Geological investigation of past tsunamis

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Field guide in Sendai on 12th Nov. 2012 (Mon)

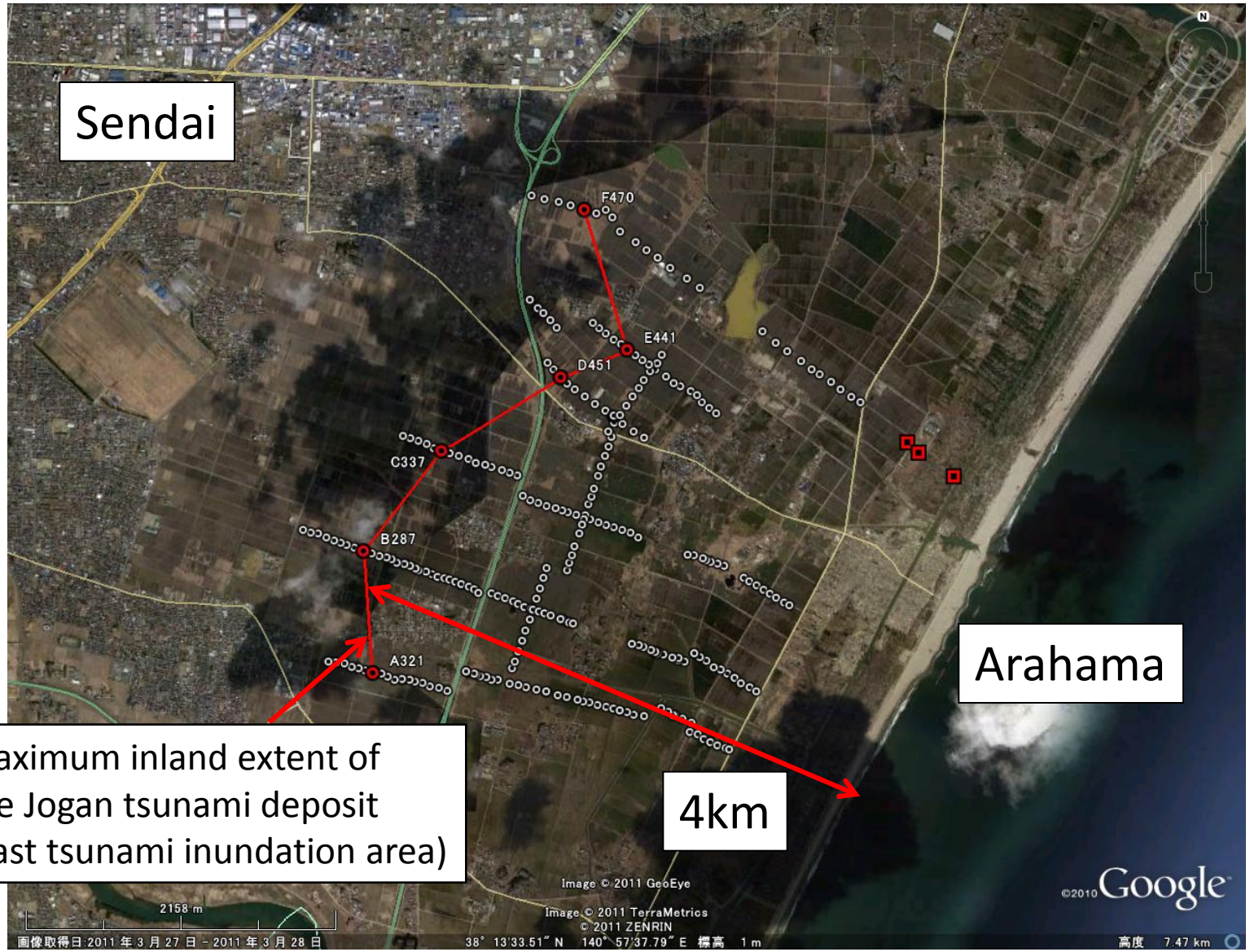
Why is the tsunami deposit so important?

Deposition of sands by the 2011 Tohoku-oki tsunami

Sandy deposit by the 2011 Tohoku-oki tsunami

Sandy deposit by the 869 Jogan tsunami

Distribution of the Jogan tsunami deposit in Sendai



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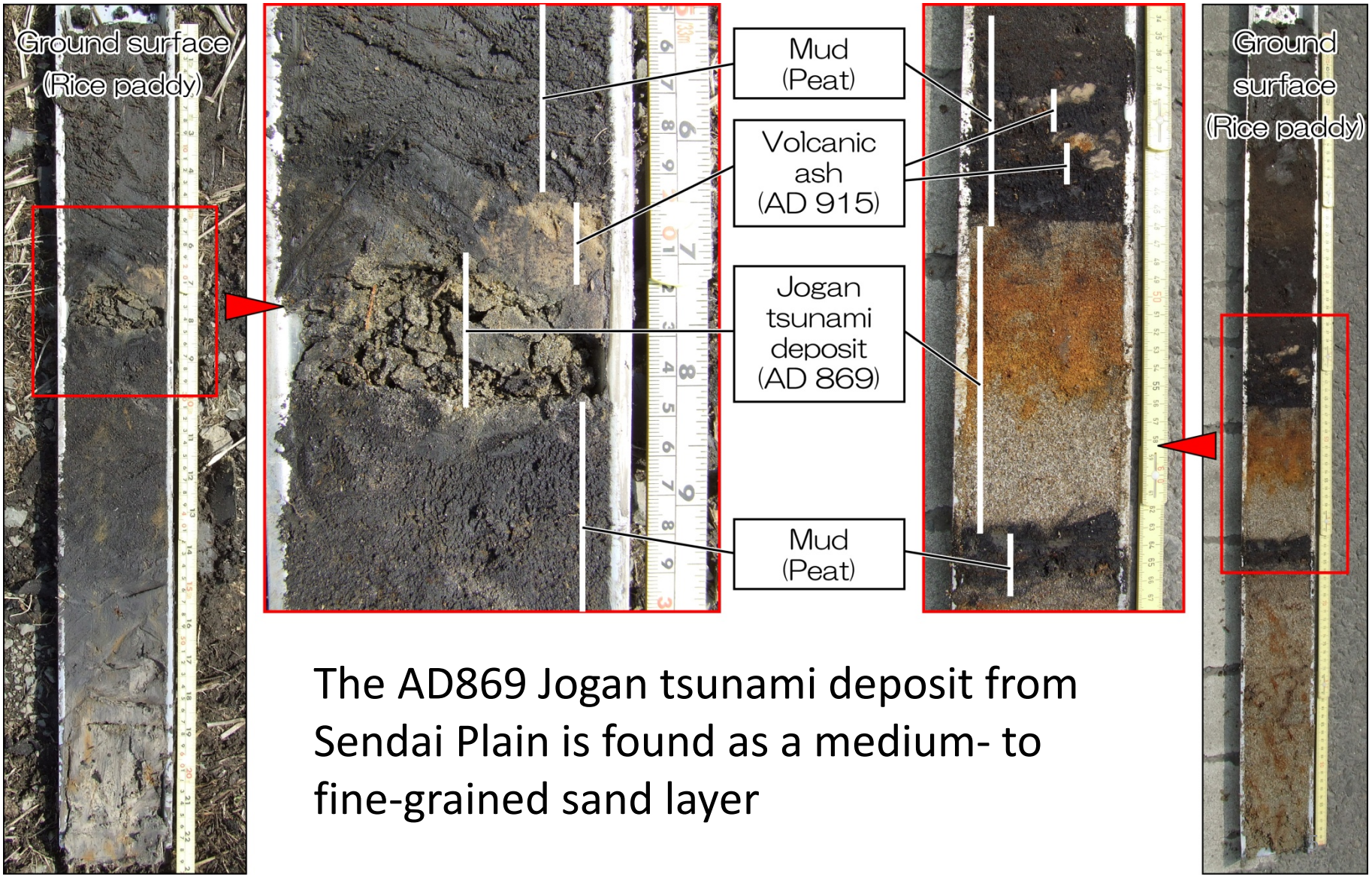
Excavation of a paleotsunami deposits in Sendai

The AD869 Jogan tsunami deposit from Sendai



The AD869 Jogan tsunami deposit from Sendai Plain is found as a medium- to fine-grained sand layer

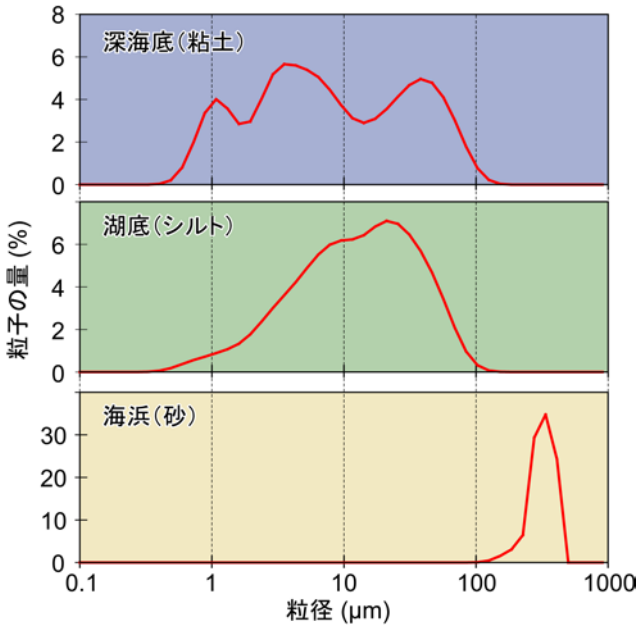
Tsunami deposits - physical evidence of past tsunamis

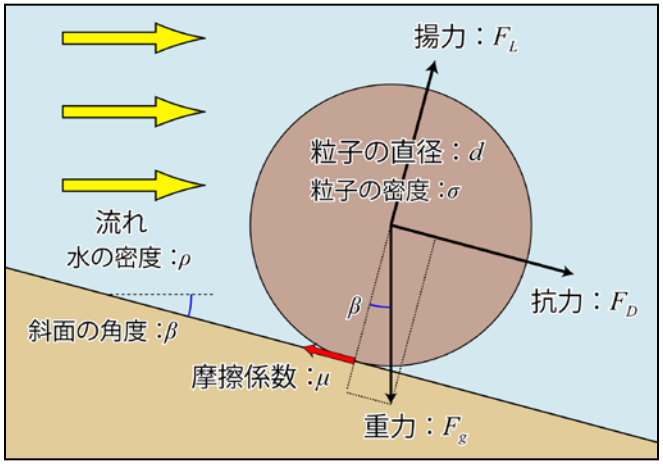
Deposit feature	Inferred tsunami character
Regional distribution	Size of tsunami source
Local distribution	Minimum inundation area
Stratigraphy	Number of waves (inflow and/or outflow)
Grain-size	Hydraulic feature of the flow
Erosion of former surface	Bottom shear?
???	Flow depth
???	Flow speed

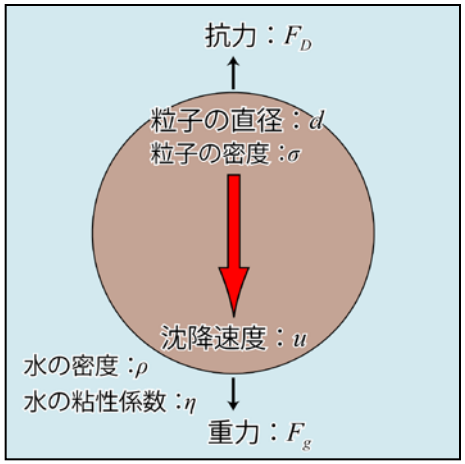
Estimate the flow characteristics

- Tsunami-specific sedimentary features?
  - Landward fining of the sand
  - Upward fining of the layer
  - Erosional features
- Estimate the flow depth and speed from sedimentary data
  - Still at infancy

Grain-size distribution



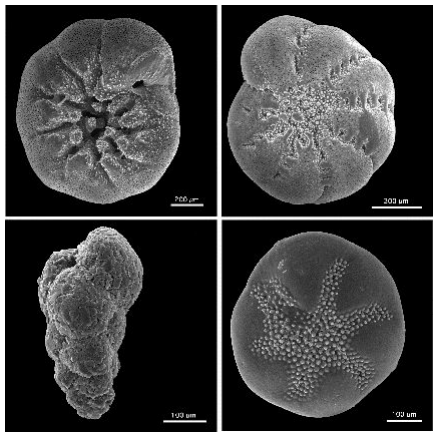




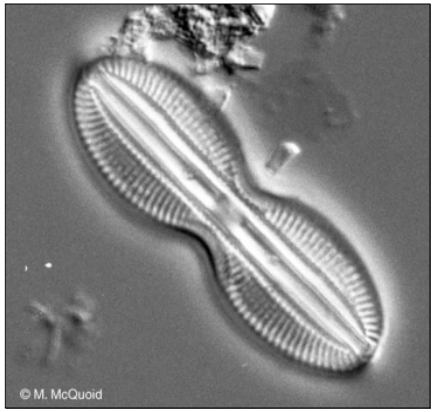
Investigate the origin of the sand layer

- To prove the flooding by seawater
- To clarify the sudden environmental change by tsunamis
- Chemical elements
- Remains of marine species
  - Seashells
  - Microfossils

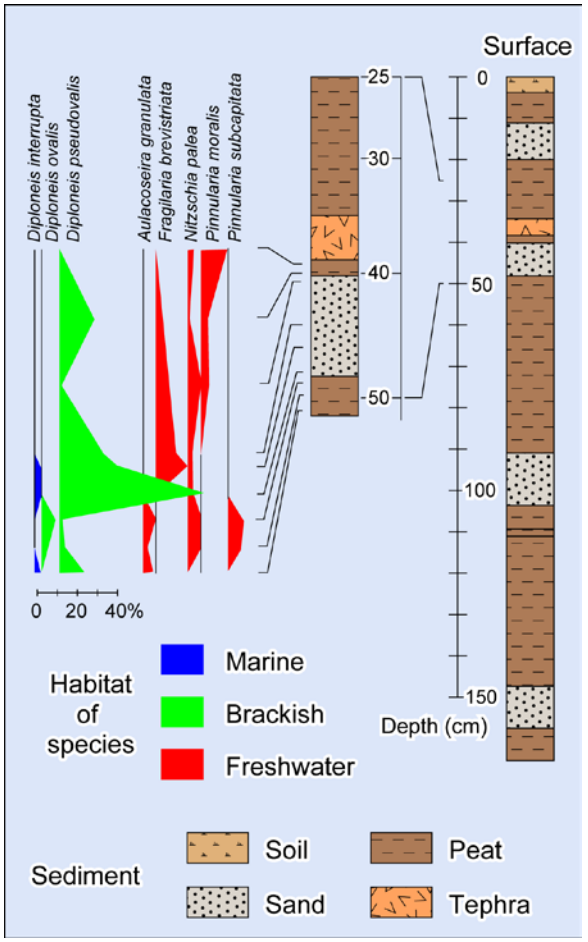
Foraminifera



Diatom



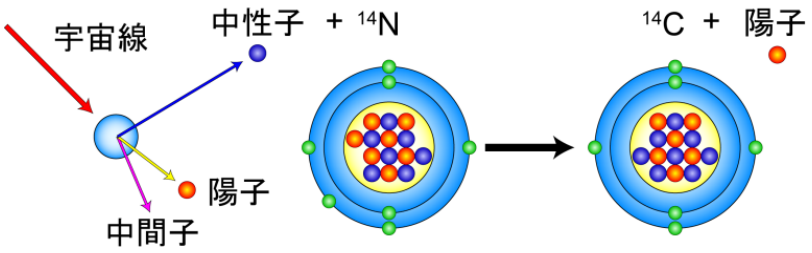
Diatom analysis of the Jogan tsunami deposit

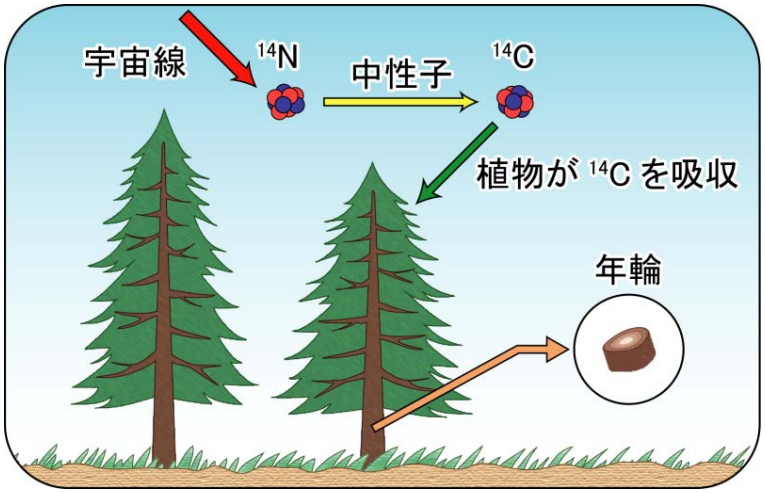


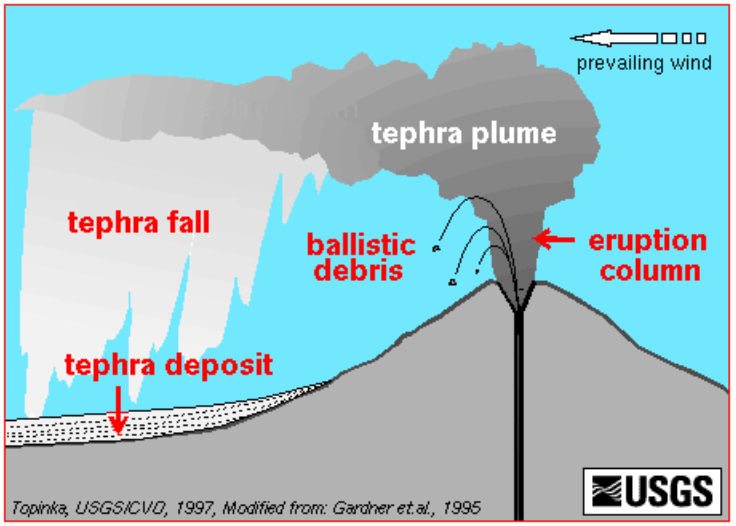
Minoura et al. (2001) Journal of Natural Disaster Science, 23 (2), 83-88.

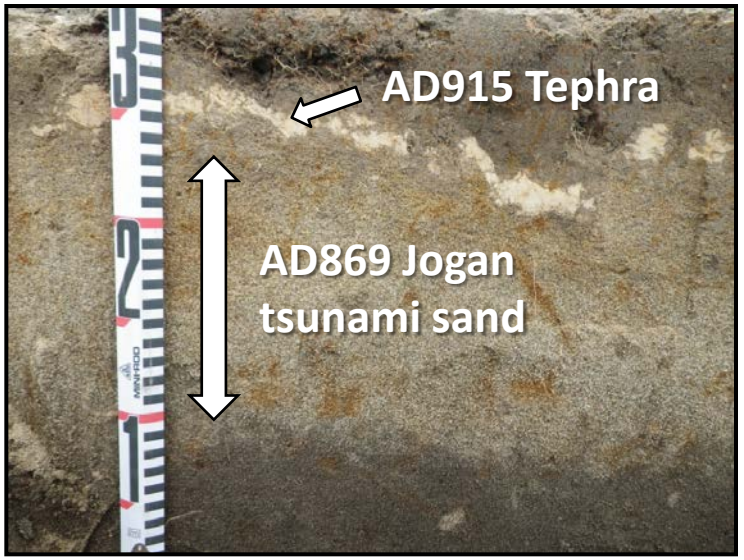
Dating of the sand layer

- Radiocarbon dating (14C)
- Stratigraphic correlation based on the regional volcanic tephra









Current issues on tsunami deposit research

Issue	Remarks
Identification criteria	**Discrimination, dating, regional correlation**
Quantification of tsunami	**Hydrodynamic character, tsunami source**
Public information	
Promotion of research	(e.g. Japan Sea coast)
Enhance efficiency of survey	Time, cost and human resources
Cultivate researchers	