中新世の深海成堆積岩に記録された複数の津波イベント

Tsunami events recorded in deep-sea depositional sequences in the Miocene Morozaki Group

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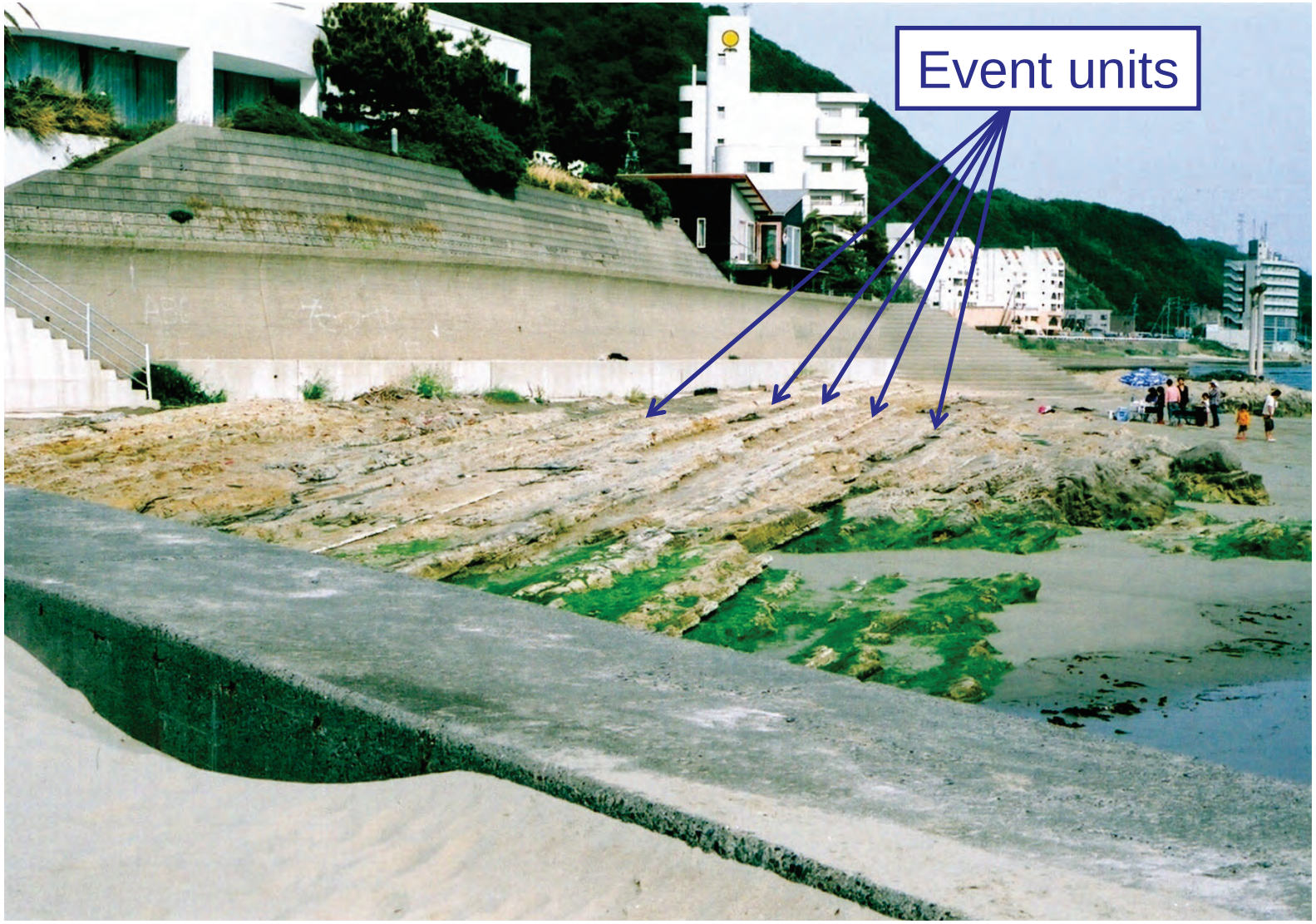
東北大学工学部

Tsunami-origin event units in deep-sea deposits



Outline

1. Introduction

2. Regional geology and tectonics

3. Tsunami-origin event units

4. Occurrence of the event units in the depositional sequence

5. Summary

1 Introduction

Background

Inland tsunami deposits record long-term recurrences of tsunamis.

Offshore tsunami deposits also record repeated tsunami events?

1 Introduction

Purpose of this study

Identification of tsunami-origin event units in offshore (deep-sea) deposits

Examination of occurrence of the event units in the depositional sequence

2 Regional geology and tectonics

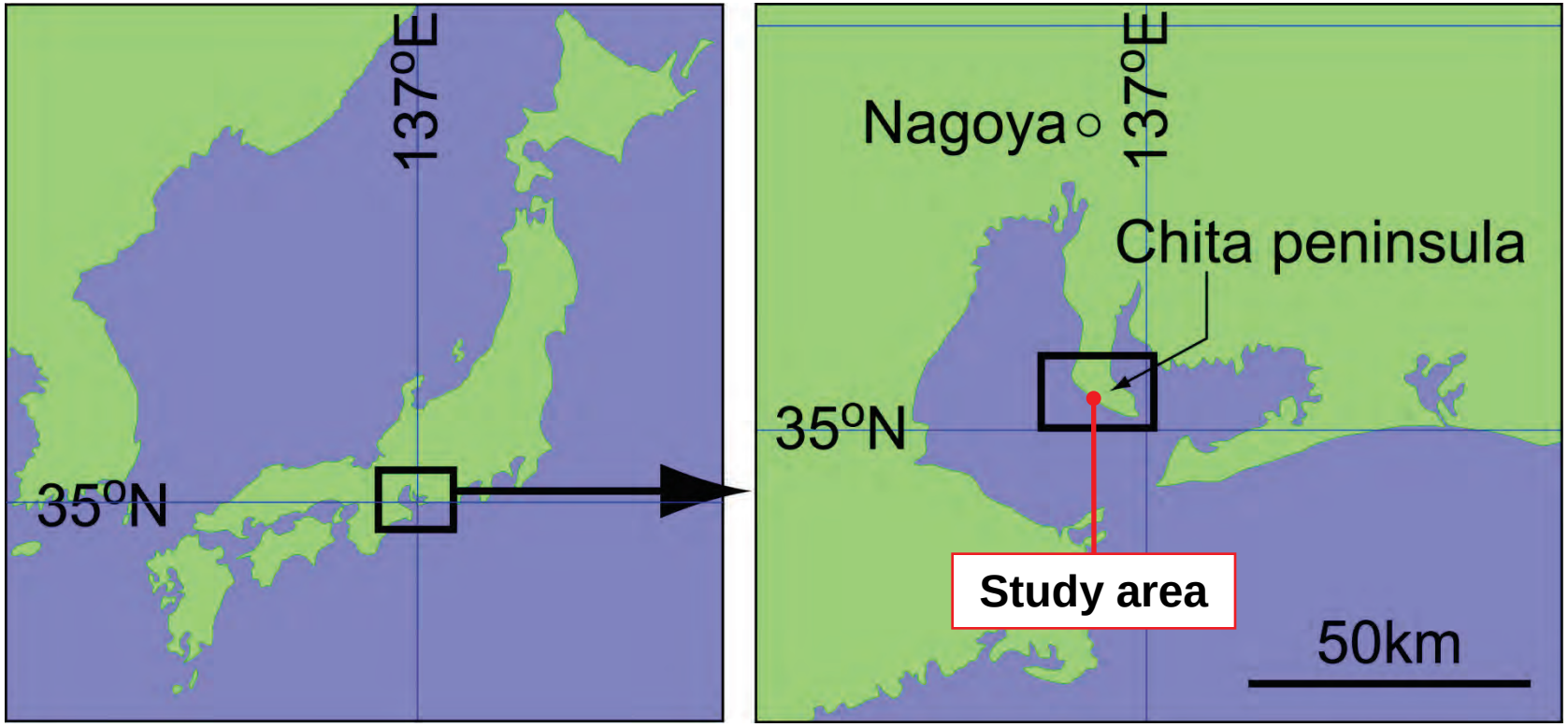
Locality: Aichi Pref., central Japan

Age: Early Miocene (ca. 17Ma)

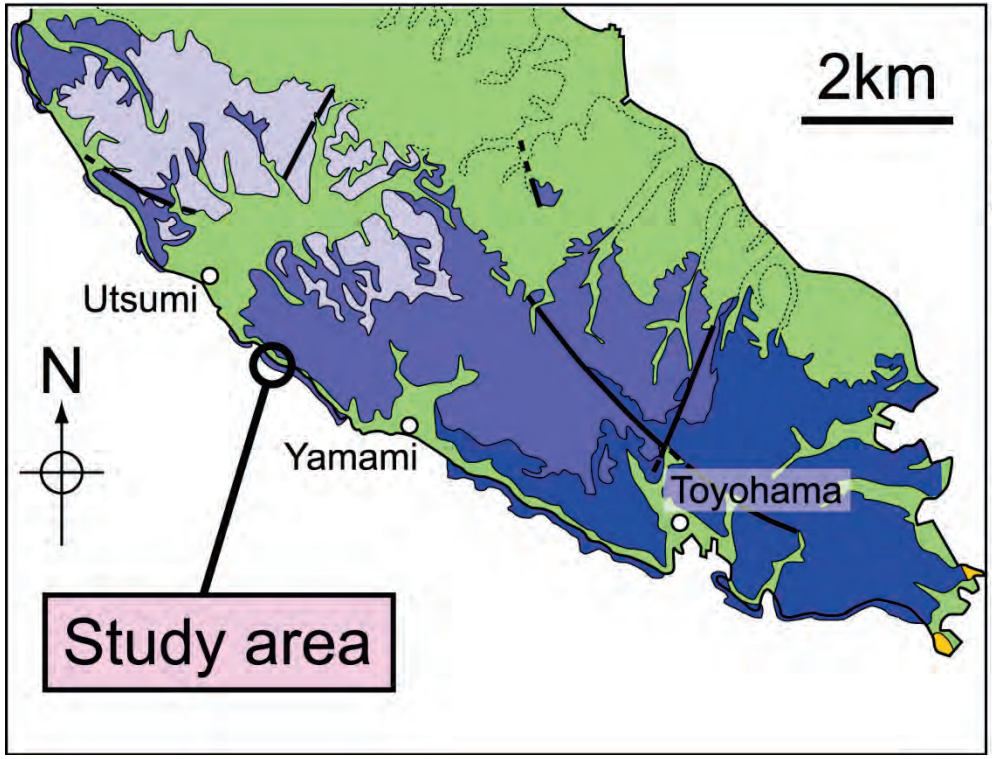
Environments: Upper bathyal (ca. 200-400m)

Regional tectonics: Forearc basin faced on subduction zone

Locality of the study area

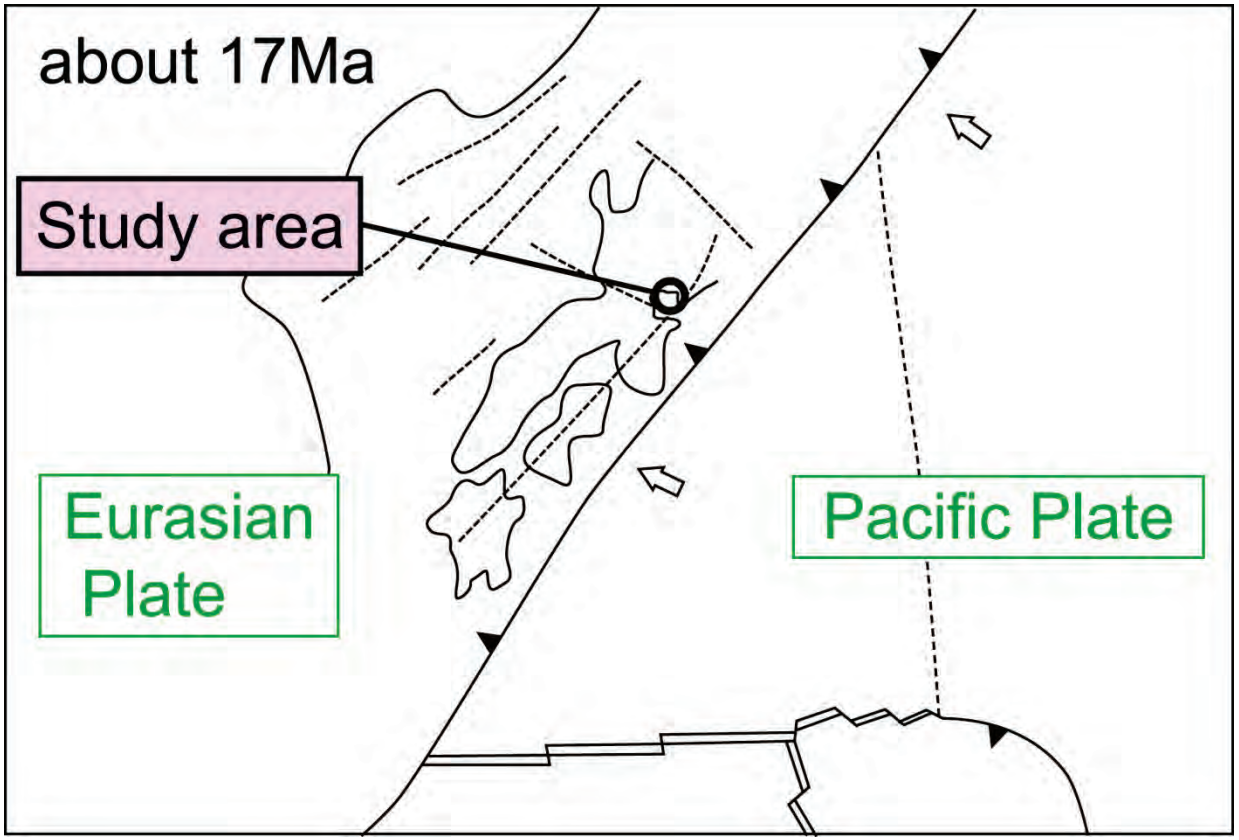


Regional geology



Age	Environ-ment	Stratigraphy		
Quat.			Quatanary deposits	
16Ma	Deep sea		Utsumi Fm.	Morozaki Group
		Study area	Yamami Fm.	
			Toyohama Fm.	
18Ma	Shallow sea		Himaga Fm.	

Regional tectonics



3 Tsunami-origin event units

Geological overview of the study area

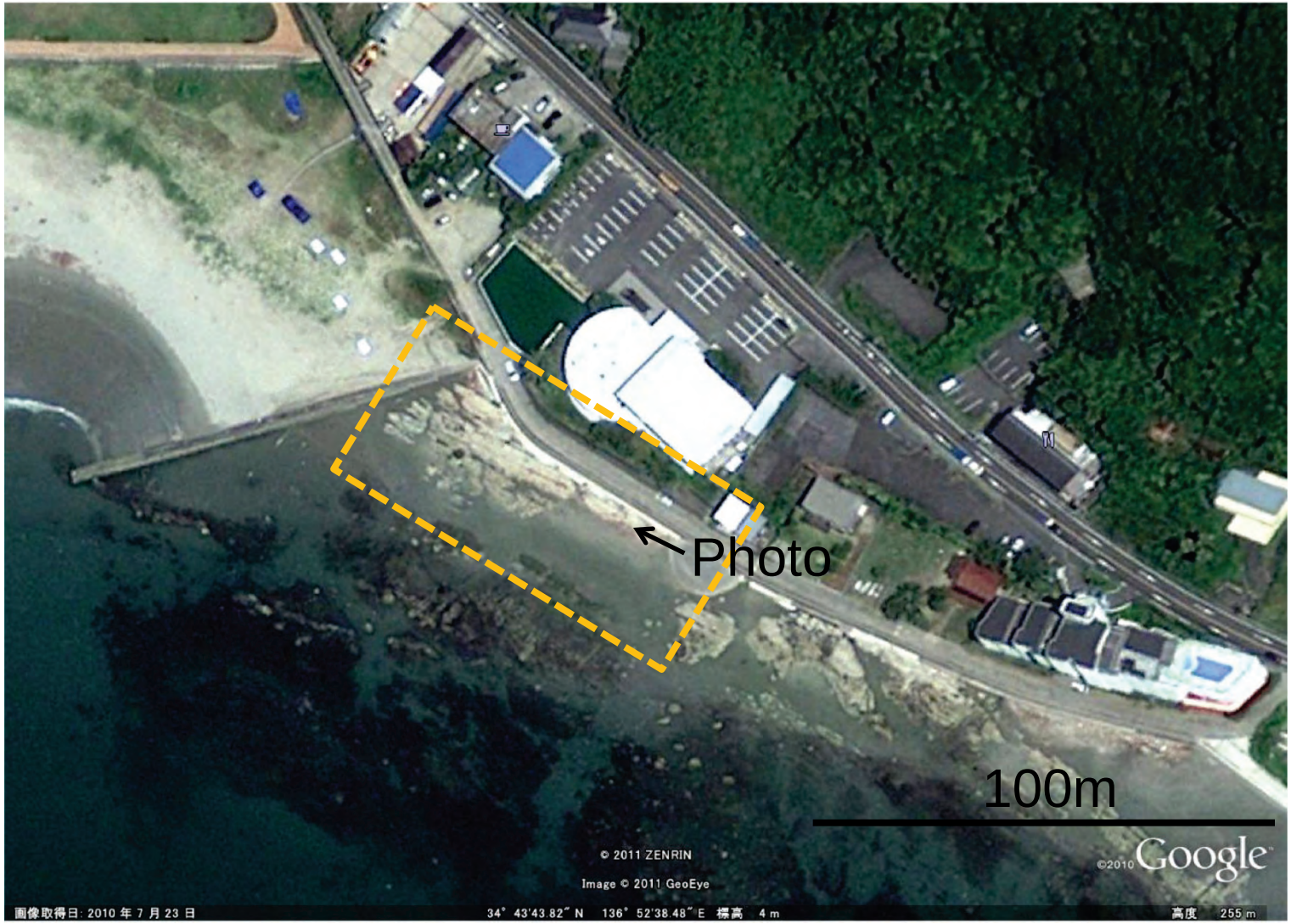
Example 1 (Unit 15)

Example 2 (Unit 11)

Example 3 (Unit 20)

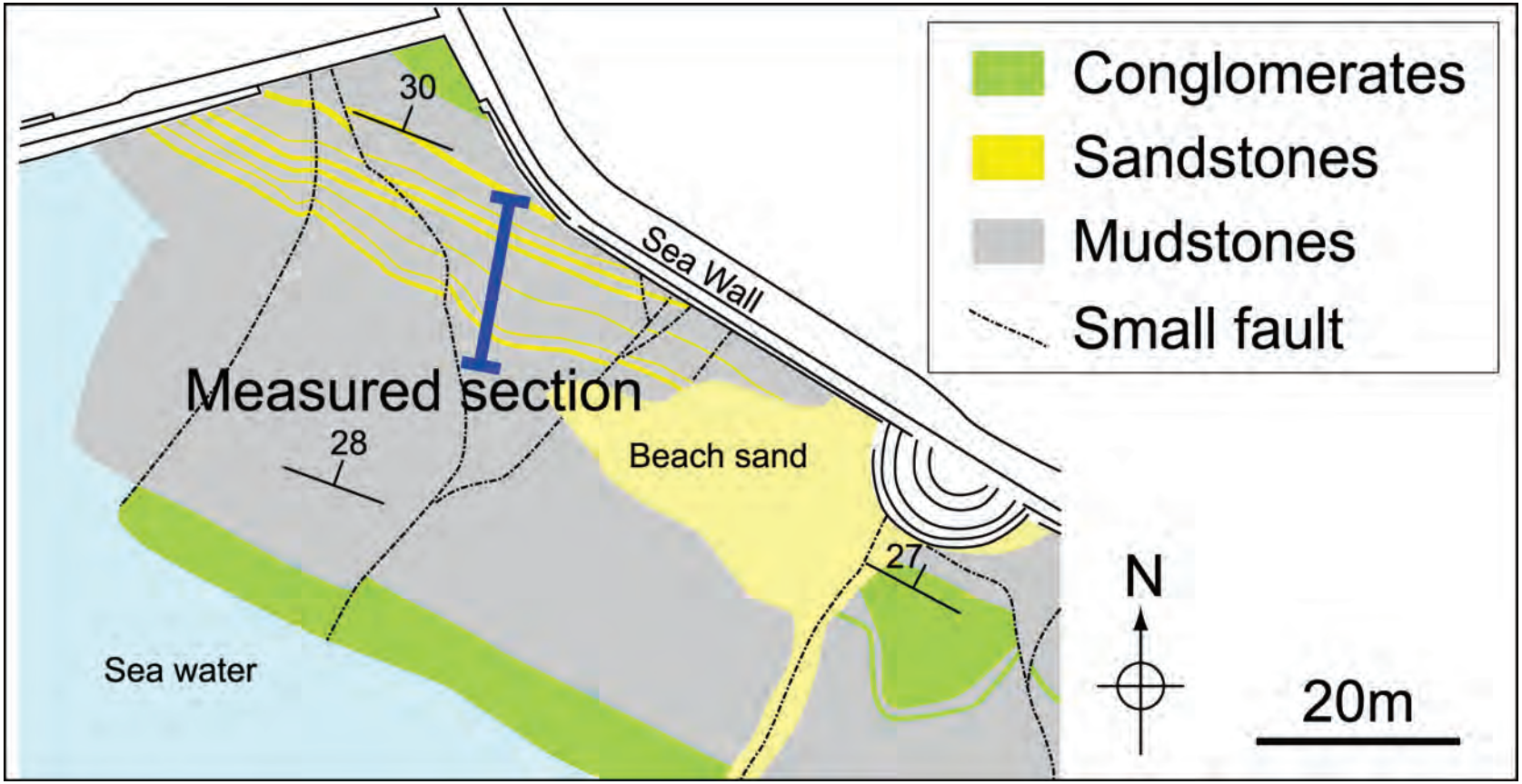
Features and interpretation of the units

Aerial photo of the study area

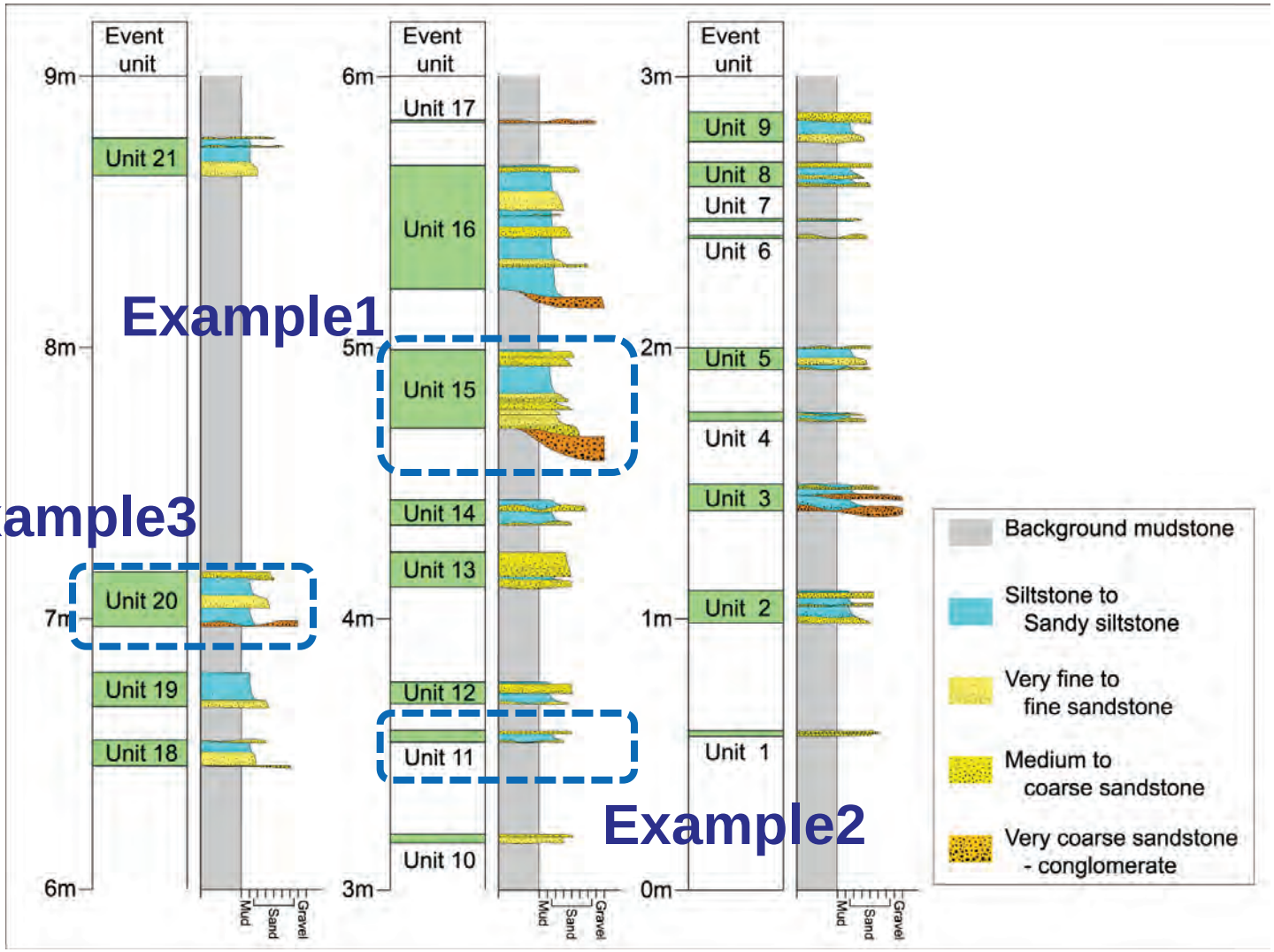


Overview of the measured section

Geological map of the study area



Measured section



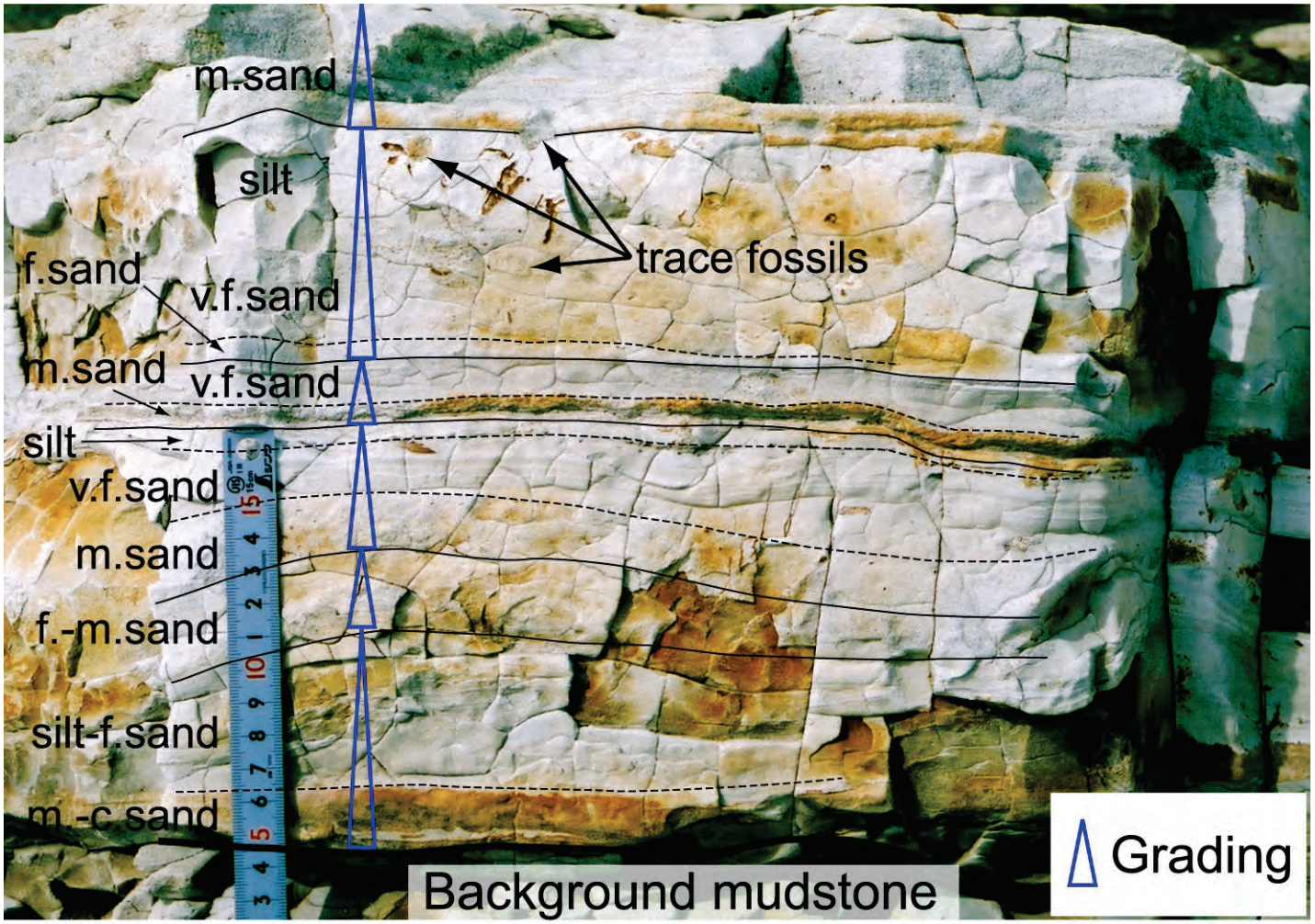
Example 1 (Unit 15)

Panoramic view of the unit

Example 1 (Unit 15)

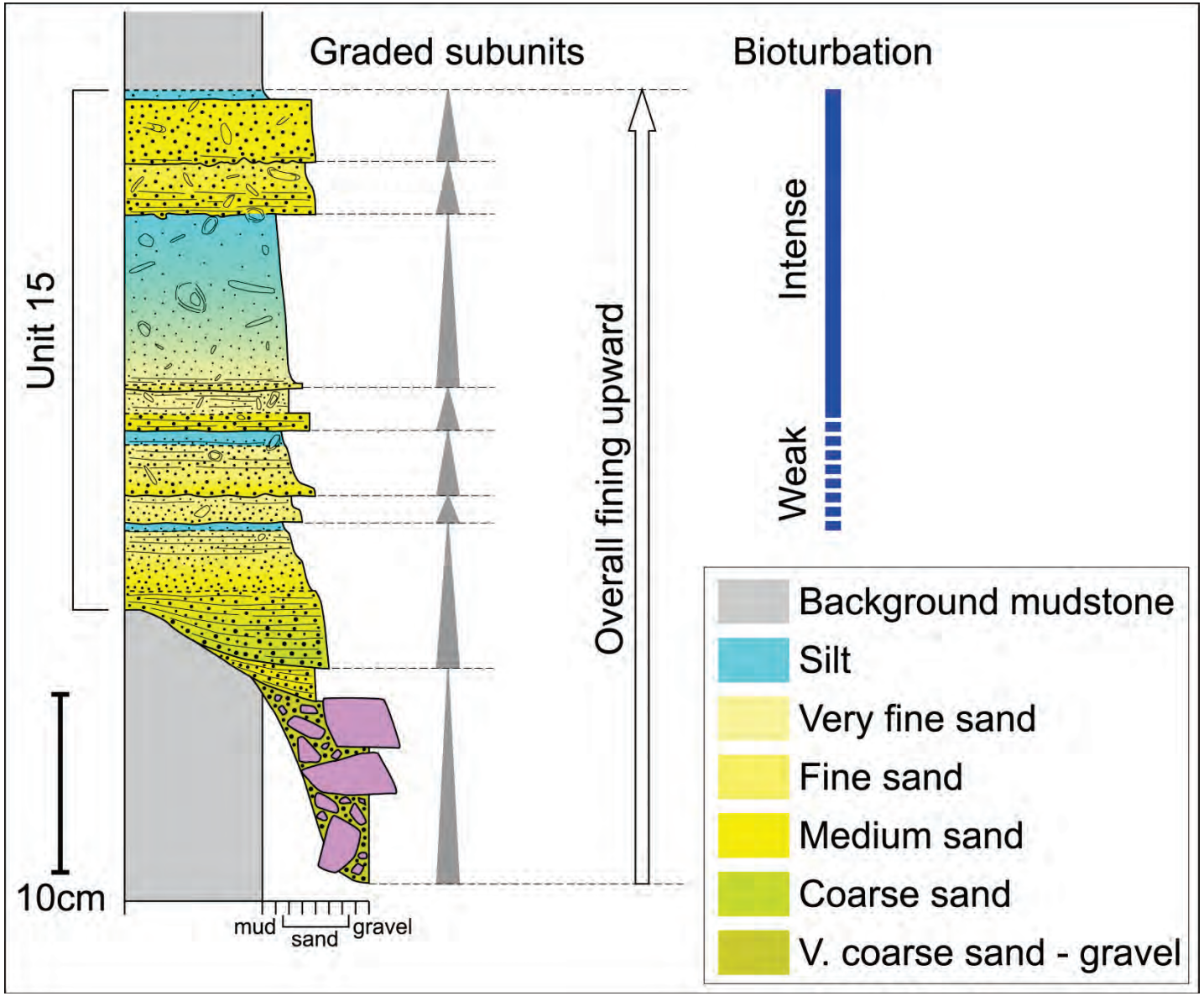
Boulders on basal scour surface

Example 1 (Unit 15)

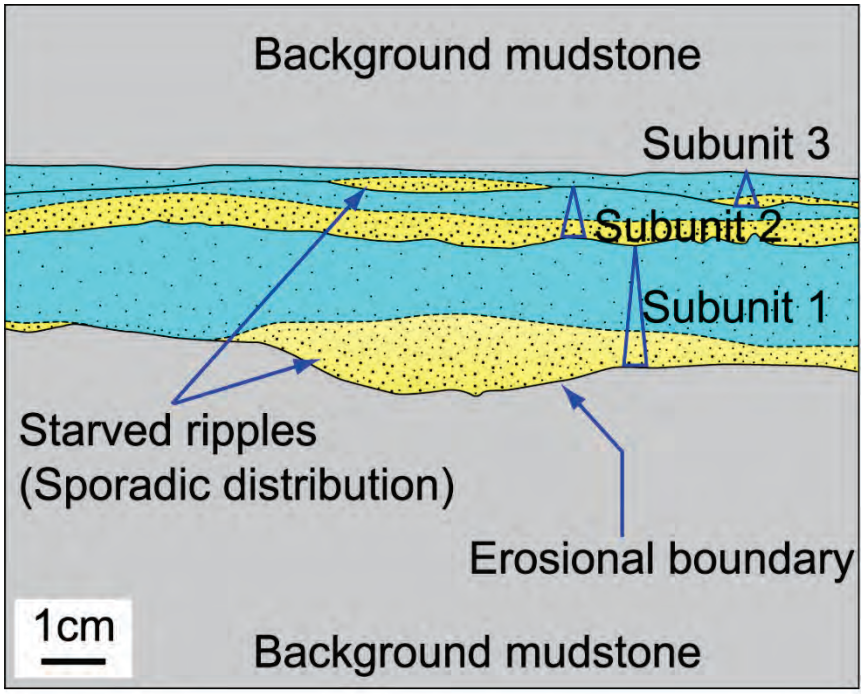


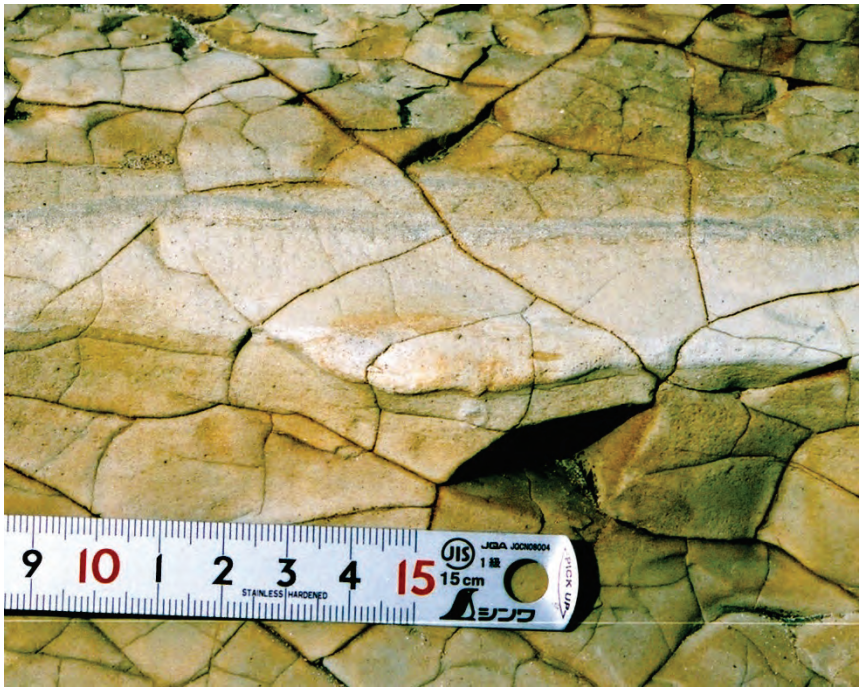
Stacking of graded subunits

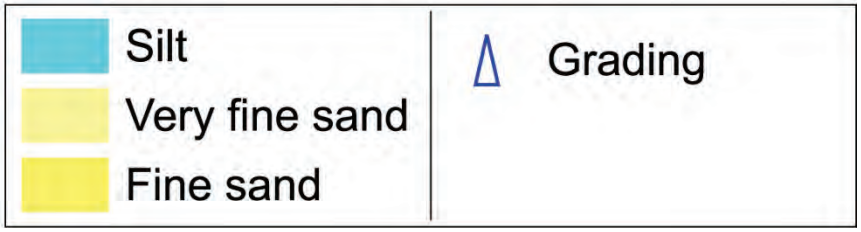
Detailed section of Unit 15



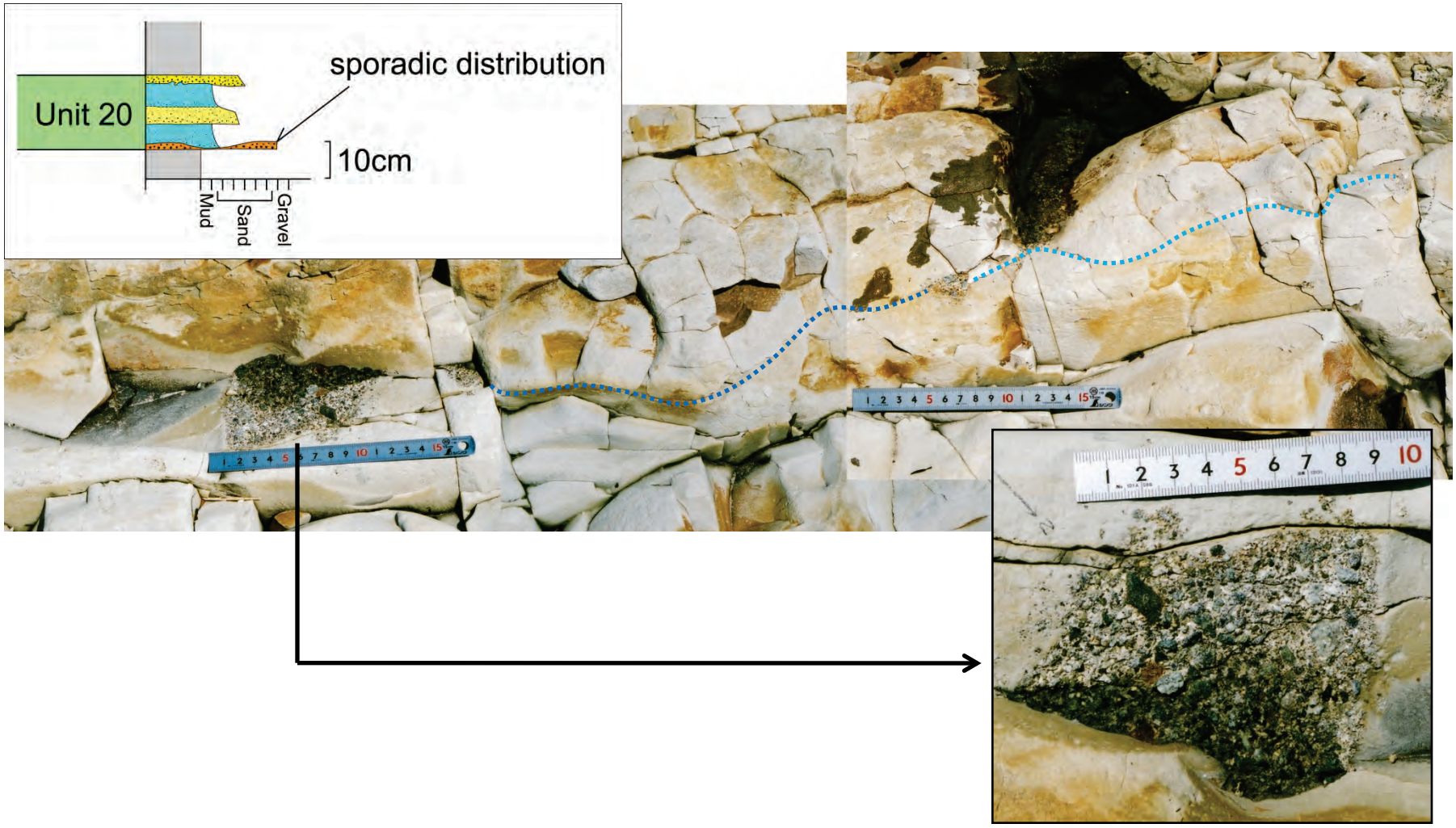
Example 2 (Unit 11)







Example 3 (Unit 20)

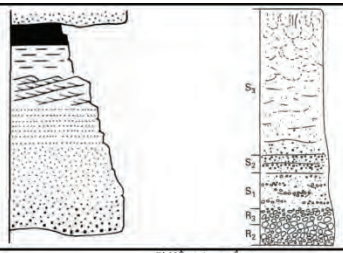
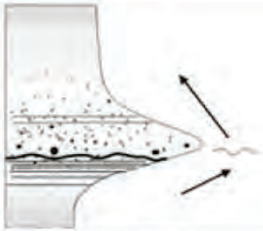
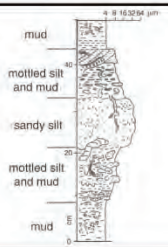


Features and interpretation of the units

Features	**Interpretation**
Downward decreasing of bioturbation	A single event deposits
Overall fining upward trend with erosional base (but not always)	Deposition during waning stage
Stacking of graded subunits containing siltstone	Repetition of flow and stagnant condition
Laterelly sporadic distribution of sand and gravel layer (starved ripples)	Traction currents (water stream)

Tsunami origin

Deep-sea coarse deposits by other agents

Turbidites		A normal graded, single bed or multi-grading without mud layer
Debrites		Disorganized or inversely graded conglomerates
Hyperpycnites		Inversely-to-normal graded Inner erosional surface
Contourites		Inversely-to-normal graded Deposits by steady flow (not event deposits)
Ice-rafted debris		Settling fall-out deposits Common gravel-grade clasts

4 Occurrence of the event units in the depositional sequence

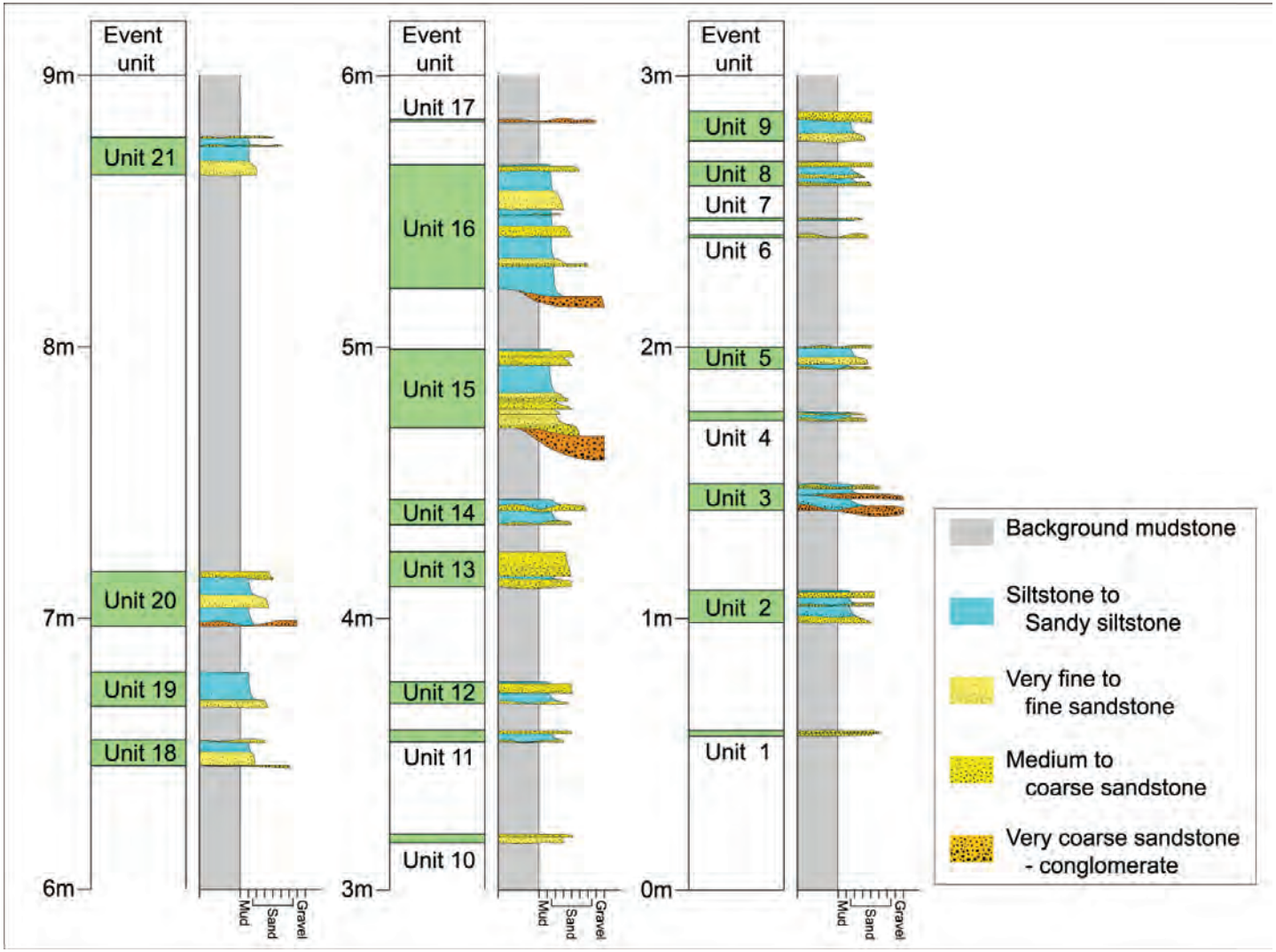
Columnar section

Definition of interval thickness

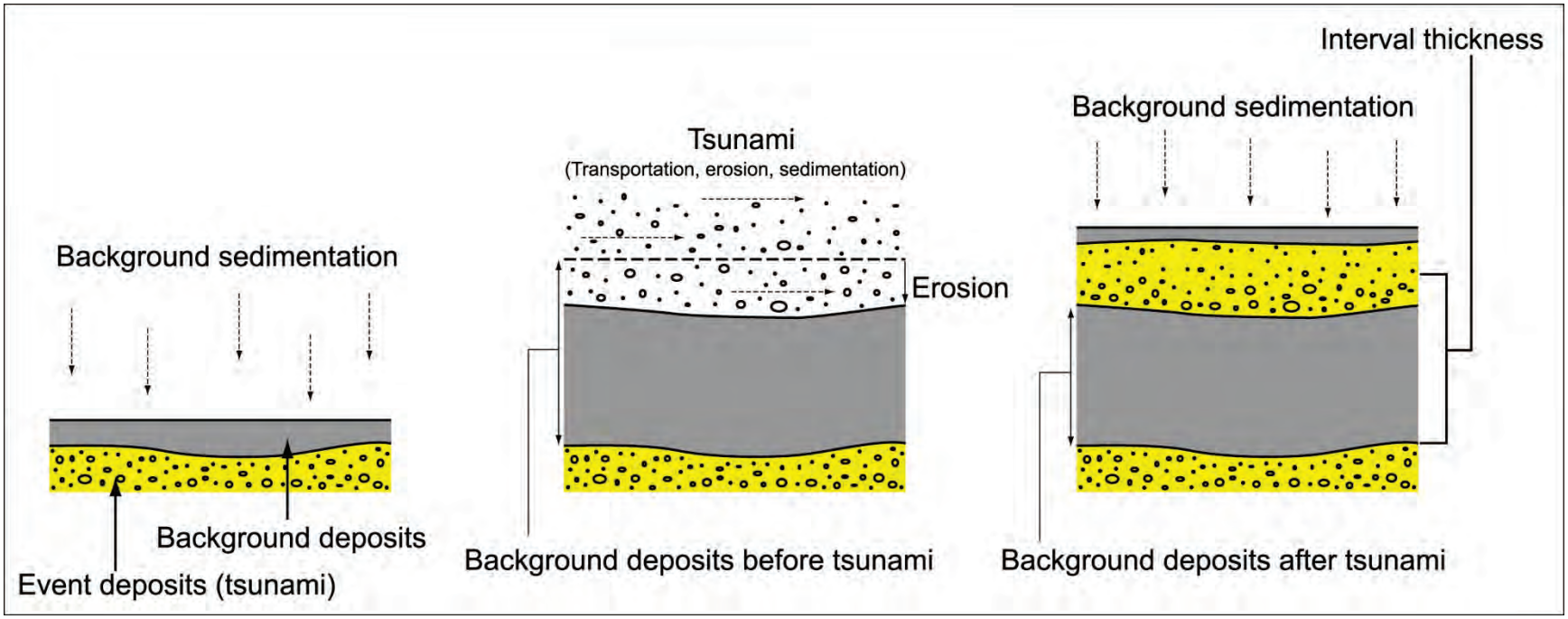
Distribution of the interval thickness

Assumed depositional rate of background deposits

Columnar section

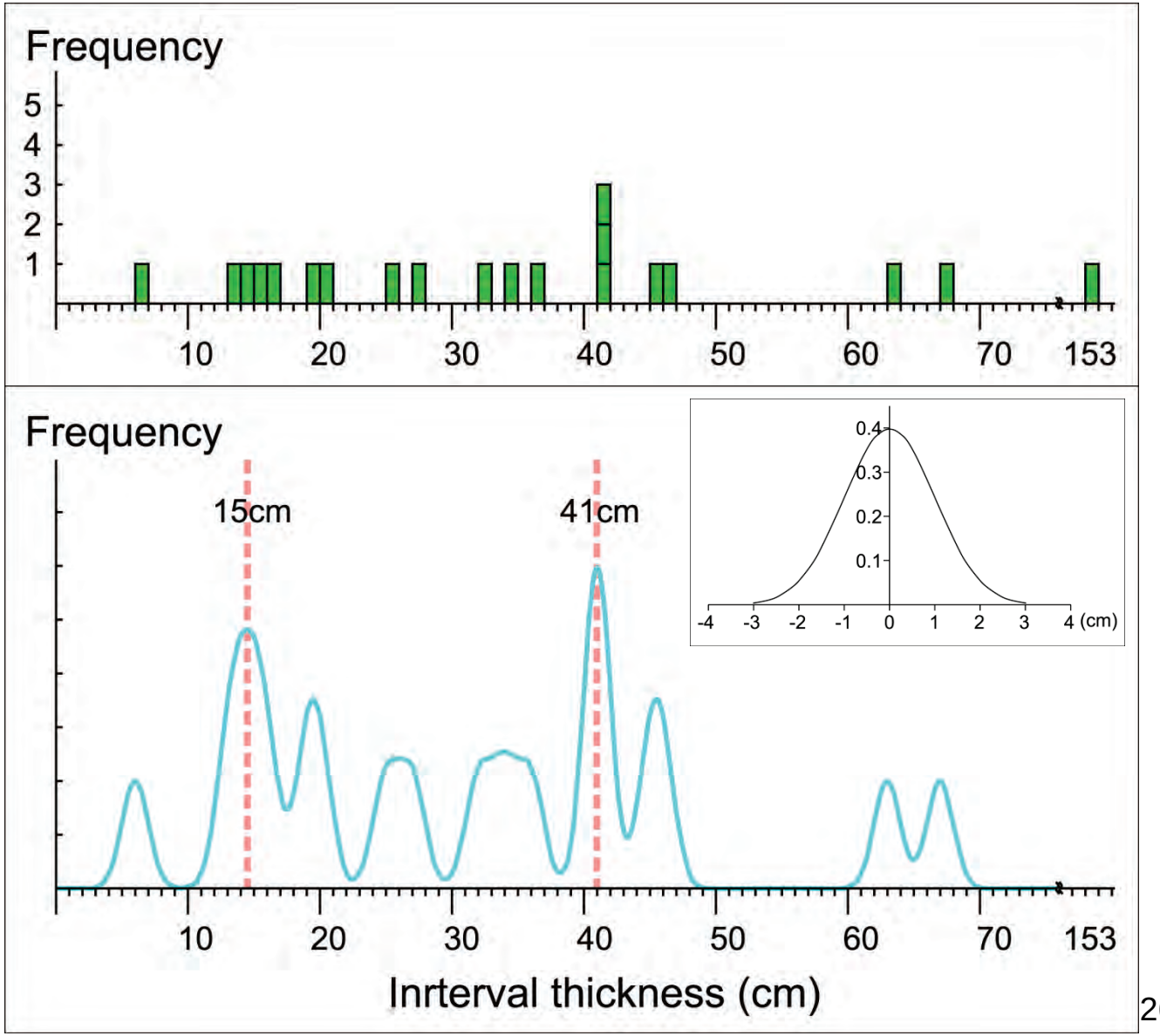


Definition of interval thickness

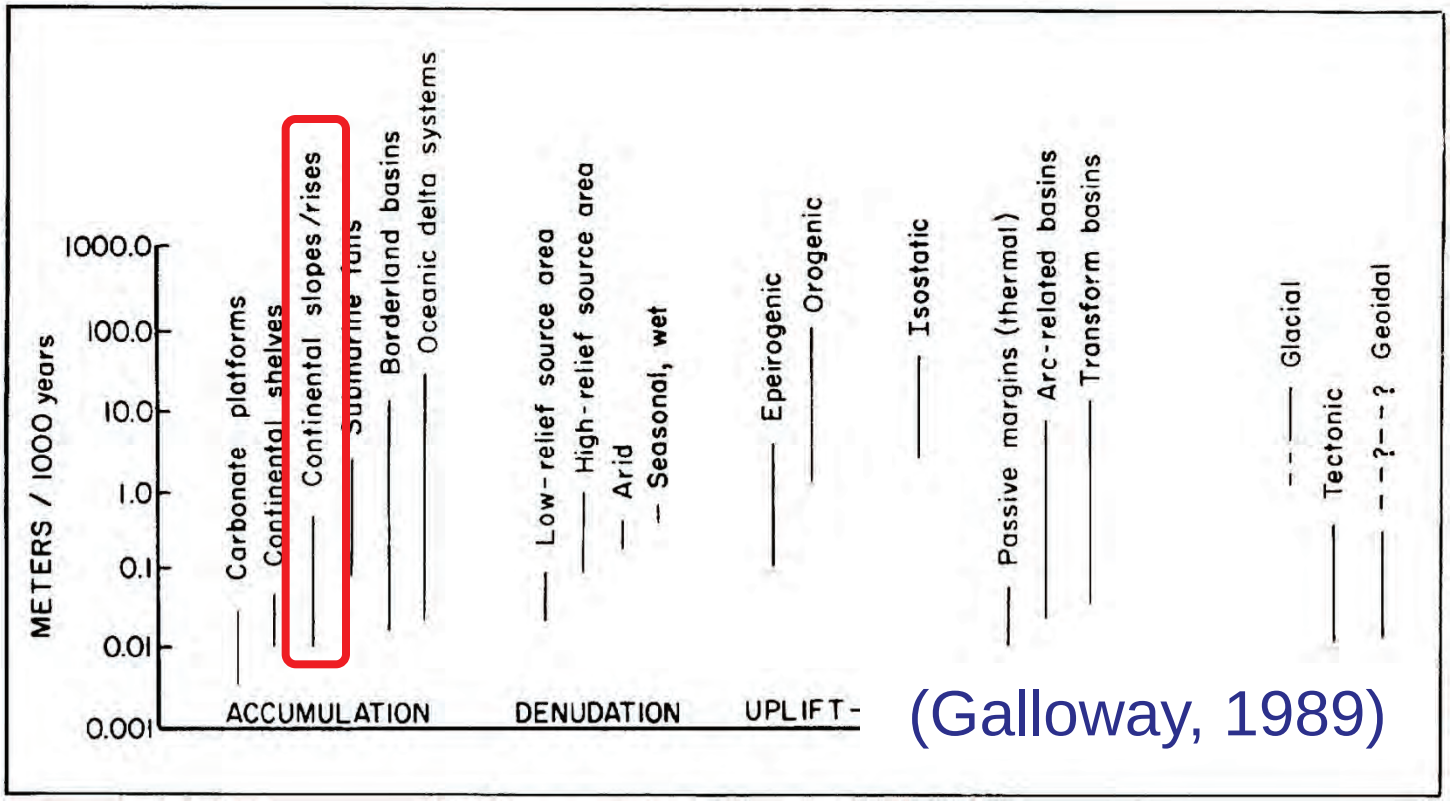


Distribution of interval thickness

Event unit	Interval (cm)
21	153
20	27
19	19
18	67
17	63
16	45
15	41
14	15
13	41
12	14
11	36
10	32
9	13
8	16
7	6
6	41
5	20
4	25
3	34
2	46
1	



Depositional rate of backgrounds



(Galloway, 1989)

Yamami and Toyohama Fm.

ca. 1000 m / 2-3 m.y. => 30-50 cm/ky

Estimated interval of recorded tsunami events

Assumed depositional rate

⇩

30 ~ 50 cm/1000year

900 cm ⇨ 18000 ~ 30000 years

15 cm ⇨ 300 ~ 500 years

41 cm ⇨ 800 ~ 1400 years

5 Summary

Based on sedimentological features, tsunami depositional units are identified in the deep-sea depositional sequence.

Tsunami depositional units can be left periodically in the deep-sea depositional sequence.


Thank you for your kind attention