seminario 25 giugno 2013

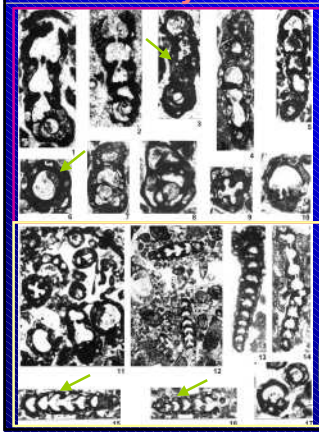
I macroforaminiferi del Paleogene:
classificazione, biostratigrafia e paleoecologia

Biostratigrafia: Paleocene

Johannes Pignatti

Università di Roma "La Sapienza"
Dipartimento di Scienze della Terra
johannes.pignatti@uniroma1.it

SBZ 1-2: Haymanella Sirel, 1998



agglutinated
milioline wall

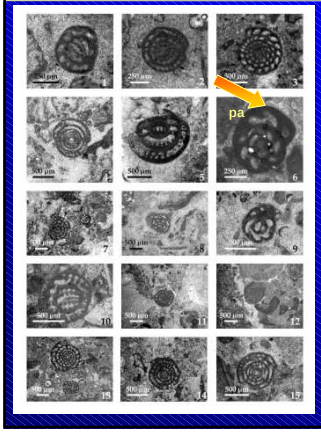
Haymanella paleocaenica Sirel, 1998
Danian
SBZ 1

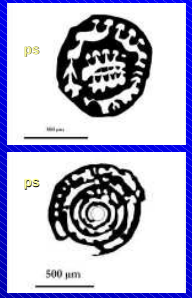
Haymanella elongata **Sirel, 2009**
(Danian?)-Selandian
SBZ (1?) – 2

agglutinated
milioline wall

Sirel (2009)

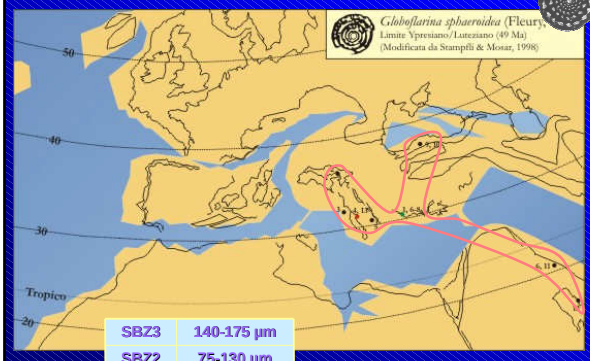
SBZ 2/3a: *Globoflarina sphaeroidea*





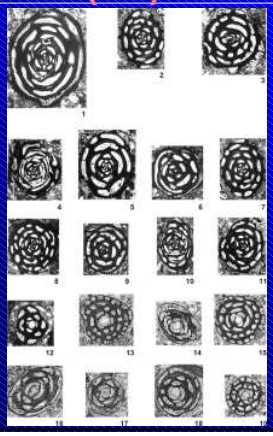
ps= subepidermal partitions
pa= anteroverse peristomes

SBZ 2/3a: *Globoflarina sphaeroidea*



SBZ3	140-175 µm
SBZ2	75-130 µm

SBZ 2 (?3a): *Kartalina* Sirel, 2013



***Kartalina kayabasiensis* Sirel, 2013**

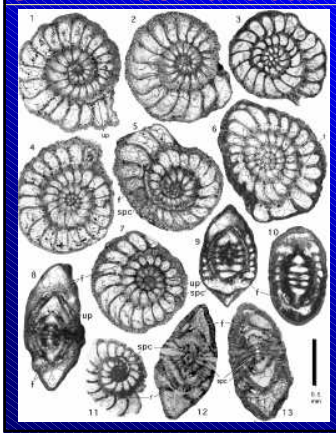
- **quinqueloculine early chambers in both generations, later biloculine**
- **late chambers subdivided by septula or ribs into large chamberlets**
- **ovoid test**
- **no trematophore**

13: holotype

Kayabaşı and Bahçecik, Turkey

Sirel (2013; *Revue de Paléobiologie* 31 (2): 267-301)

SBZ 2 Miscellaneidae: Ornatononion



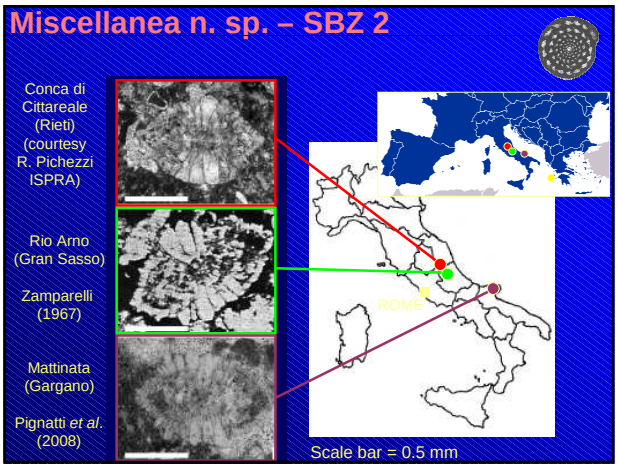
Ornatononion moorkensii
Hottinger, 2009
Mons, Belgium

This is a small-sized, early species of Miscellaneidae, with reduced dimorphism

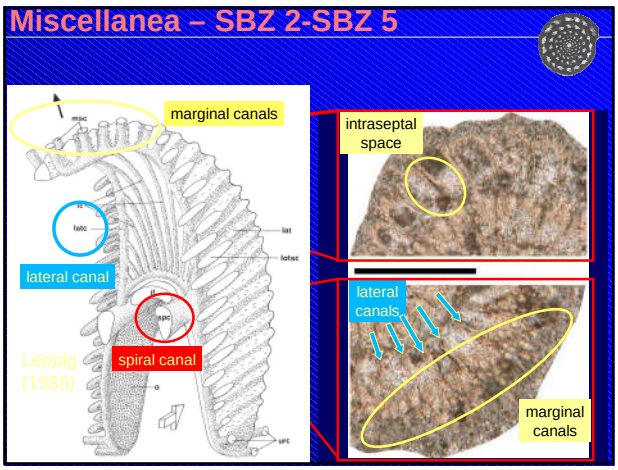
f: foramen; s: septum; spc: spiral canal; up: umbilical plate

Hottinger (2009)

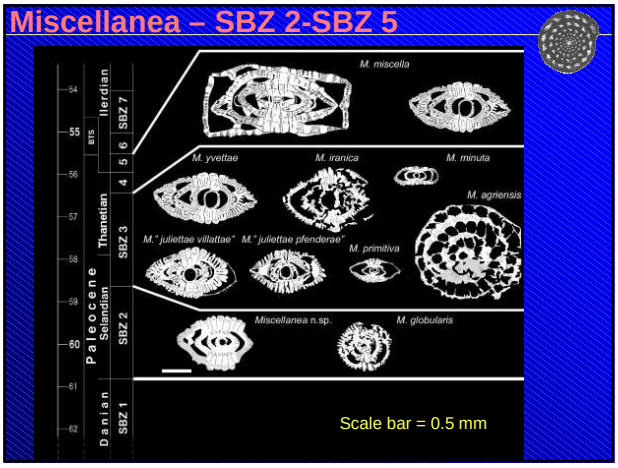
Miscellanea n. sp. – SBZ 2



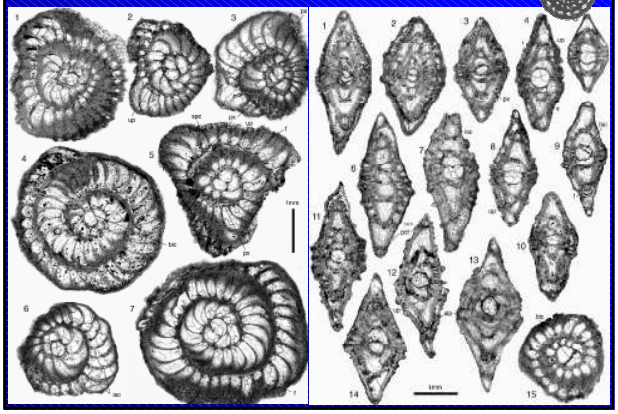
Miscellanea – SBZ 2-SBZ 5



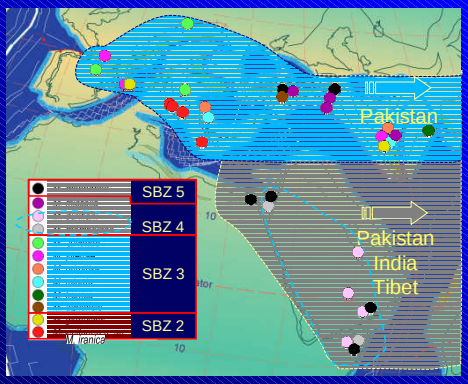
Miscellanea – SBZ 2-SBZ 5



Miscellanea miscella



Miscellanea: paleobiogeography



Thanetian (57 Ma) paleogeography after Stampfli & Borel (2004, adapted)

Other (new) miscellaneids

JATIBUNGKUS (Central Java)

Scale bar = 0.5 mm

MAIELLA MT. (Central Italy)

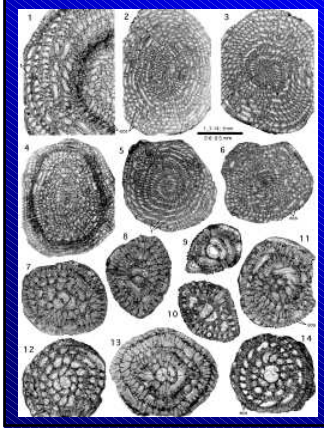
Miscellanites Hottinger, 2009

Type species: Miscellanea iranica Rahaghi, 1983

f: foramen; ecs: enveloping canal system

Hottinger (2009)

Carterella Sirel, 2013



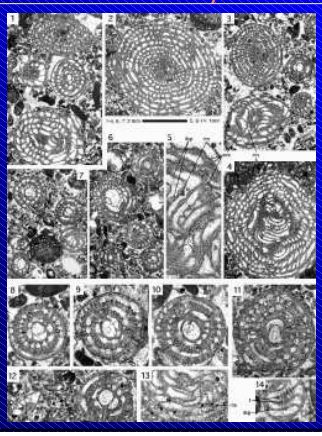
Carterella meandrina (Carter, 1861) Sirel, 2013

In microspheric forms, adult stage with numerous, very low and short chambers, arranged in multiple spirals; later chambers meandrine, extending from pole to pole

f: foramen; ecs: enveloping canal system

SBZ 4
All from Turkey, except 9
Hottinger (2009)

Carterella Sirel, 2013

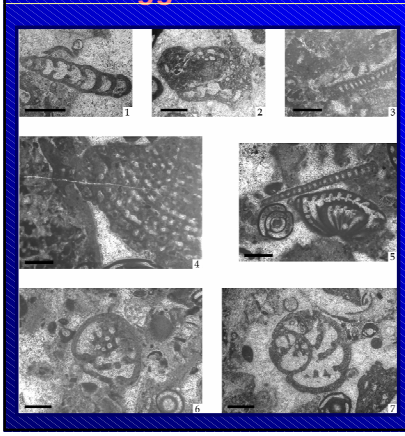


Carterella sp.
[= *Miscellanites meandrinus* (Carter, 1861) sensu Hottinger, 1989]

SBZ 4
Wadi Araba, Egypt

Hottinger (2009)

SBZ 3: Agglutinated taxa



Haymanella paleocenica (1)

Haddonia praeheissigi (2)

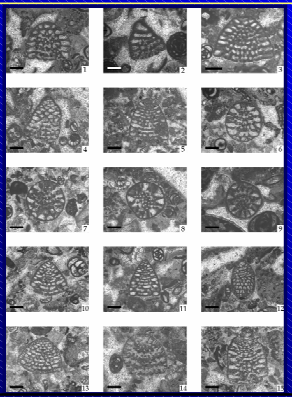
Thomasella (=Vania) anatolica (3-5) [+ *Hottingerina anatolica* (5)]

Cribrobulimina cf. *carniolica* (6, 7)

Zakynthos (Kiliomeno)

Scale bar = 0.5 mm

SBZ 3: agglutinanti conici



Zante
-
Kiliomeno

Coskinon rajkae (1-3)

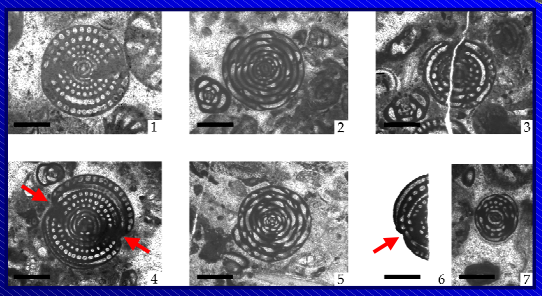
Fallotella alavensis (4-12)

F. kochanskae (13-14)

Gen. et sp. indet. (15)

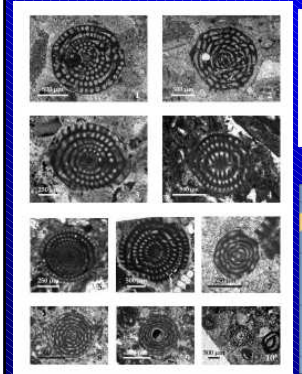
Barra = 0,5 mm

SBZ 3: *Glomalveolina primaeva*

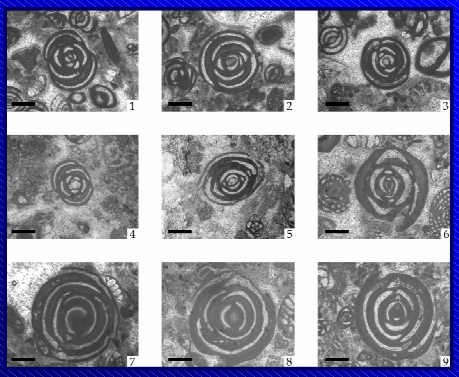


G. primaeva primaeva **(Reichel, 1936) (1-3)**
G. primaeva ludwigi **(Reichel, 1936) (4-6)**
?Helenalveolina **(7)**

"Odd partner" for *G. primaeva* - SBZ?



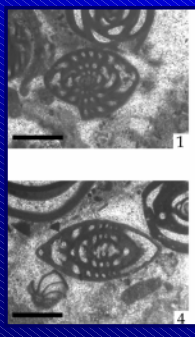
SBZ 3: *Idalina sinjarica*

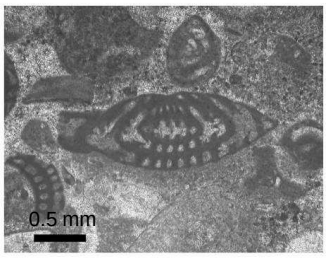


Idalina sinjarica
Grimsdale, 1952

Zakynthos
(Kiliomeno)

SBZ 3, 4: *Hottingerina*



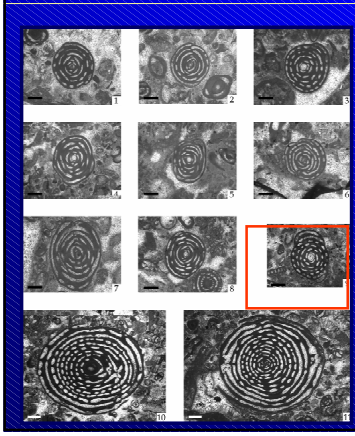


Hottingerina lukasi Drobne, 1975
SBZ ?3-4

***Hottingerina anatolica* Sirel, 1999**

Zakynthos (Kiliomeno)

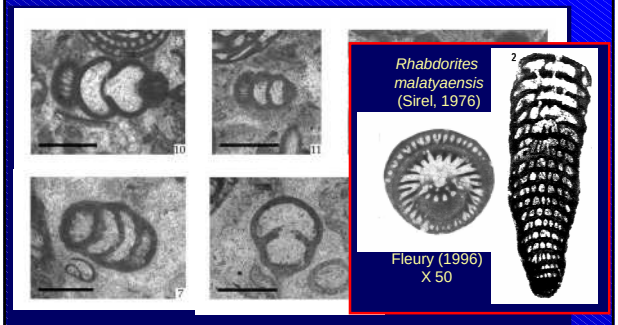
SBZ 3: *Periloculina slovenica*



Periloculina slovenica
Drobne, 1974

Zakynthos (Kiliomeno)

SBZ 3: ?*Rhabdorites*

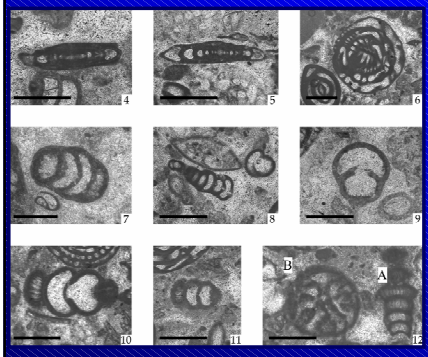


Rhabdorites malatyaensis (Sirel, 1976)

Fleury (1996)
X 50

Scale bar = 0.5 mm

SBZ3a: other Miliolina

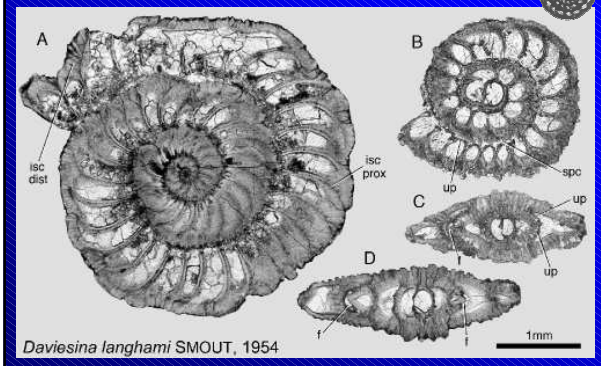


Elazigiella altineri Sirel, 1999 (4, 5)

Globoflarina sphaeroidea (Fleury, 1982) (6)

?Rhabdorites (7-12A)

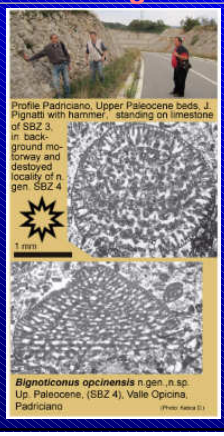
SBZ 4: Daviesina langhami



Daviesina langhami SMOUT, 1954

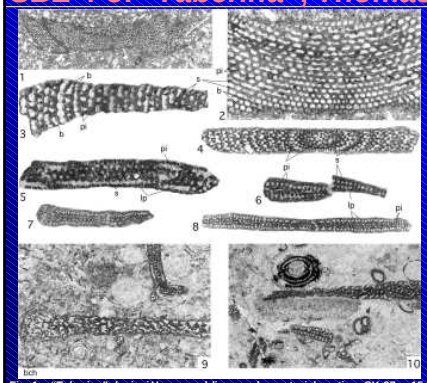
Hottinger (2009)

SBZ 4: Bignoticonus Drobne n. gen.



A new SBZ 4 genus and species of conical agglutinated foraminifers is being described by K. Drobne from near Trieste

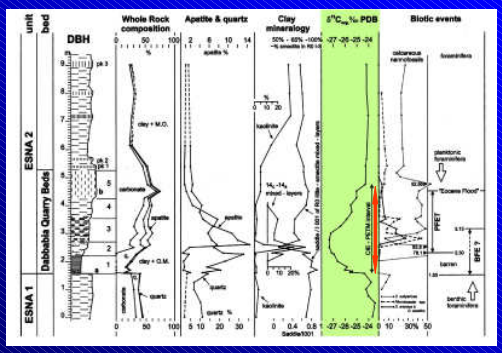
SBZ 4-5: "*Taberina*", *Thomasella*



Abbreviations indicating structural elements: b: beam (exoskeleton), bch: brood chamber, lp: lateral passage, pi: pillar (endoskeleton), s: septum.

Fig. 1 – *"Taberina" daviesi* Henson, oblique, subequatorial section. SK-27, x 15. SBZ 4. Fig. 2 – Detail of fig. 1, x 50. Note subepidermal, radial exoskeleton (beams) and endoskeleton with pillars following an oblique-overcrossing pattern with ramps similar to *Orbitolites*. (Figs. 5-8 illustrate *Thomasella* (=*Vania* Auctt.) *labyrinthica* (Grimsdale), SBZ 4-5). All from N Somalia (unpublished).

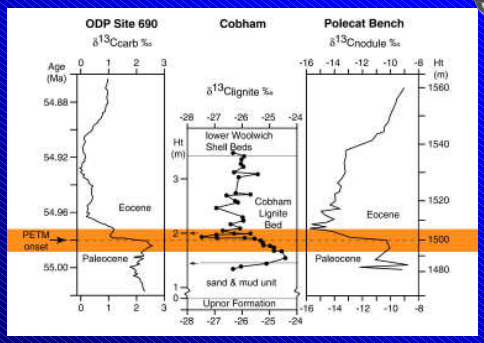
P/E boundary: Dabbabiya



PETM CIE

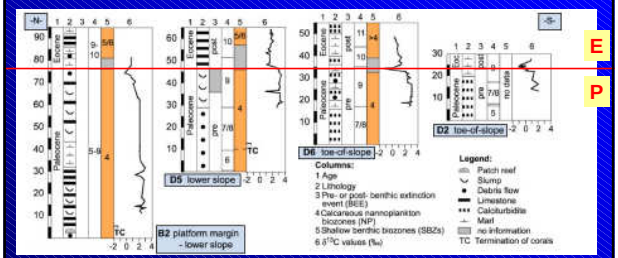
Dupuis et al. (2003: *Micropaleontology* 49(S1): 41-59)

PETM & CIE



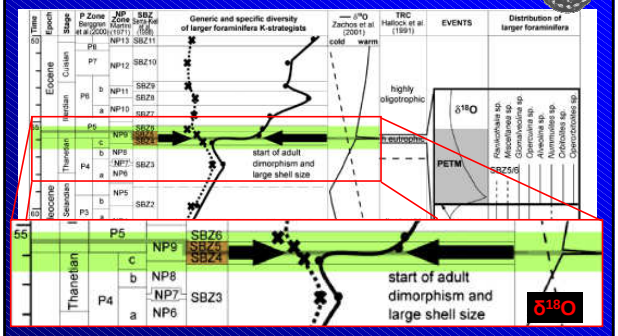
Collinson et al. (2003: *Spec. Pap. GSA* 369:333-349)

LFT: P/E boundary in Egypt (Galala)



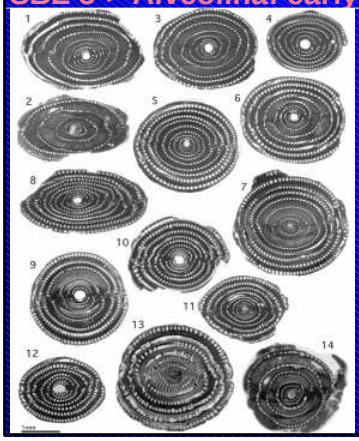
Scheibner et al. (2005: Geology 33: 493-496)

LFT: larger foraminifera turnover



Scheibner et al. (2005: Geology 33: 493-496)

SBZ 5-> Alveolina: early Ypresian



1-3: *Alveolina decipiens* Schwager, 1883
4: *A.* cf. *globula* Hottinger, 1960
5-7: *A. avellana* Hottinger, 1960

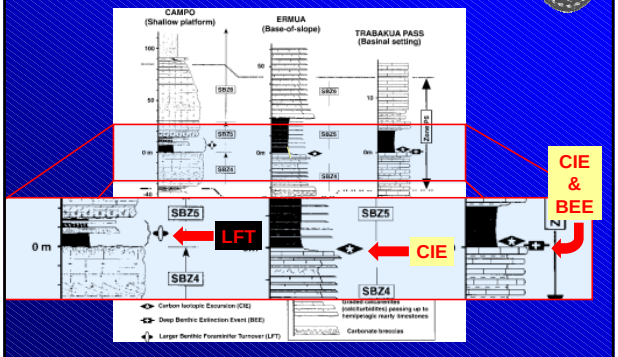
8: *A. moussoulensis* Hottinger, 1960
9: *A. pisiformis* Hottinger, 1960
10, 13: *A.* gr. *dolioliformis* Schwager, 1883
11, 12: *A. regularis* Hottinger, 1960
14: *A. globosa* Leymerie, 1846

SBZ 5-SBZ 6

SBZ 6-SBZ 7

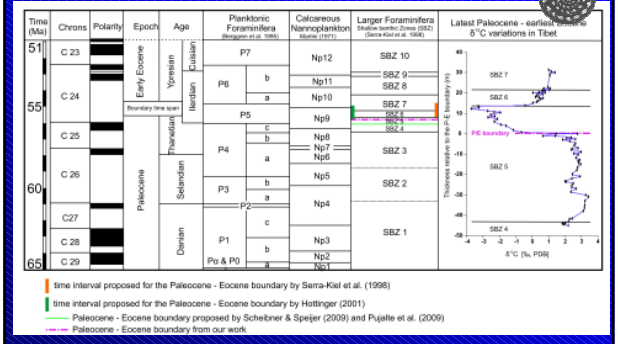
Northern Aquitaine, France
Sztrákos et al. (2011)

P/E boundary in Spain



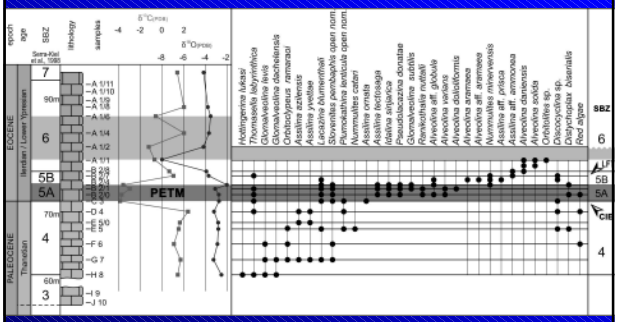
Orue-Etxebarria et al. (2001: Marine Micropal. 41: 45–71)

P/E boundary: Tibet



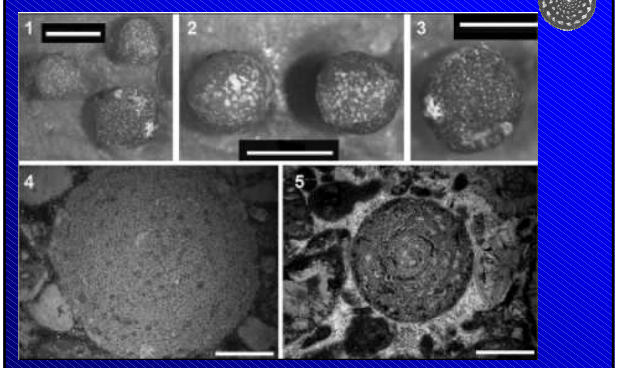
Zhang, Willems & Ding (2013; *International Journal of Earth Sciences*)

P/E boundary: Sopada – SBZ 5A/SBZ 5B



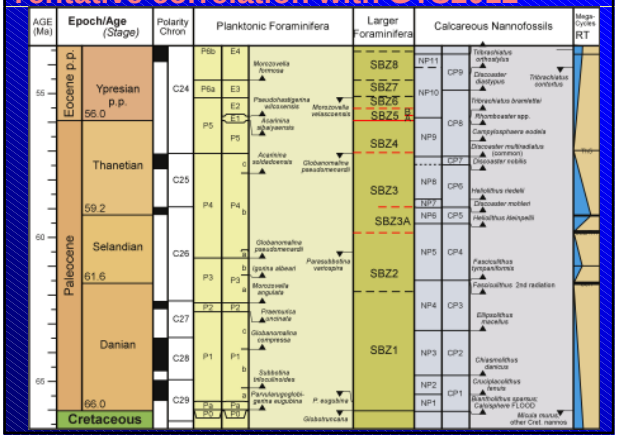
Drobne et al. (in press)

SBZ 5A: *Aberisphaera* spp.



1-4 *Aberisphera* n. sp. 1, Mt. Nanos, Slovenia; 5 *Aberisphera* n. sp. 2, Meghalaya, NE Himalaya. Scale bars = 1 mm. Drobne et al. (2012)

Tentative correlation with GTS2012



Cause

PETM/CIE

- Dissociazione di metano idrato causata da aumento di temperatura (Thomas *et al*., 2002) o da abbassamento del livello del mare (Schmitz, 2003)
- Vulcanismo – azione diretta (Dickens, 1997)
- Vulcanismo – intrusione di magmi in depositi ricchi di materia organica (Svensen *et al*., 2004)
- Cometa (Kent *et al*., 2003)
- Incendio di giacimenti di carbone (Kurtz, 2003)

LFT

Eutrofizzazione delle acque (scomparsa delle forme a più marcata strategia K)

+

Scomparsa dei coralli (successiva occupazione delle nicchie vacanti da parte dei macroforaminiferi)

↓

Ipotesi limitata alle Montagne di Galala (Egitto) Scheibner *et al*. (2005)

P/E: problemi e ipotesi

Problemi

Cosa cambia al limite P/E per gli ecosistemi di acque sottili?

a) drastica contrazione degli ecosistemi ad agglutinanti conici

Ipotesi

1) Comparsa o diffusione delle praterie a fanerogame marine (→ esplosione degli orbitolitidi; più elevati tassi di aggradazione e stabilizzazione dei substrati?)

+

2) Enorme aumento della produttività degli alveolinidi → barre pseudoolitiche, instabilizzazione dei substrati

↓

a) + b) forte limitazione delle nicchie non-epifite ed epifite

P/E: problemi e ipotesi

Problemi	Ipotesi
Cosa cambia al limite P/E per gli ecosistemi di acque sottili?	4) Forte incremento di diversità tassonomica in pochi generi (*Alveolina*, *Nummulites*, *Assilina*)
b) radiazione evolutiva di nummulitidi e alveolinidi (→ key novelties)	5) Enorme aumento della produttività di carbonati dovuta a pochi generi di macroforaminiferi
c) distinzione tra SBZ5A e SBZ5B	MA: diversità specifica globale Incrementa e poi ± costante per >5 M.a.

Problemi aperti

Problemi	Risposte
Il limite P/E non coincide con il passaggio SBZ4/SBZ5 ma con SBZ5A/SBZ5B? Quali taxa sono più utili a individuarlo esattamente?	?
Cosa accade a paleolatitudini diverse?	? (ma alcune ipotesi)
Perché drastica riduzione delle scogliere "profonde", probabilmente fin dal Thanetiano superiore?	? (ma alcune ipotesi)
Eutrofizzazione al limite P/E?	improbabile