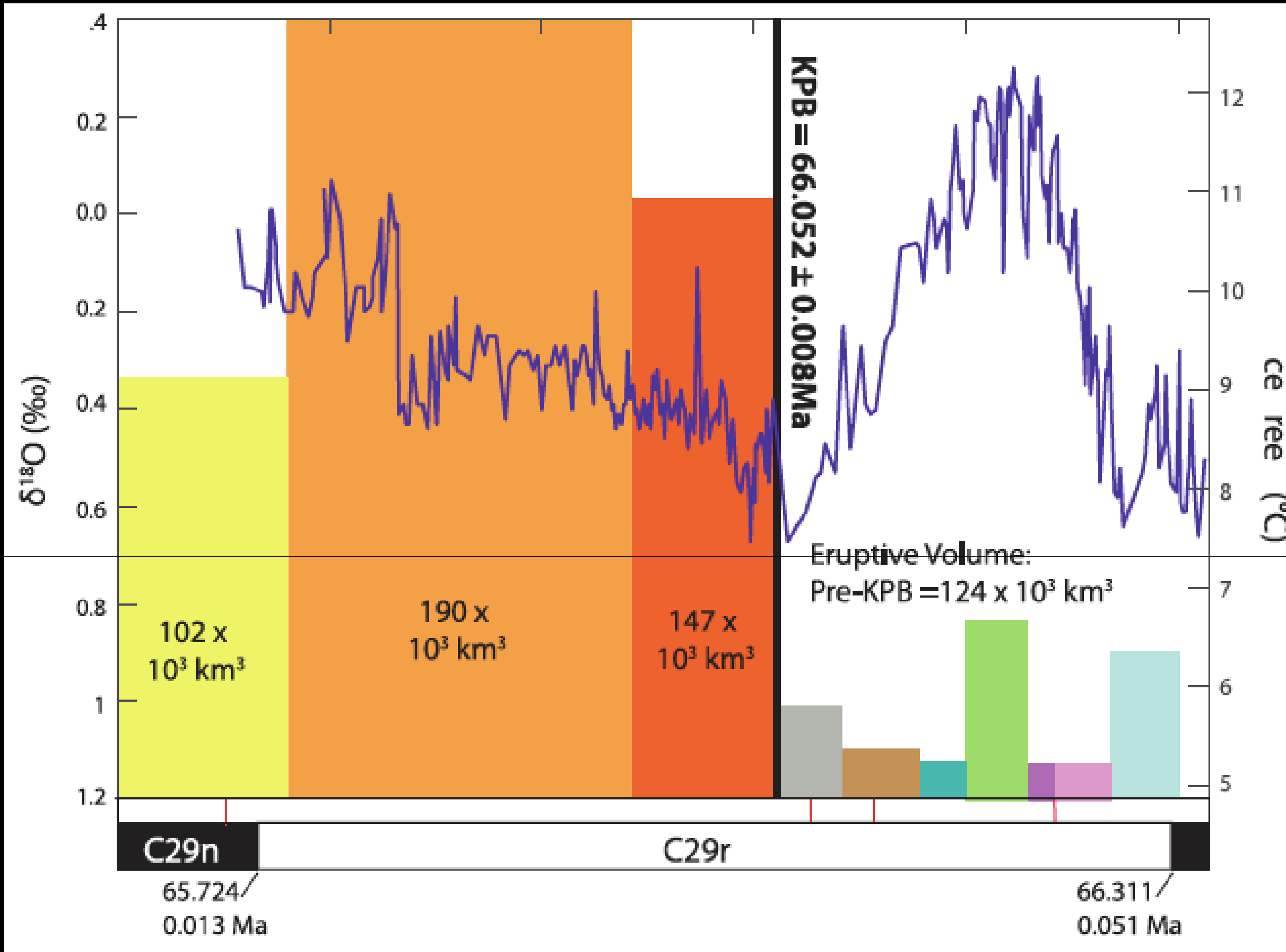

FAÎTES LE JEU!
RIEN NE VA PLUS!
65... ROUGE...
Montanari '81



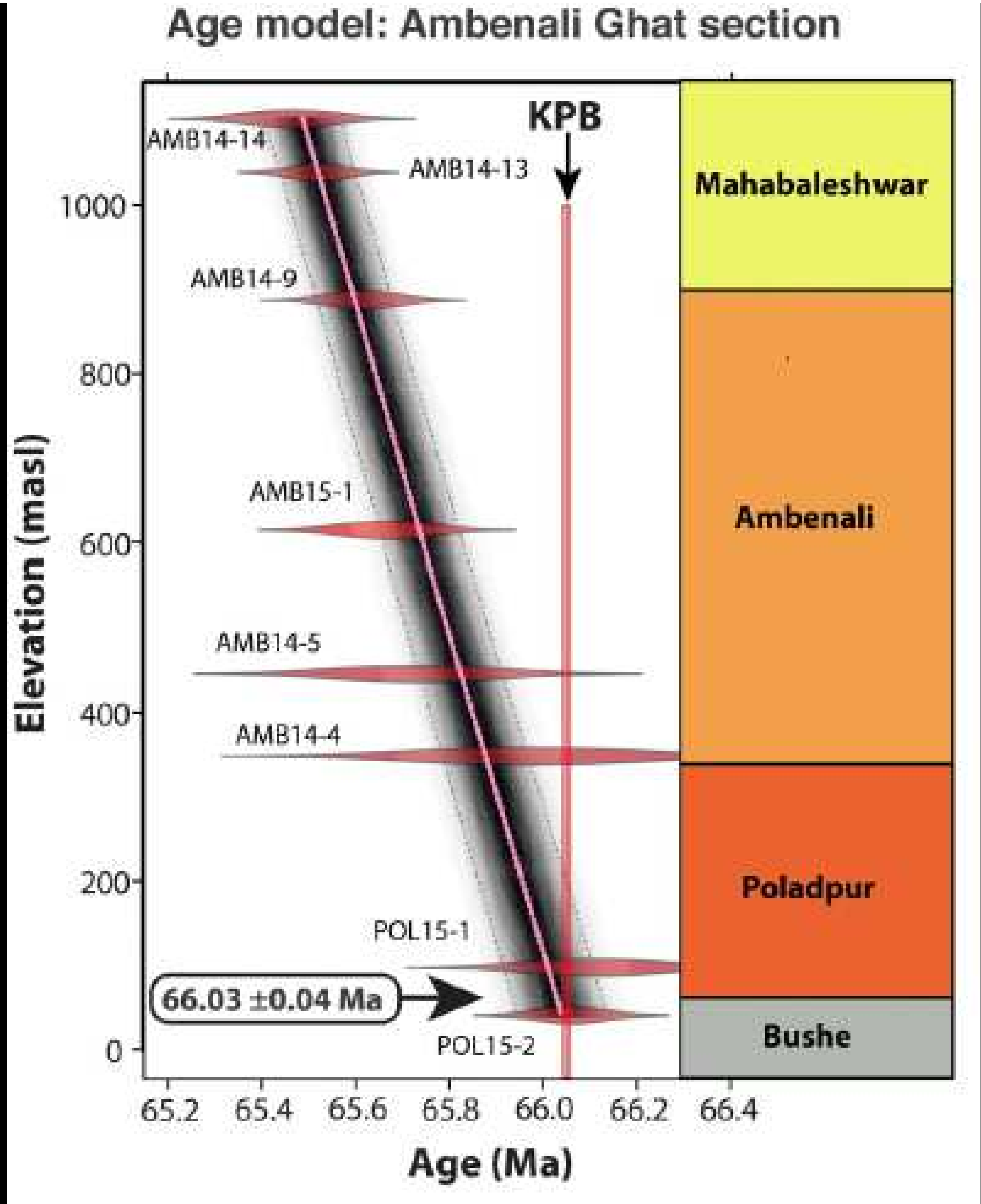
Sprain et al. (2019)



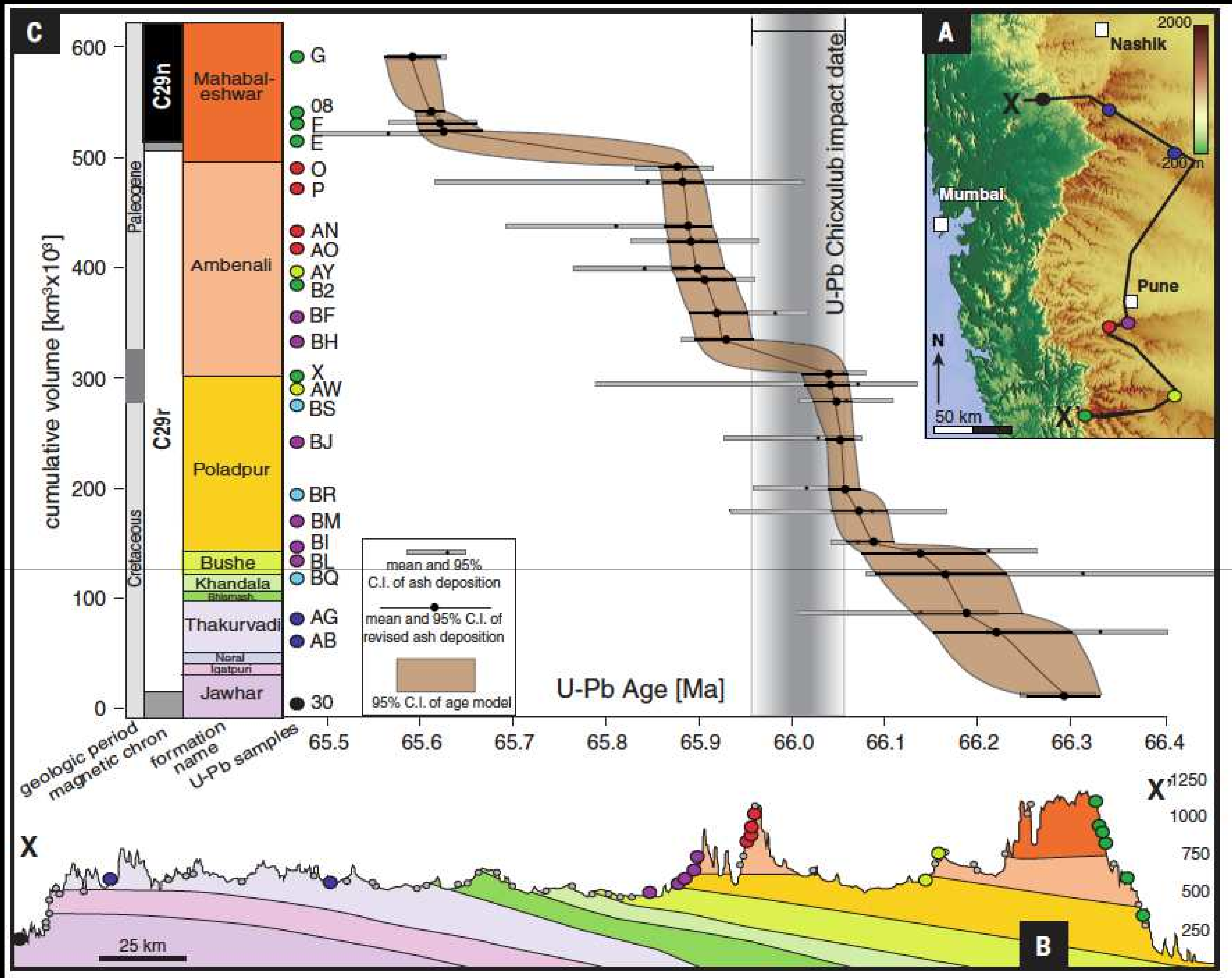
Sprain et al. (2019)



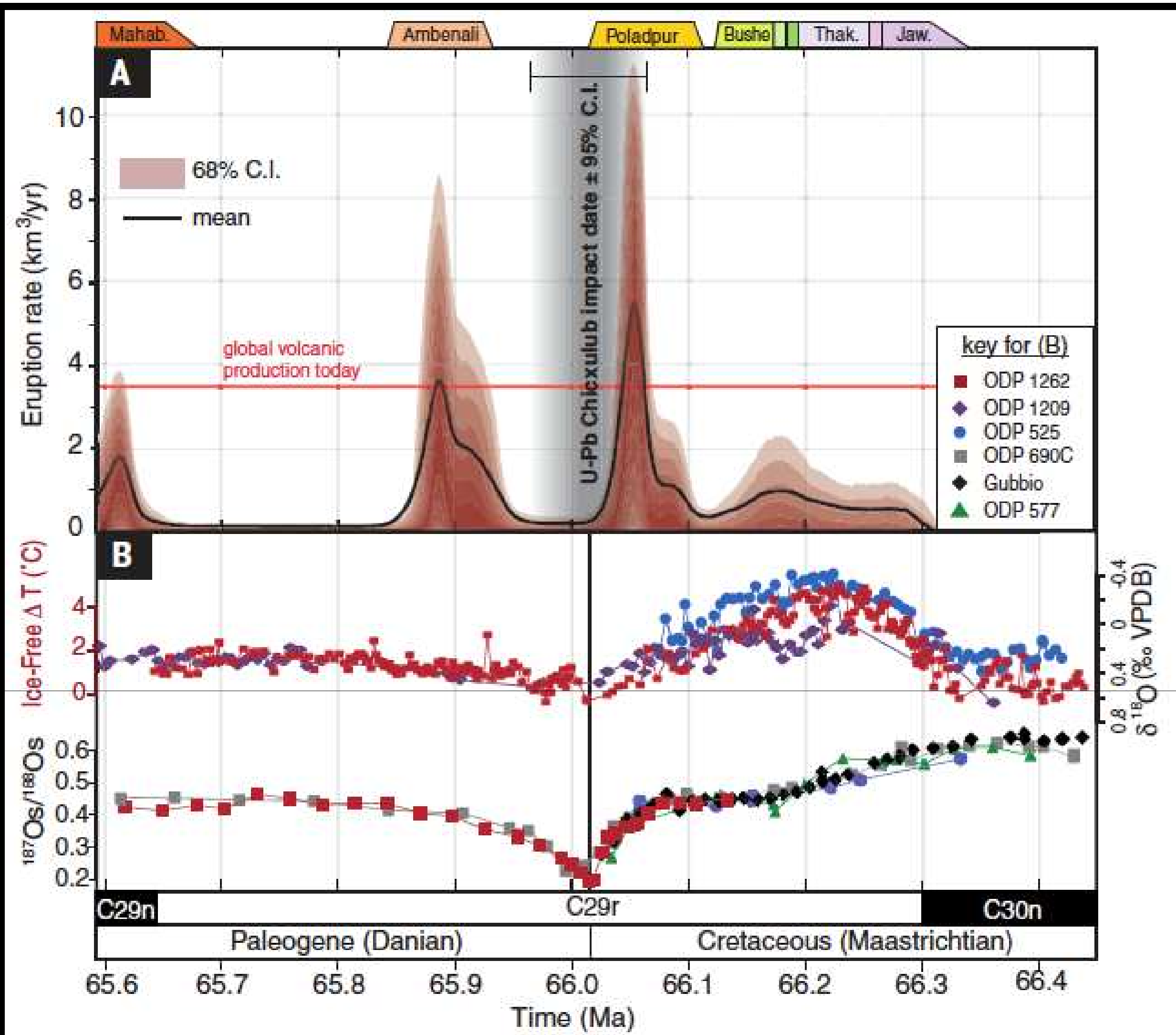
Sprain et al. (2019)



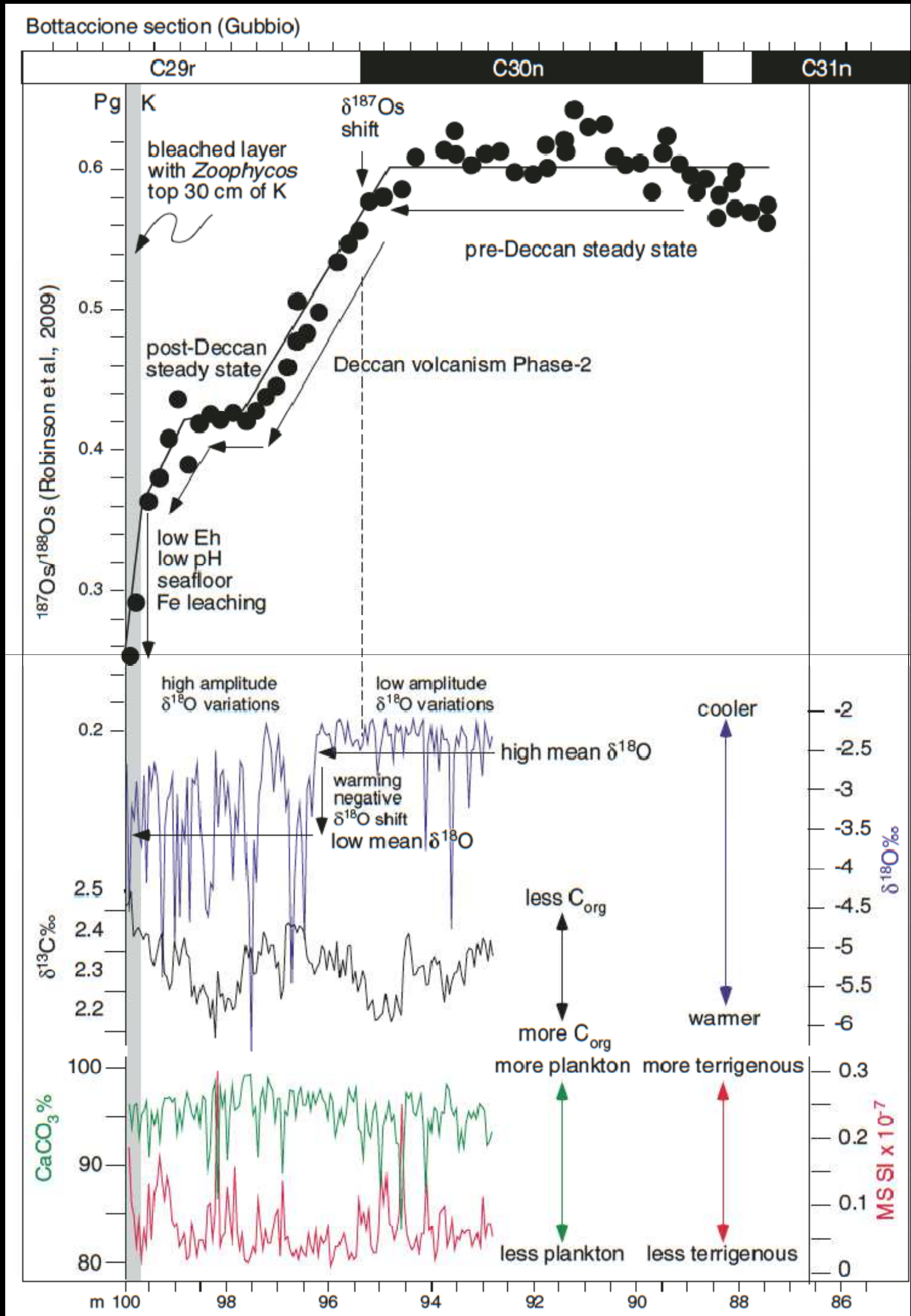
Sprain et al. (2019)



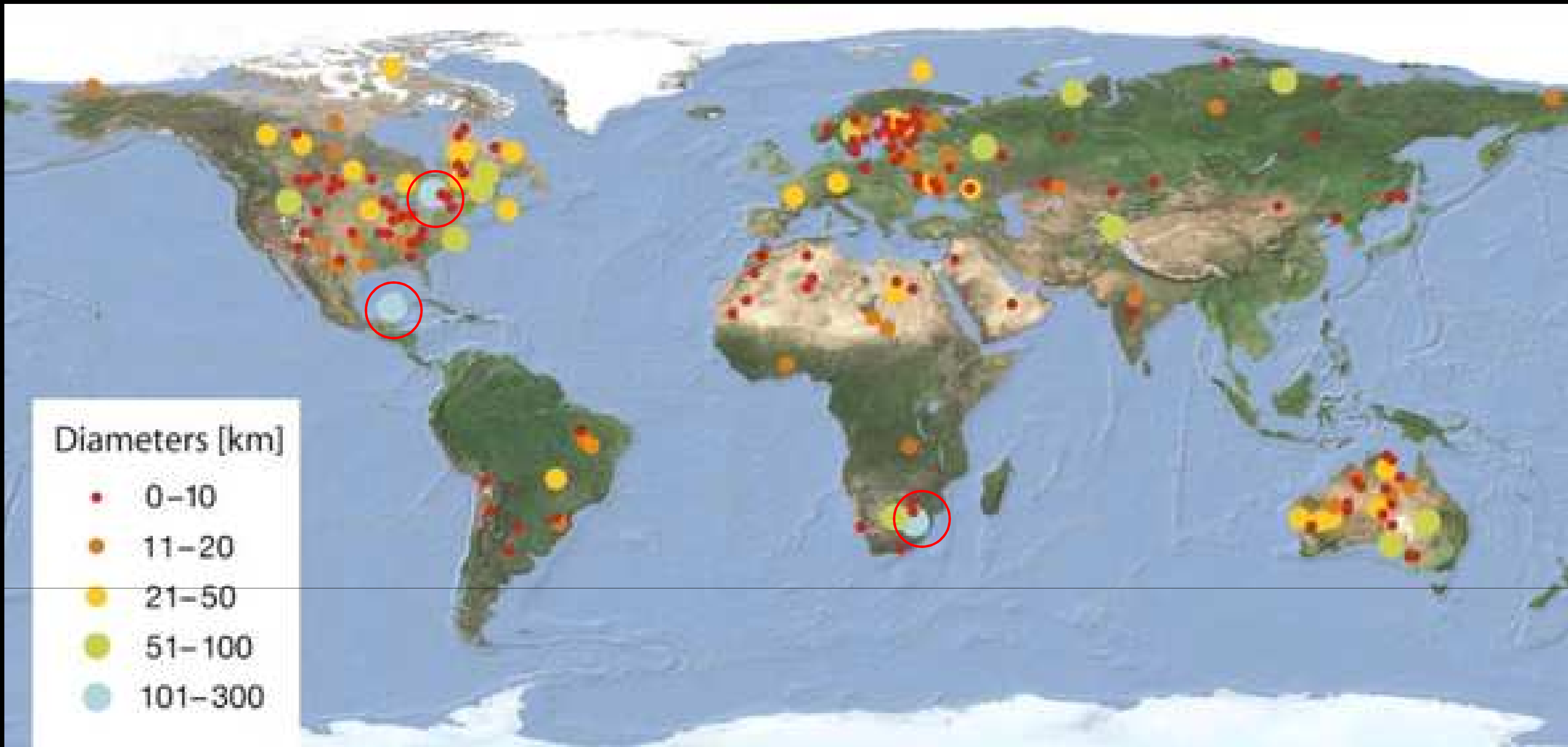
Shoene et al. (2019)

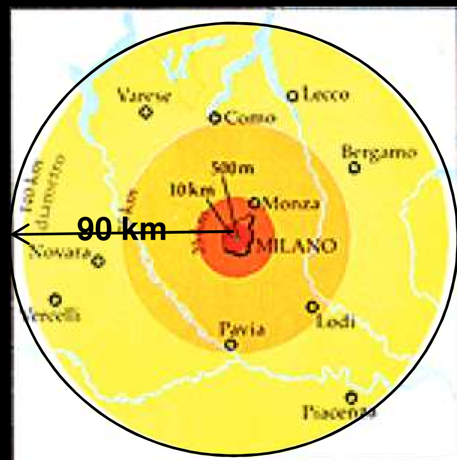


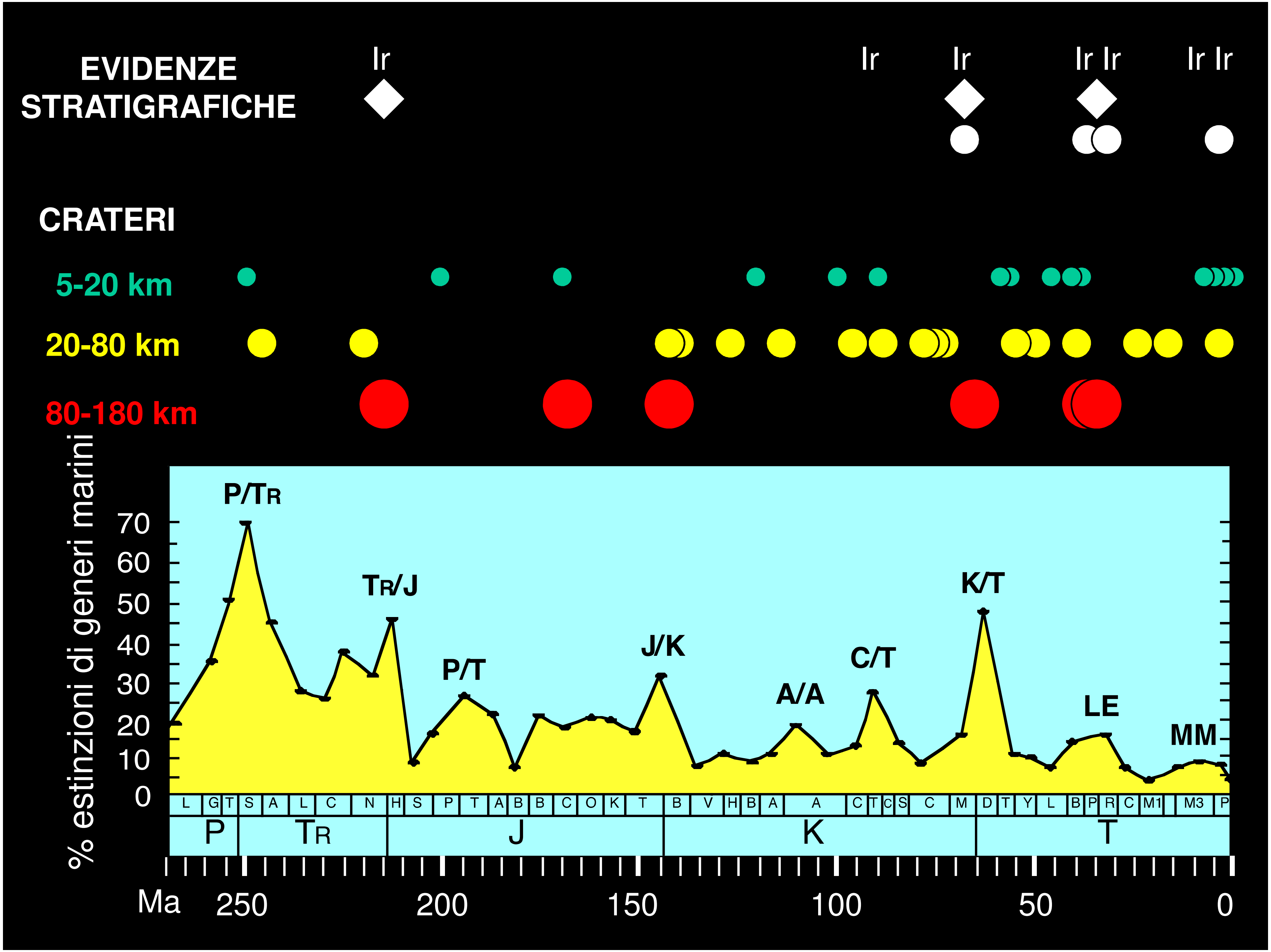
Schoene et al. (2019)



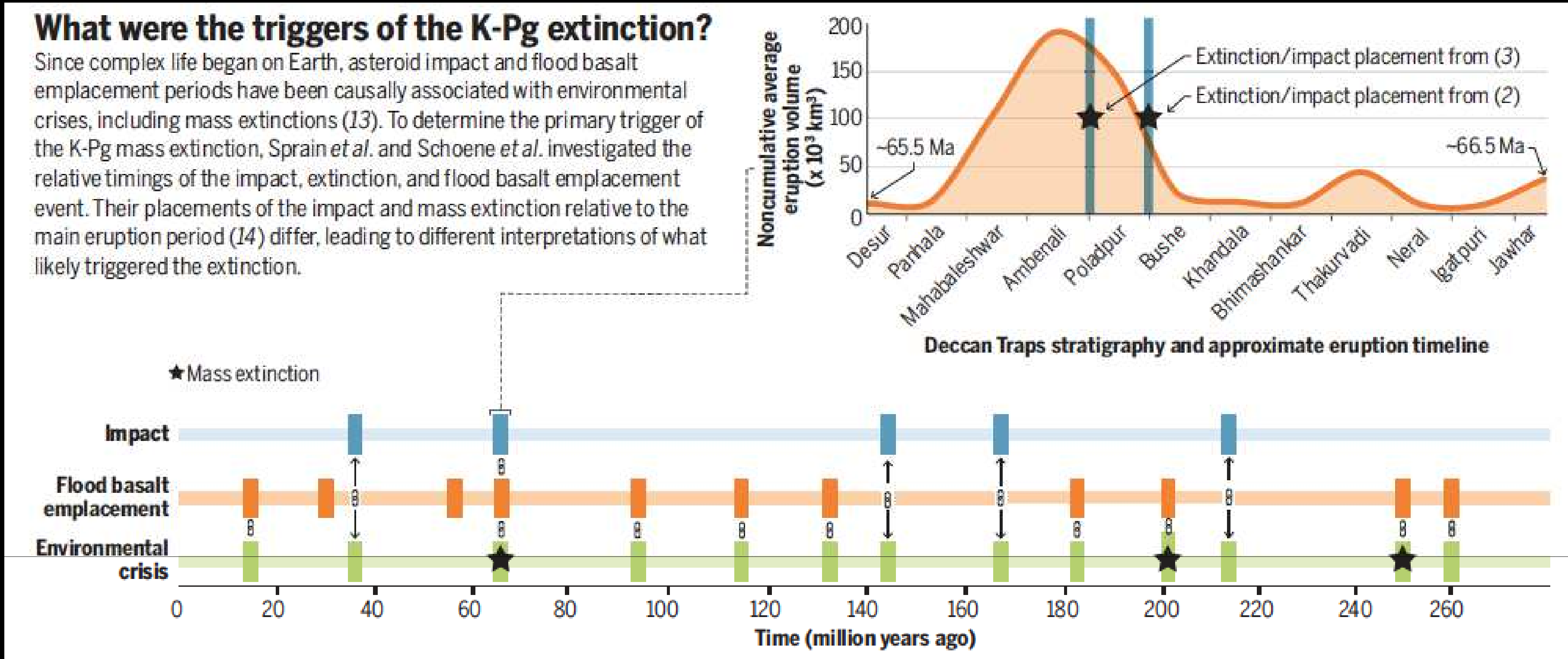
Sinnesael et al. (2016)


Diameters [km]
0–10
11–20
21–50
51–100
101–300


Varese
Como
Lecco
Bergamo
500 m
10 km
Monza
90 km
MILANO
Novara
Pavia
Lodi

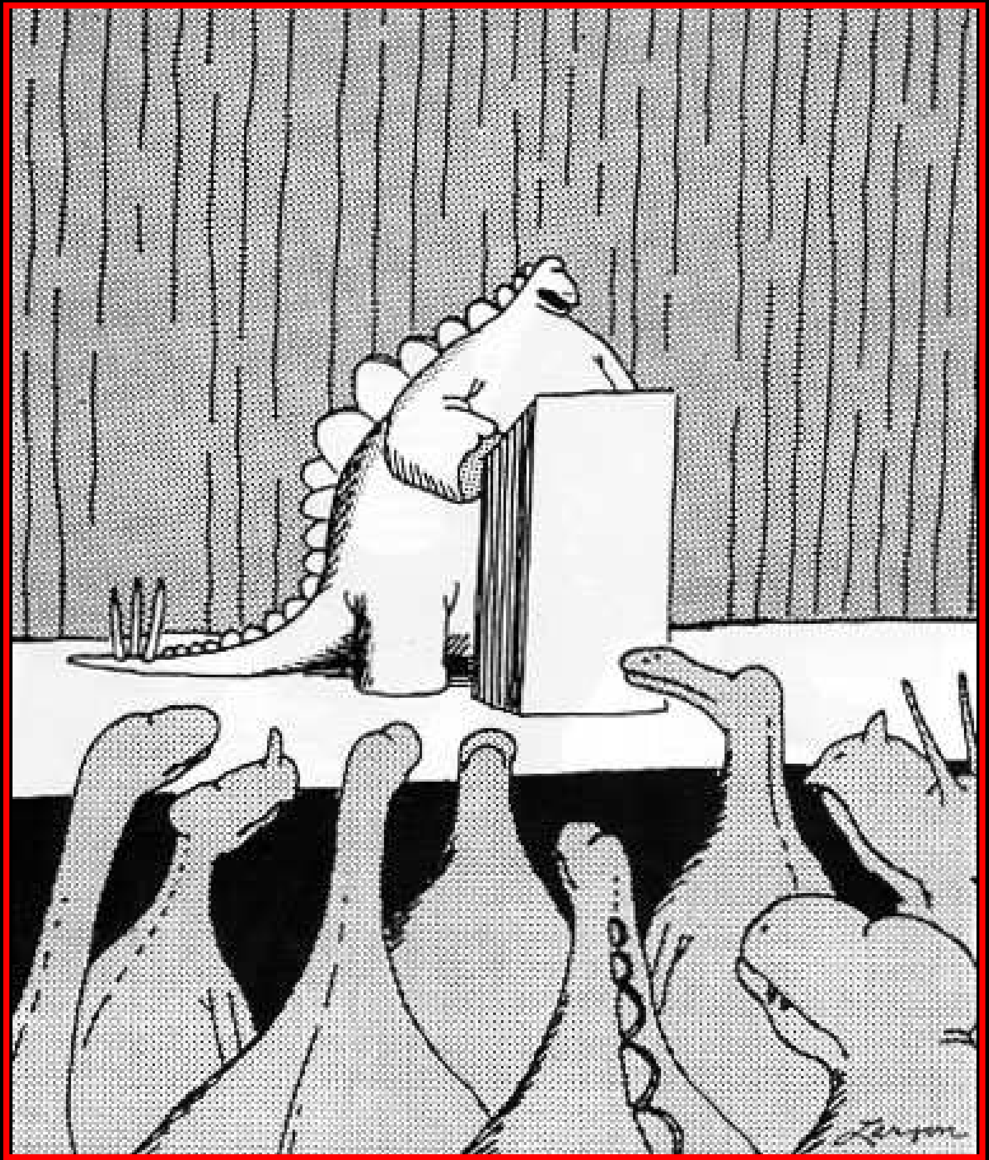


EVIDENZE STRATIGRAFICHE
Ir
Ir
Ir
Ir Ir
Ir Ir
CRATERI
5-20 km
20-80 km
80-180 km
% estinzioni di generi marini
P/TR
TR/J
P/T
J/K
A/A
C/T
K/T
LE
MM
70
60
50
40
30
20
10
0
L G T S A L C N H S P T A B B C O K T B V H B A A C T C S C M D T Y L B P R C M1 M3 P
P TR J K T
Ma 250 200 150 100 50 0

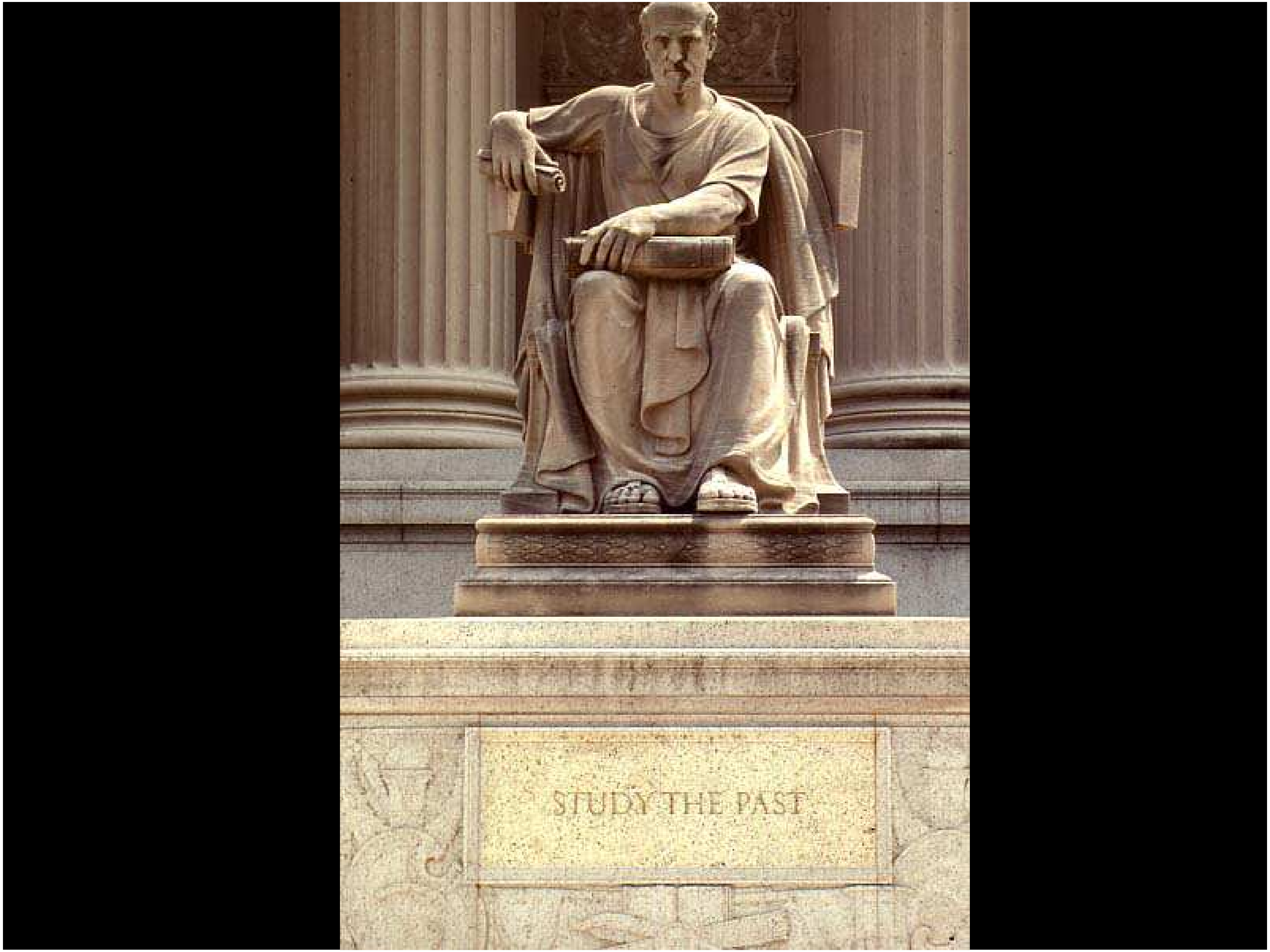


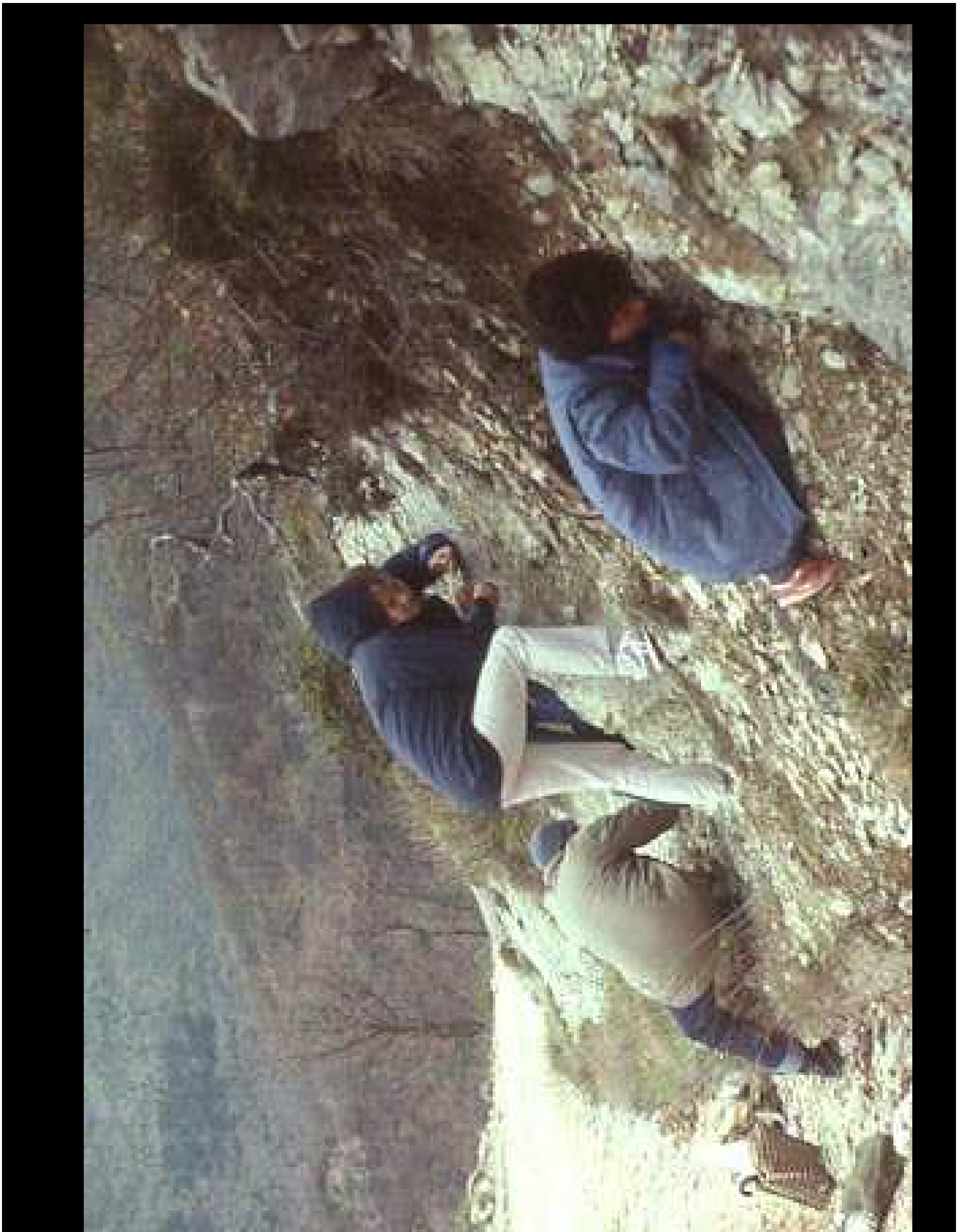
Burgess (2019)

Le ultime parole



"Signori, la situazione sta precipitando….
il clima è cambiato, i mammiferi ci incalzano e noi
abbiamo un cervello troppo piccolo per questi grandi problemi"


STUDY THE PAST



OSSERVATORIO GEOLOGICO

EX
LIBRO
LAPI•
DUM

HIS•
TORIA
MUNDI

1992

COLDIGIOCO