



**A CAMBRIAN EVOLUTIONARY
“EXPLOSION”?**

1

**10 MY EVOLUTIONARY STASIS OF EARLIEST CAMBRIAN
(TERRENEUVIAN) MOLLUSK-RICH COMMUNITIES**

AND CAMBRIAN EVOLUTIONARY RADIATION CORRELATIONS

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Diversity of Phanerozoic metazoan taxa (and communities)



Cambrian
←
Ediacaran

—
short
CER?

THREE STAGES OF LONG CER



← trilobites, other arthros diversify

← first archaeocyaths (tropical),
“worm” mounds in Avalonia

← diversification biomineralized taxa,
particularly molluscs

← deep burrowers diversify
BASE OF CAMBRIAN

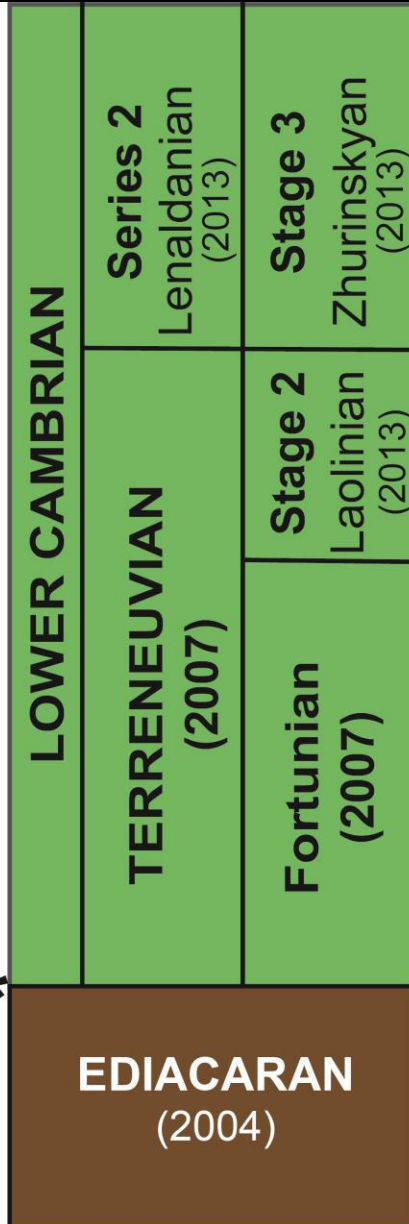
← extinction “Ediacarans”

← deep burrows & biomineralized
metazoans








petalonae, problematica, Cloudina, Namacalathus

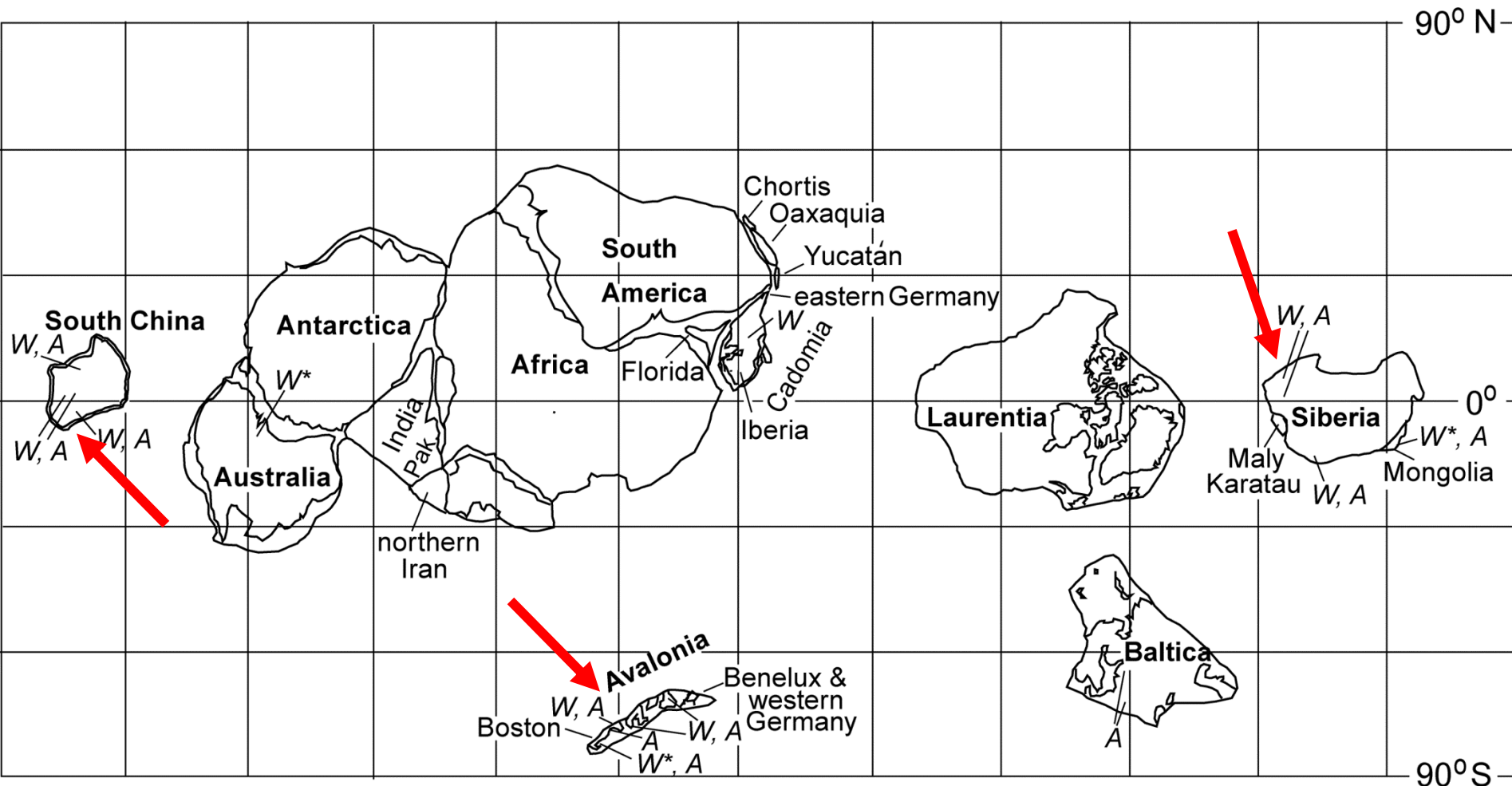
EDIACARAN-CAMBRIAN BOUNDARY INTERVAL BIOTIC AND GEOCHEMICAL HISTORY

Fortune
Head *
GSSP



CAMBRIAN EVOLUTIONARY RADIATION

- 

 IV carbon isotope excursion
oldest trilobites, ca. 520 Ma
- 
 base Tommotian/oldest archaeocyaths and lingulates
ca. 525 Ma (Landing & Kouchinsky, submitted)
- 

 I', L4, F carbon isotope excursions
diverse mollusks, incl. *Watsonella cylindrica* and *Aldanella*
(middle Meishucunian, Heraltia Lst., middle Chapel island F., upper Bayan Gol', upper Manykaian, ca. 530 Ma (Landing & Kouchinsky, submitted))
- 

 ca. 542 Ma
last Ediacaran „Petalonamae“ and Problematica
initial diversification of biomineralized taxa,
appearance of deeper, more complex burrows



Watsonella crosbyi (W) and *Aldanella attleborensis* (A) in Fortunian-Stage 2 ("Laolinian") boundary interval,
 W* = *W. crosbyi* from upper part of range (Series 2)

Terminal Ediacaran through Lower Cambrian paleogeography (no polar continents!)

Siberian Platform

South China Platform

Toyonian

TRILOBITE-BEARING

Botoman

Atdabanian

Tommotian Stage

Nemakit-Daldynian Stage

3 trilobite-bearing stages

China C

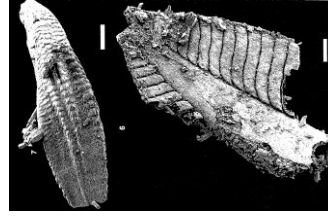
Meishucunian Stage "sub-trilobitic"

sparsely fossiliferous interval

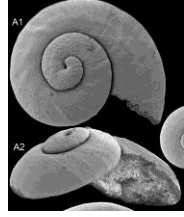
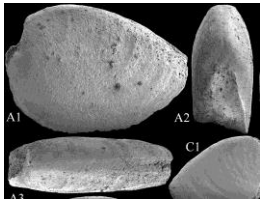
China B

China B

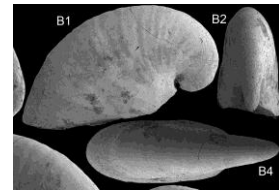
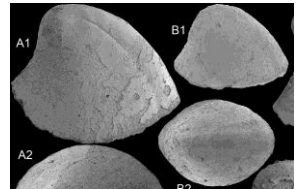
China A



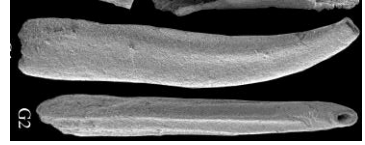
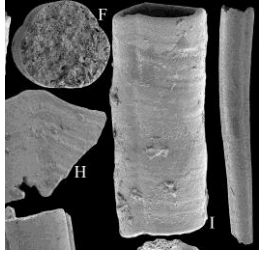
Sinosachites



Watsonella, Aldanella



Purella, Anabarella



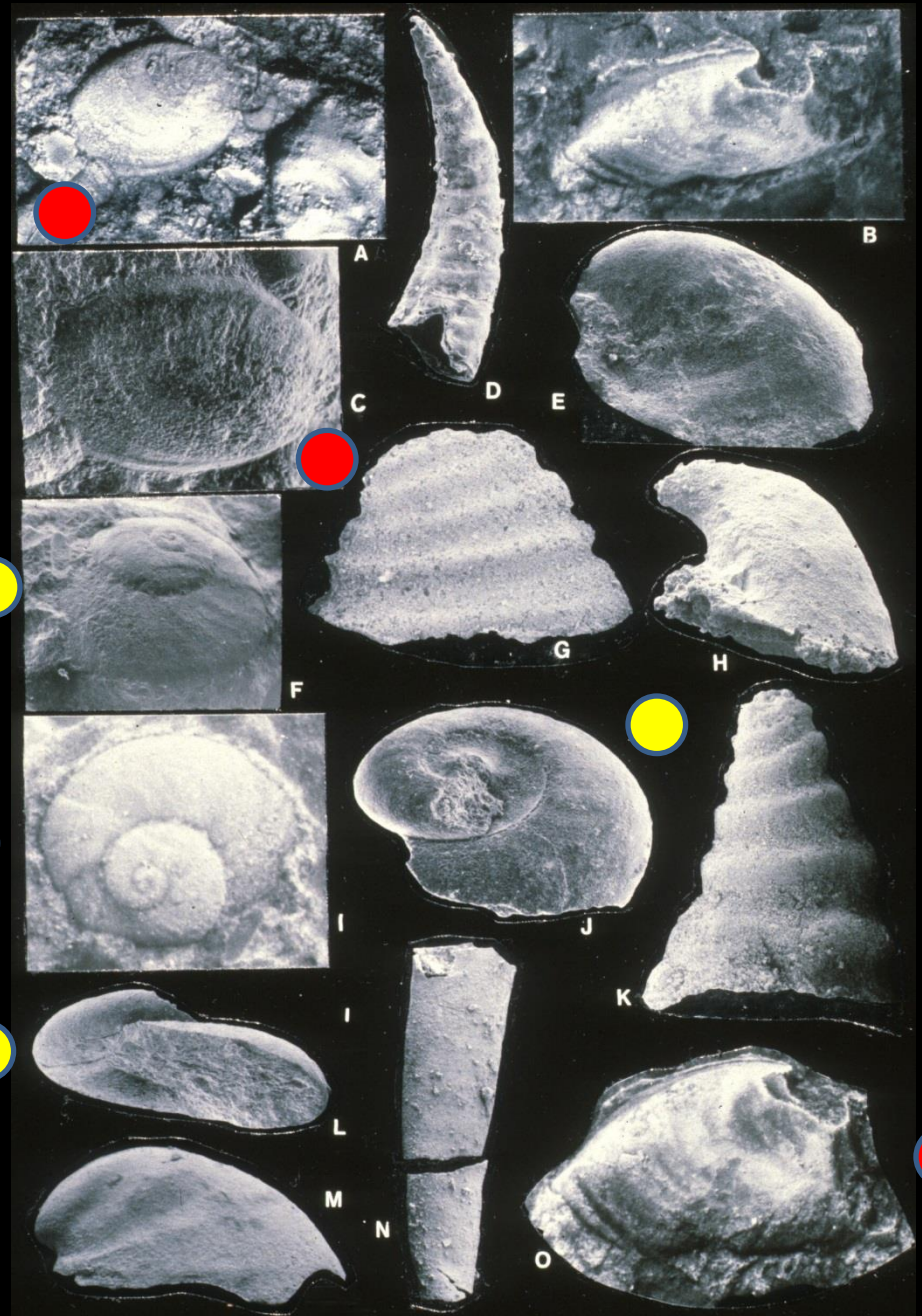
Anabarites, Protohertzina

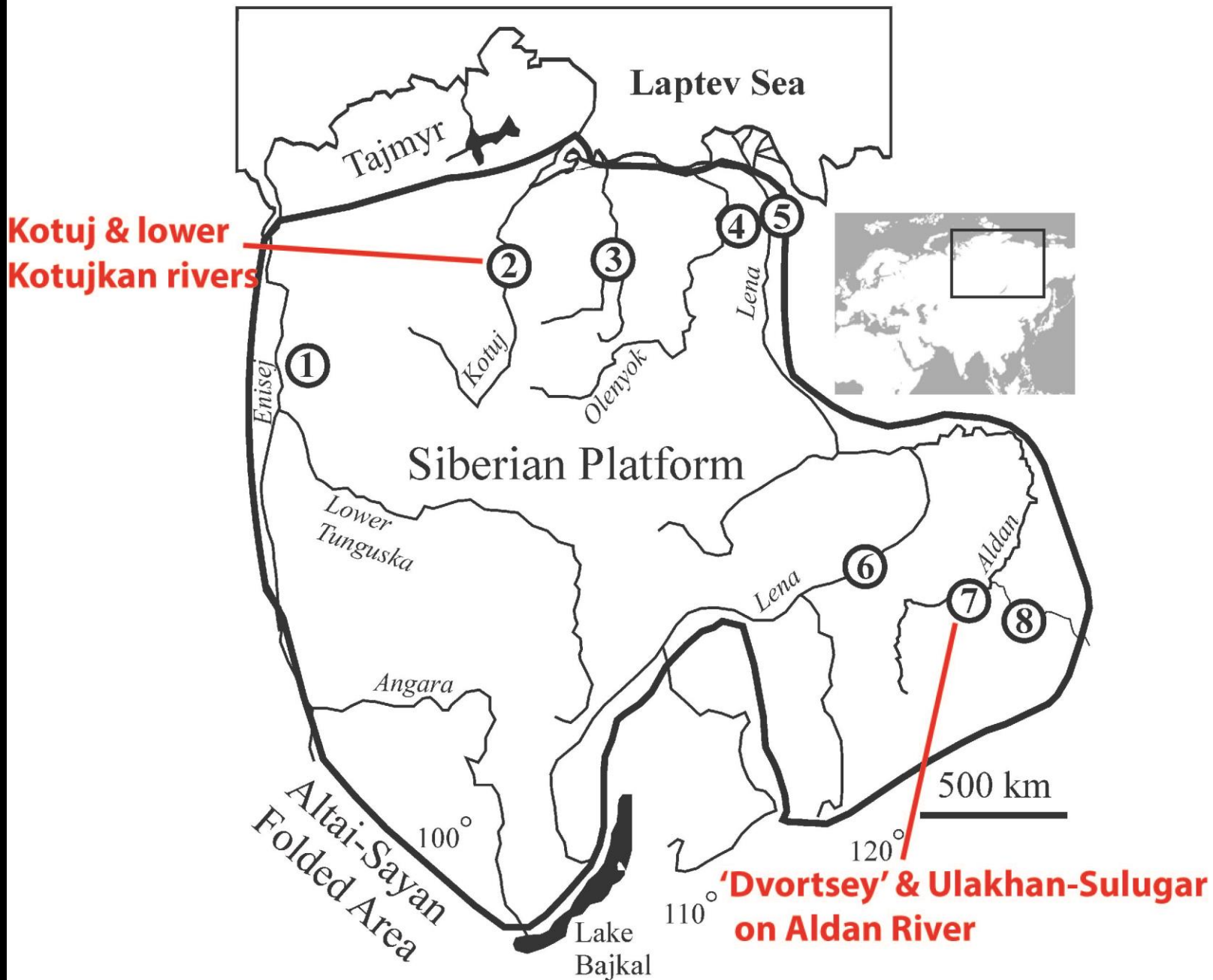
STAGE 2 CER

"TRADITIONALIST" LOWER CAMBRIAN CORRELATION!

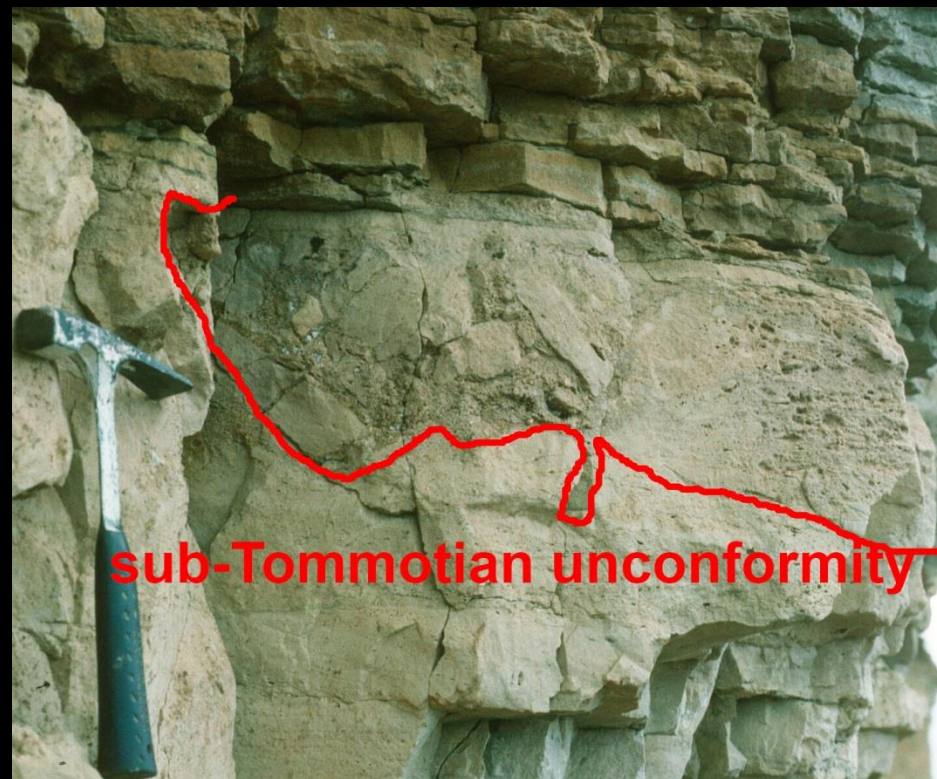
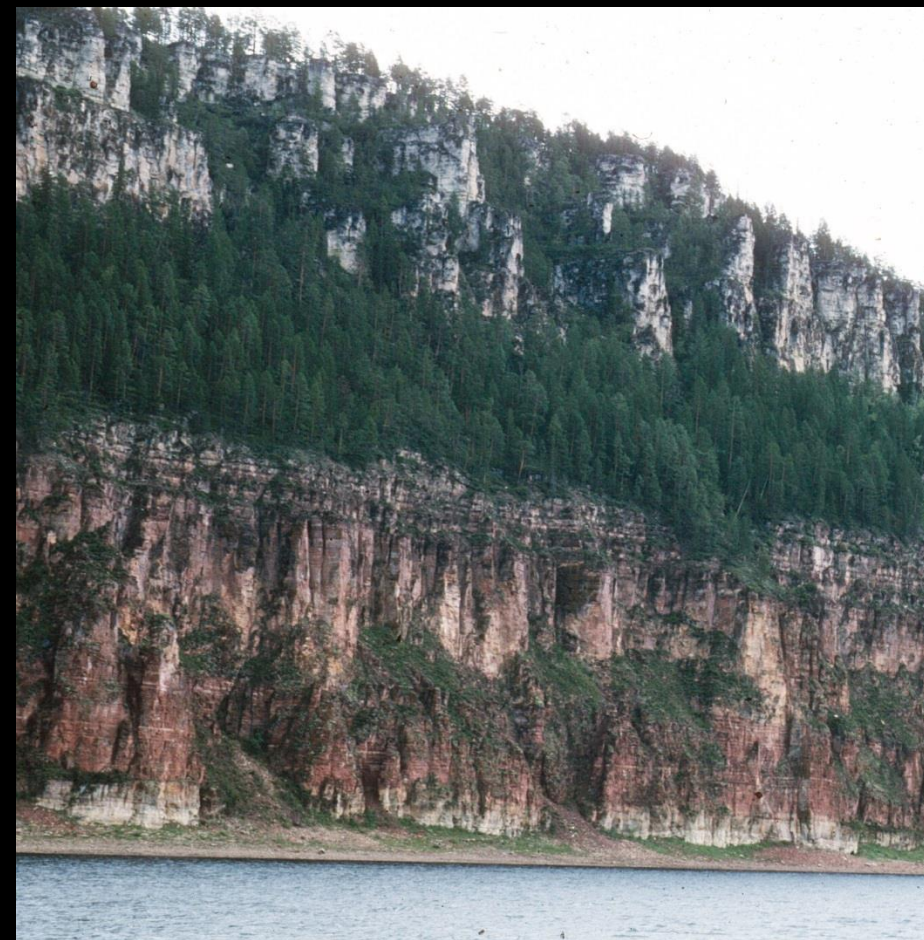
*Watsonella
crosbyi*

*Aldanella
attleborensis*





Siberian Platform



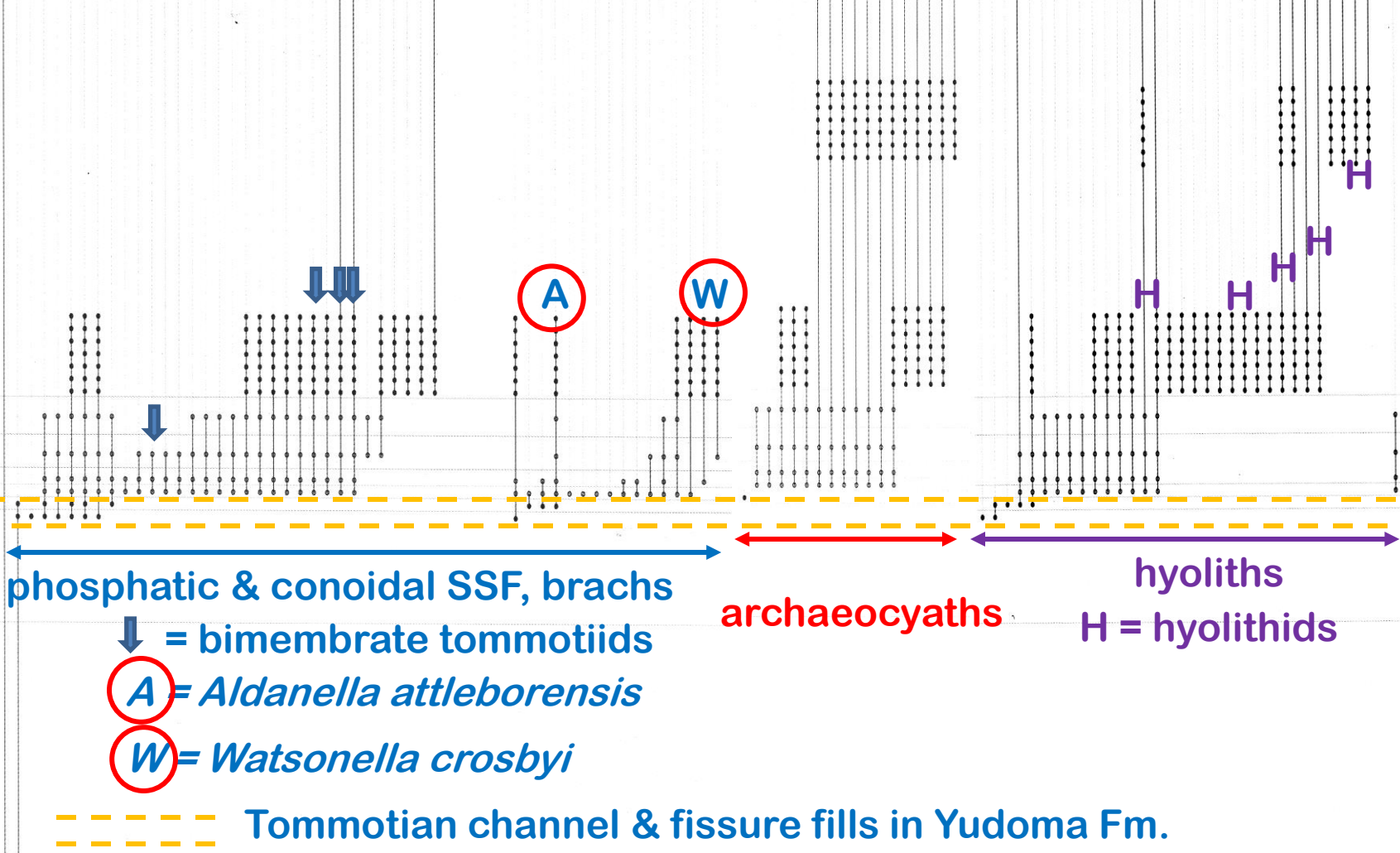
sub-Tommotian unconformity

**Ulukhan-Sulugar,
sub-Tommotian unconformity**

Yudoma

Nemakit-Daldynian

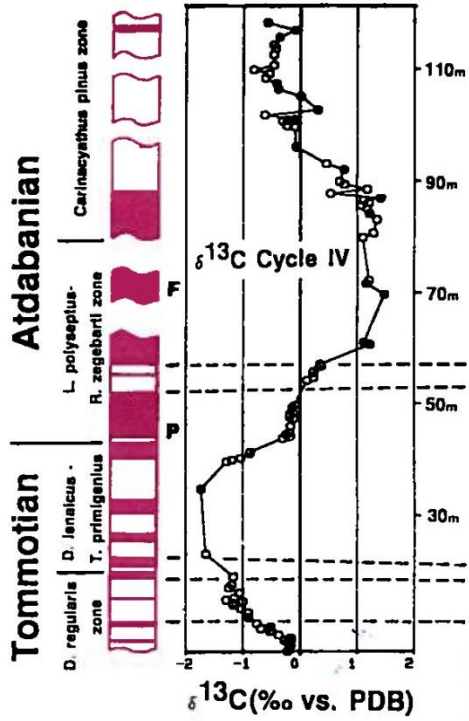
lower Tommotian



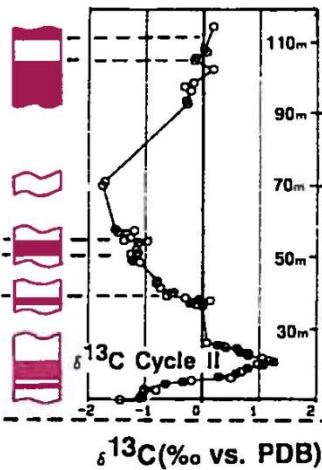
“Tommotian concepts” & problem on the SE Siberian Platform

Carbon isotope stratigraphy, SE Siberian Platform

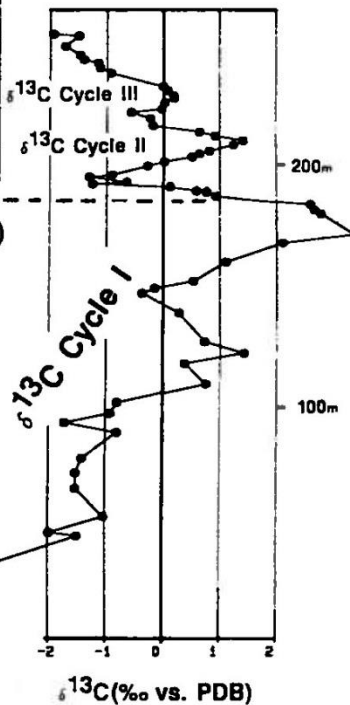
Zhurinsky Mys Section, Lena River, Siberia



Isit Section, Lena River, Siberia



Dvortsy Section, Aldan River, Siberia



Precambrian
Vendian

○ ○ ○ Calcite
● ● ● Dolomite

Geomagnetic Polarity Interpretation

Normal
Reversed

peak IV

peak III

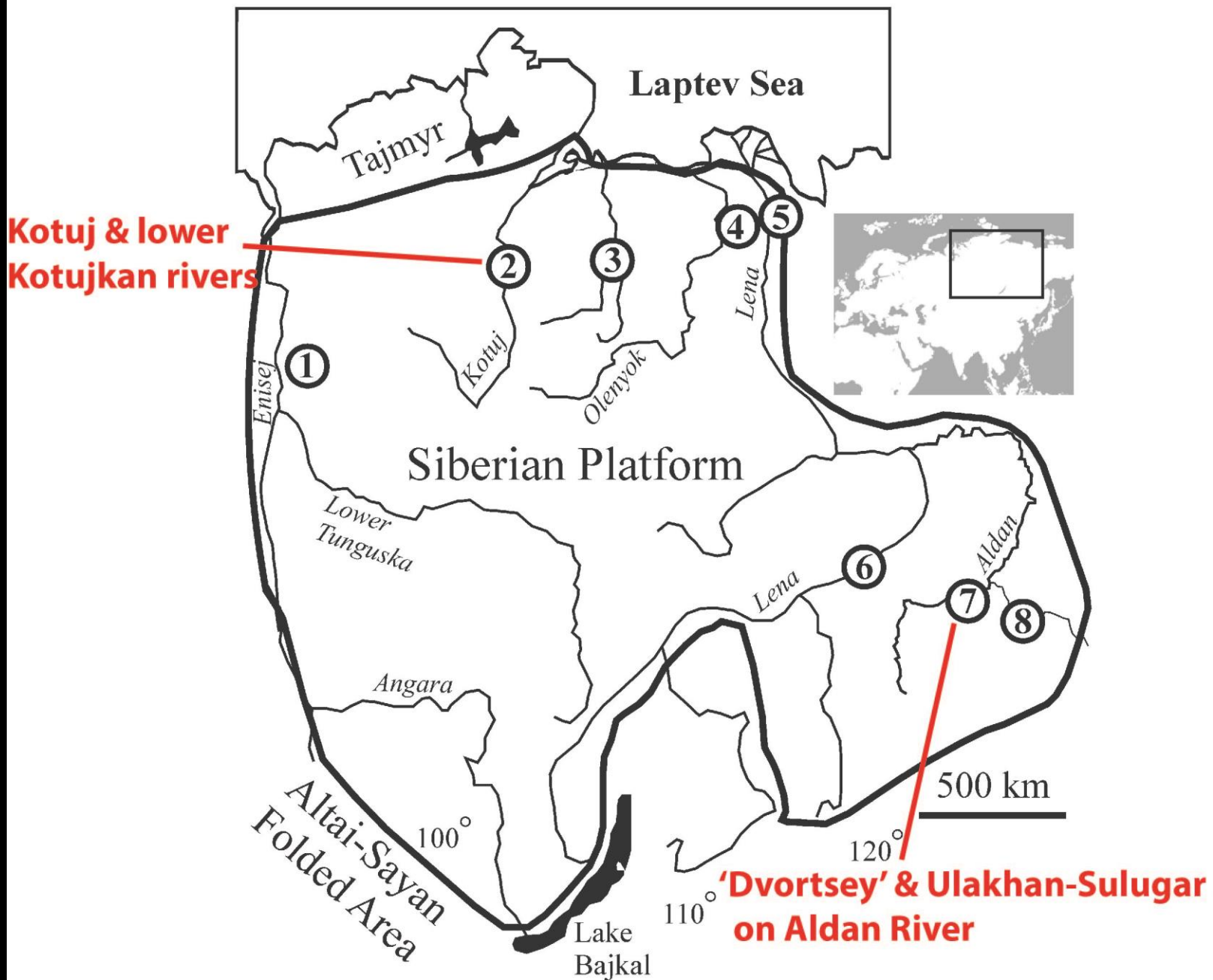
peak II

basal Tommotian excursion

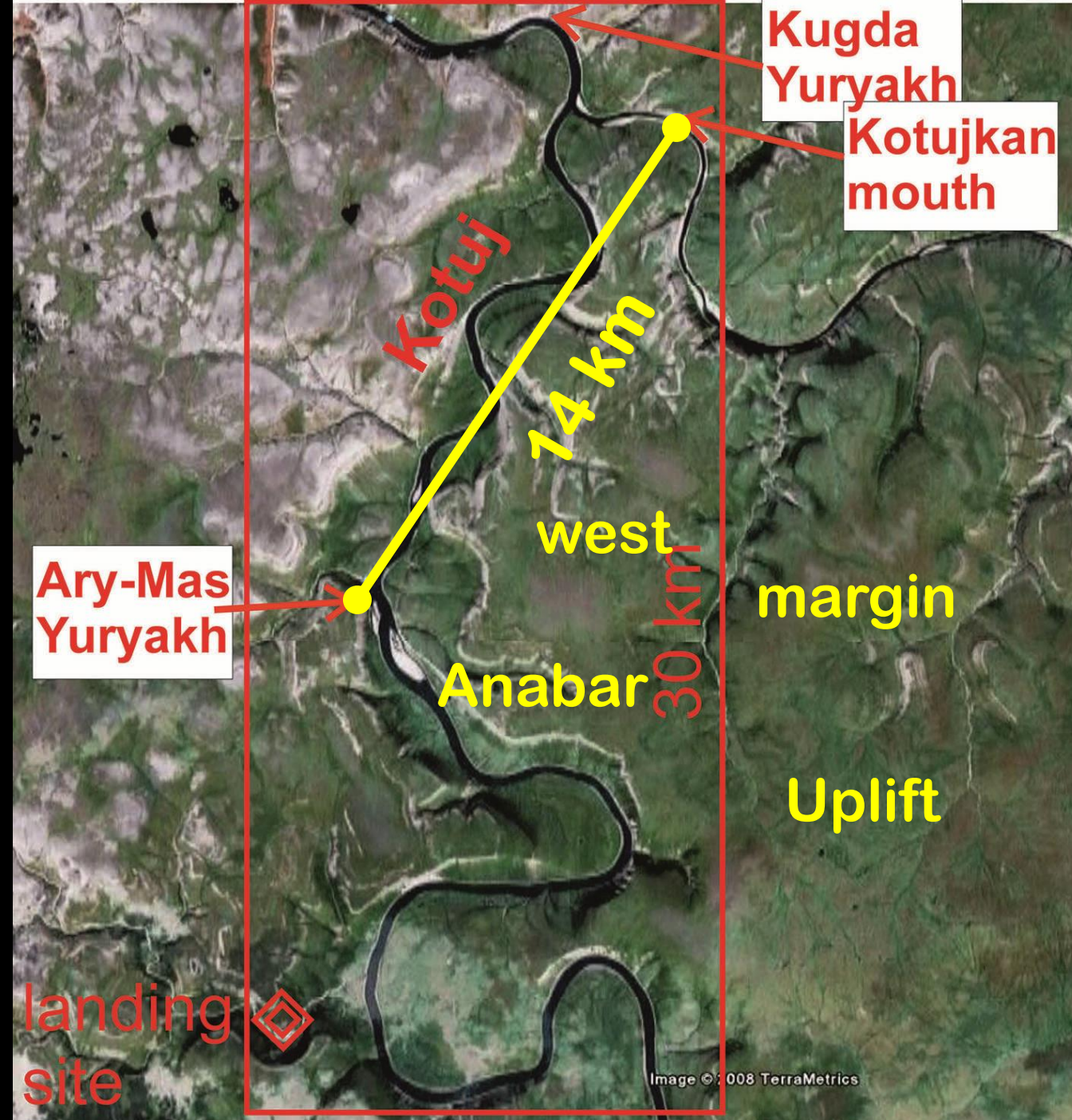
peak I

peak Z

N excursion



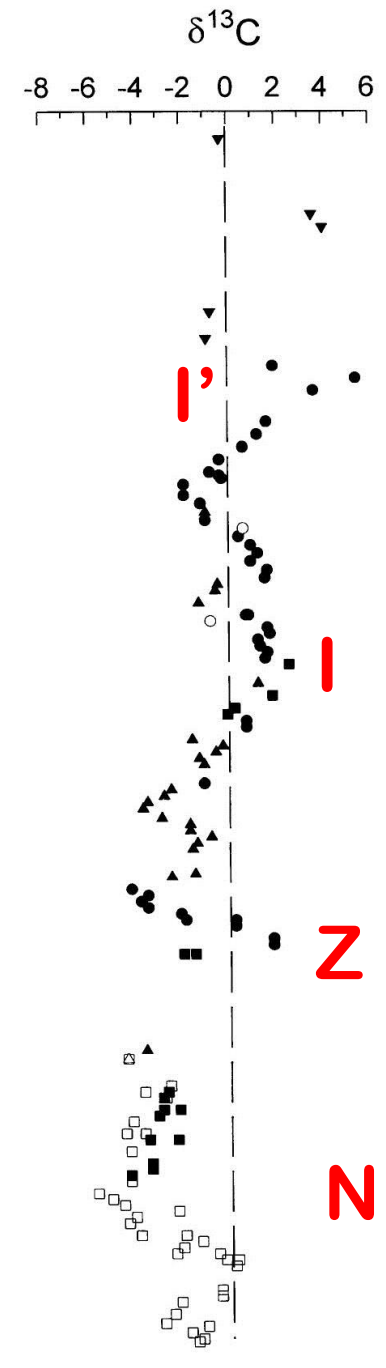
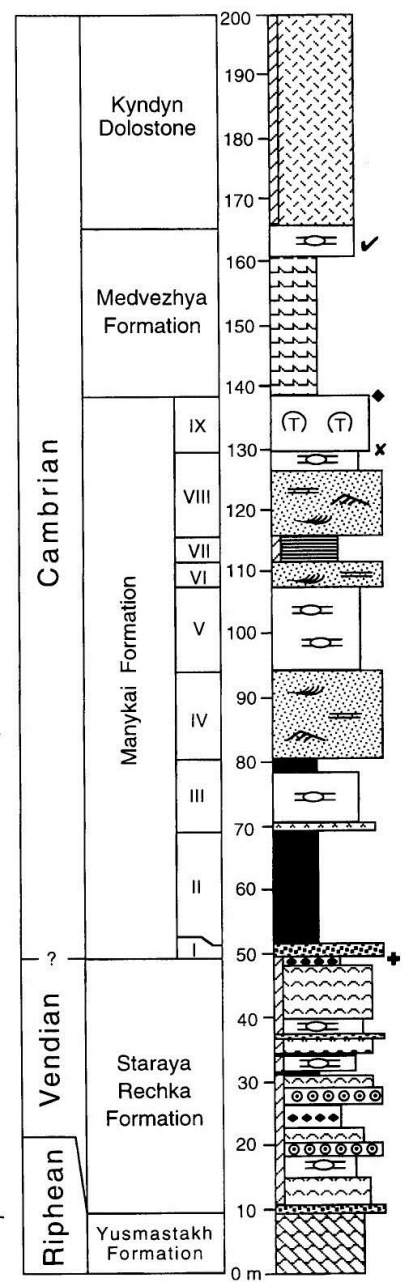
Siberian Platform

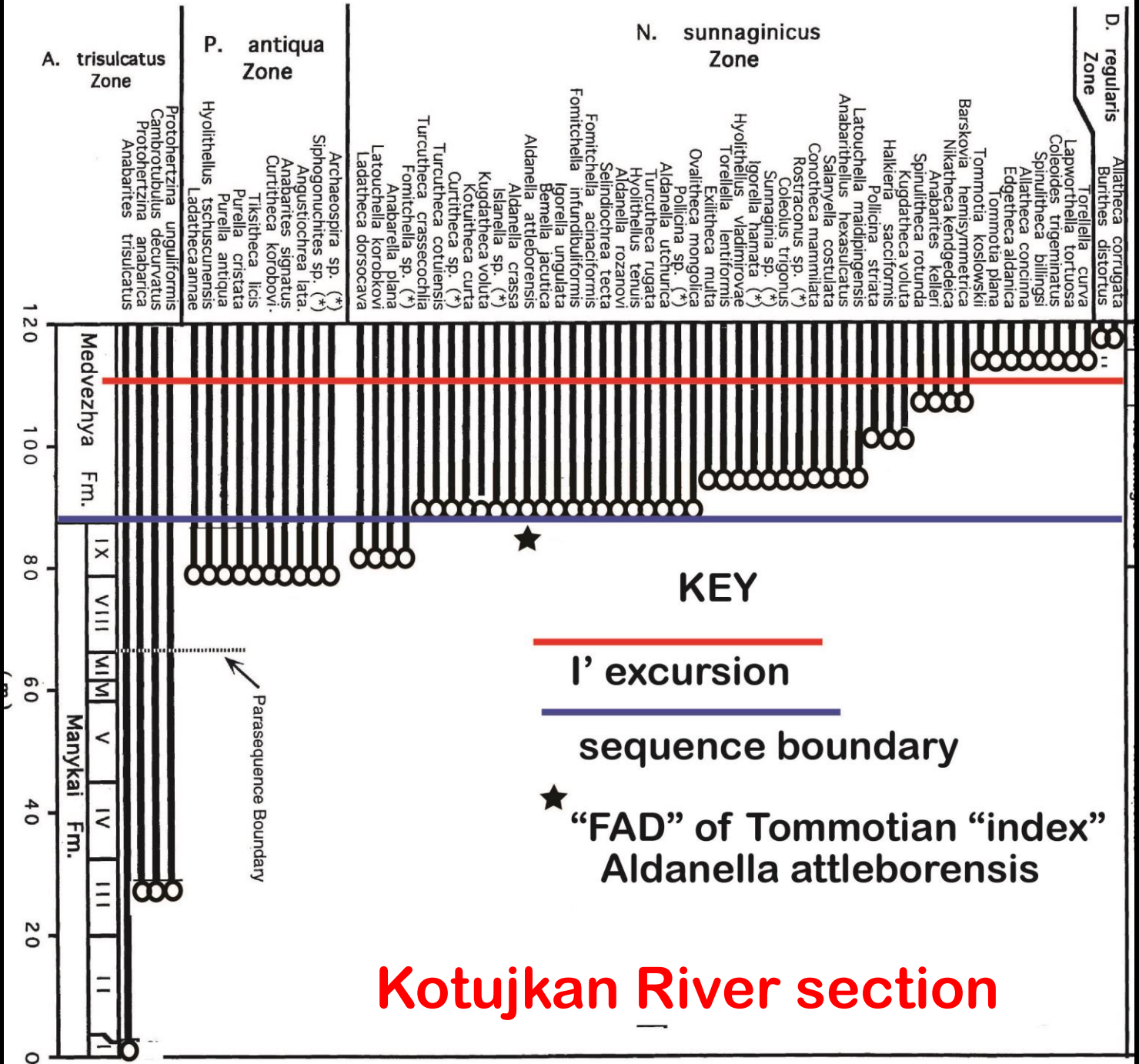


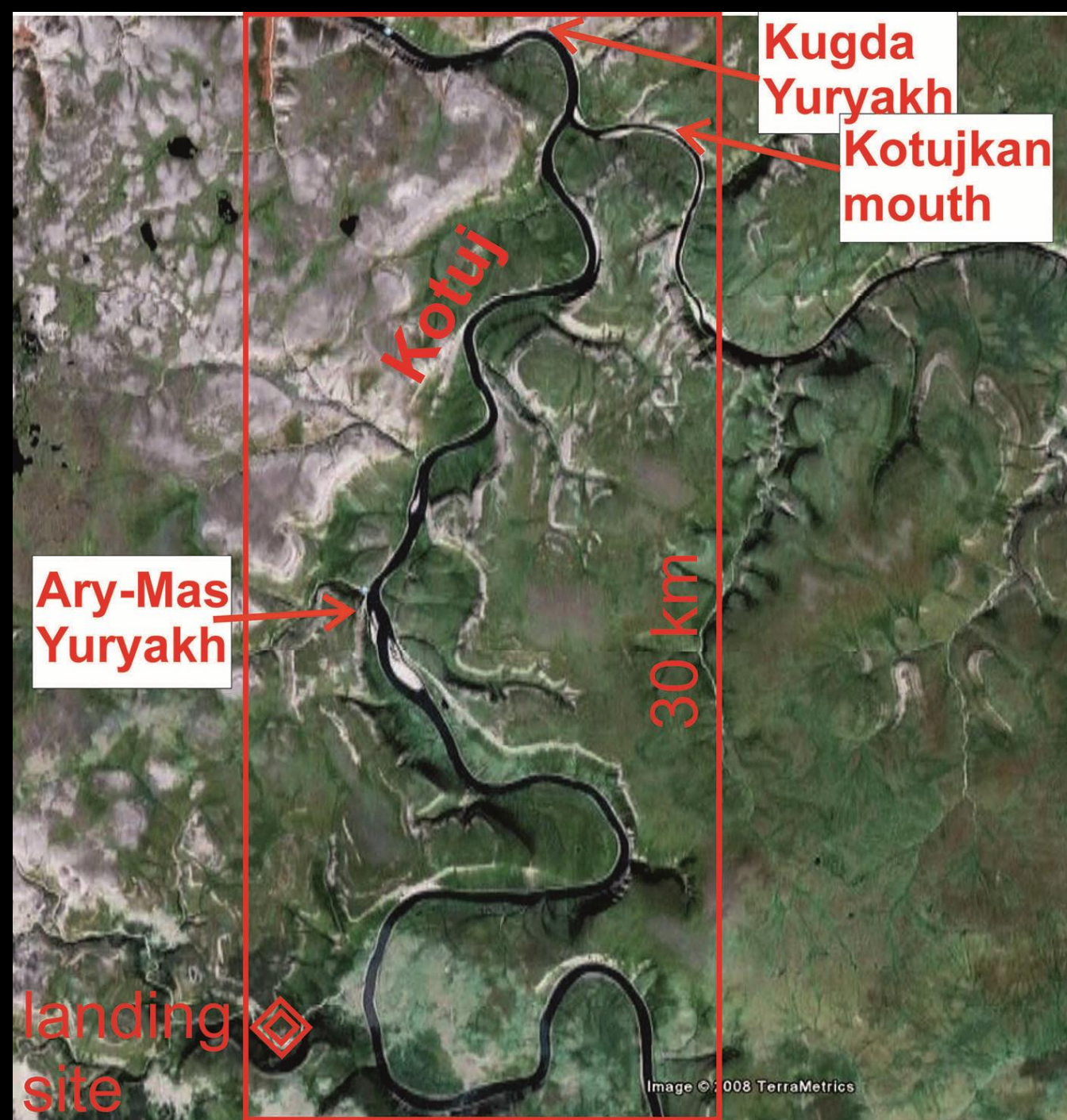
Koril Mbr.
(top Manykay Fm) **lower Medvezhya Fm**

lower Manykay Fm.
top Staraya Rechka Fm

Kotujkan River mouth
section (Knoll et al.,
1995)







Kugda
Yuryakh

Kotujkan
mouth

Ary-Mas
Yuryakh

Kotuj

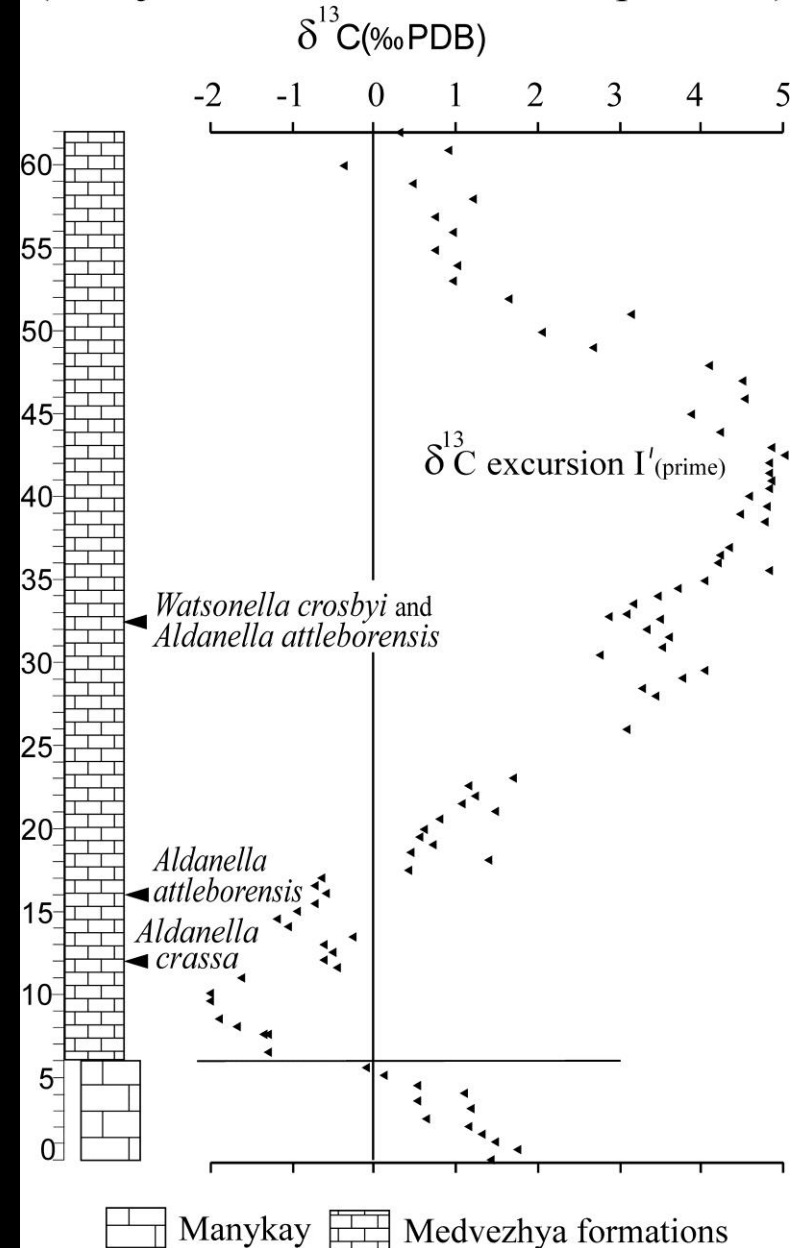
30 km

landing
site

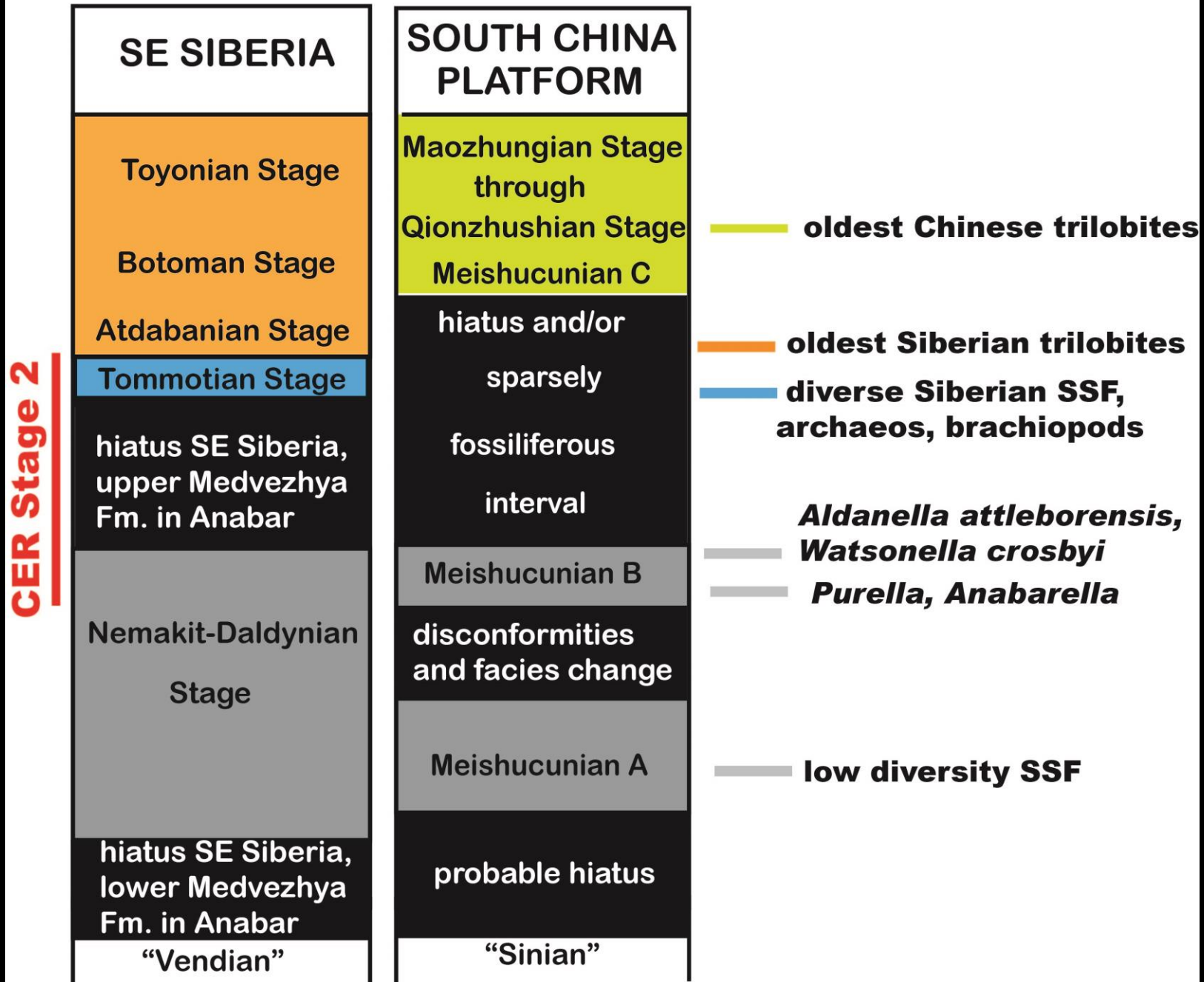
base Medvezhya
Fm.
top Manykay Fm.

Ary-Mas-Yuryakh section 1

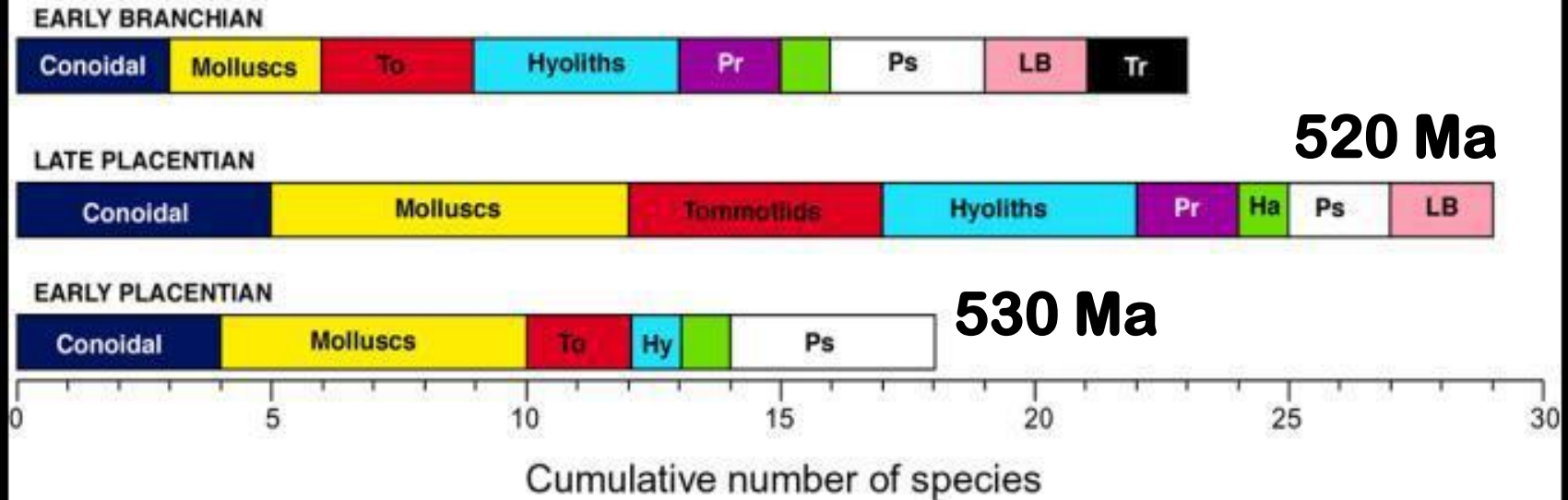
Ary-Mas-Yuryakh section
(Kotuj River, northern Siberian platform)



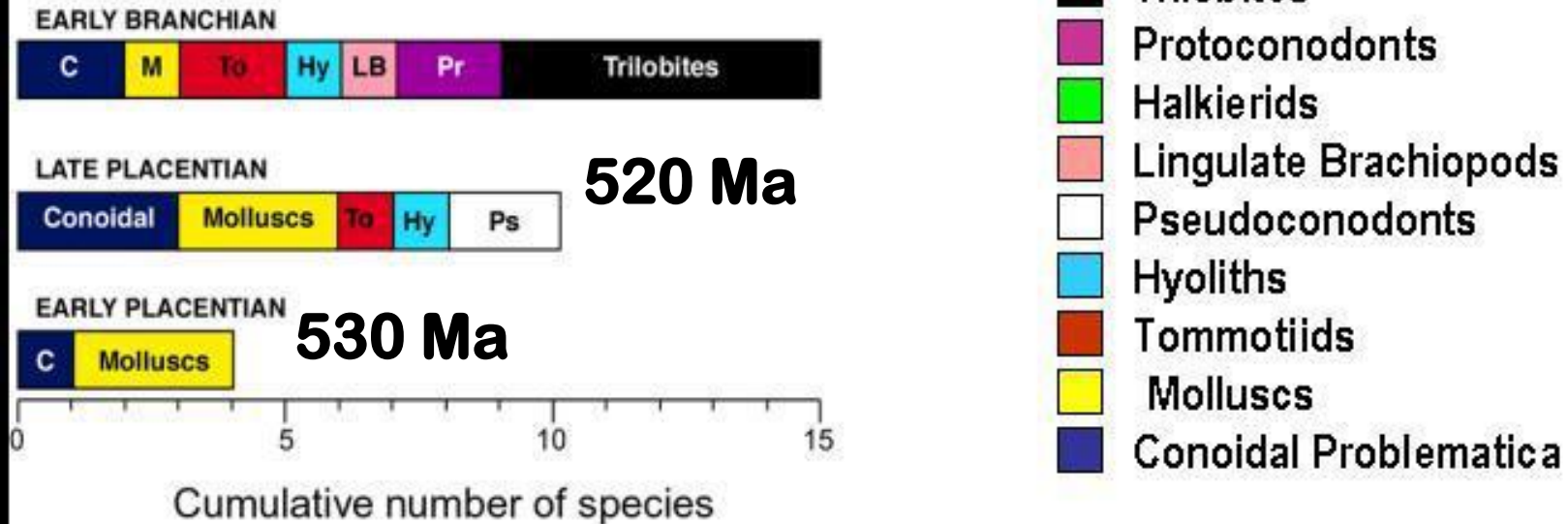
Stratigraphic Continuity & Correlation



SPECIES COMPOSITIONS, ONSHORE FACIES



SPECIES COMPOSITIONS, OFFSHORE FACIES



CER Stage 2 benthic community Composition in Avalonia

This presentation summarized in:

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E. Landing, G. Geyer, M.D. Brasier & S.A. Bowring, 2013.
Cambrian Evolutionary Radiation: context, correlation. and chronostratigraphy—overcoming deficiencies of the first appearance datum (FAD) concept.
Earth-Science Reviews 123, 133–172.

AND

E. Landing & A. Kouchinsky. Submitted.
Biostratigraphy of the Cambrian Evolutionary Radiation: geochronology and evolutionary stasis of Early Cambrian (Terreneuvian) mollusk-rich communities.