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THE 869 JOGAN AND THE 2011 TOHOKU-OKI EARTHQUAKE TSUNAMIS

Introduction

Contents and organization of the presentation

1. Recognition of the Jogan event (1906-)
   by written record, tsunami deposit, oral legends

2. Estimation of the event size (2001-)
   by tsunami deposit, numerical modeling

3. Comparison to the 2011 Tohoku-oki event (2011-)
   by inundation area, fault size, fault slip

Recognition of the Jogan event (1)

Japanese imperial era name

Earlier researches on written record (1906-)

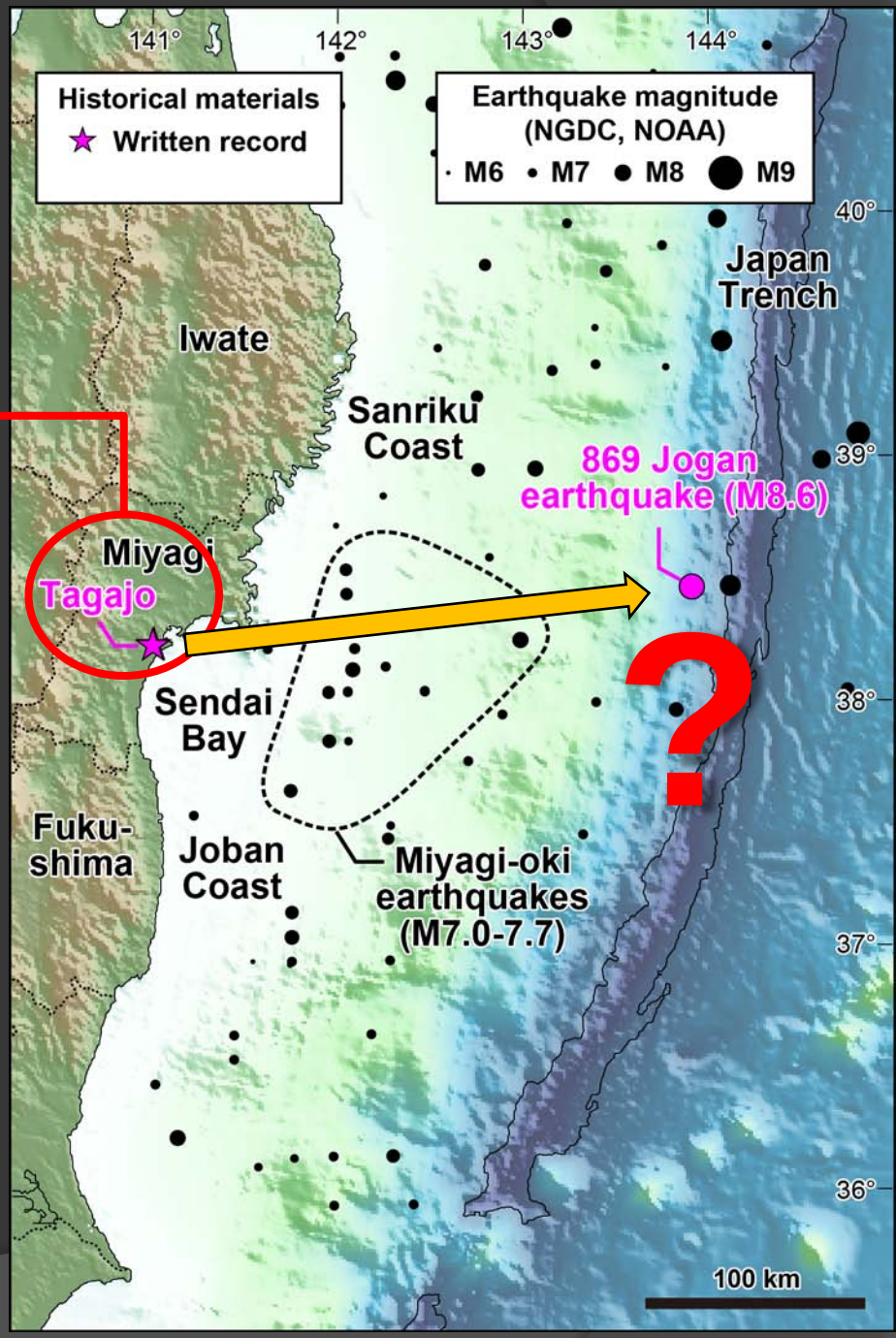
Summary of the record

- Earthquake on 13, July, 869
  (26, 5th month, Jogan 11)
- Collapse of buildings
- Flooding and damage by the tsunami
- Drowned 1,000 people

Earlier researches [1][2][3][4]

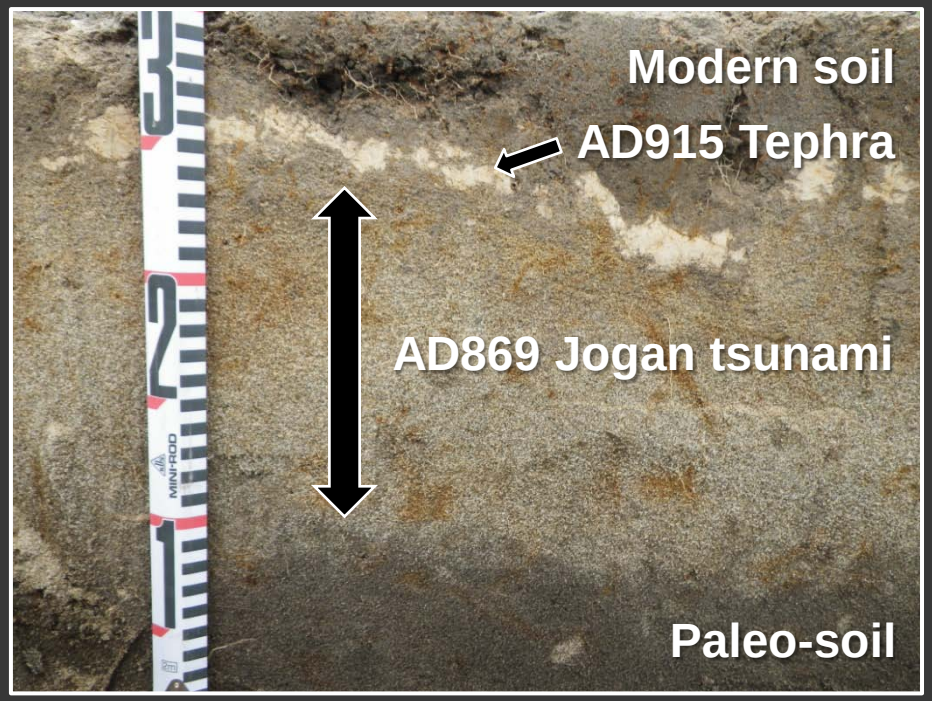
1906	First interpretation of the record
1934	Listed in earthquake catalogue
1951	First estimation of magnitude
1970	re-estimation of magnitude

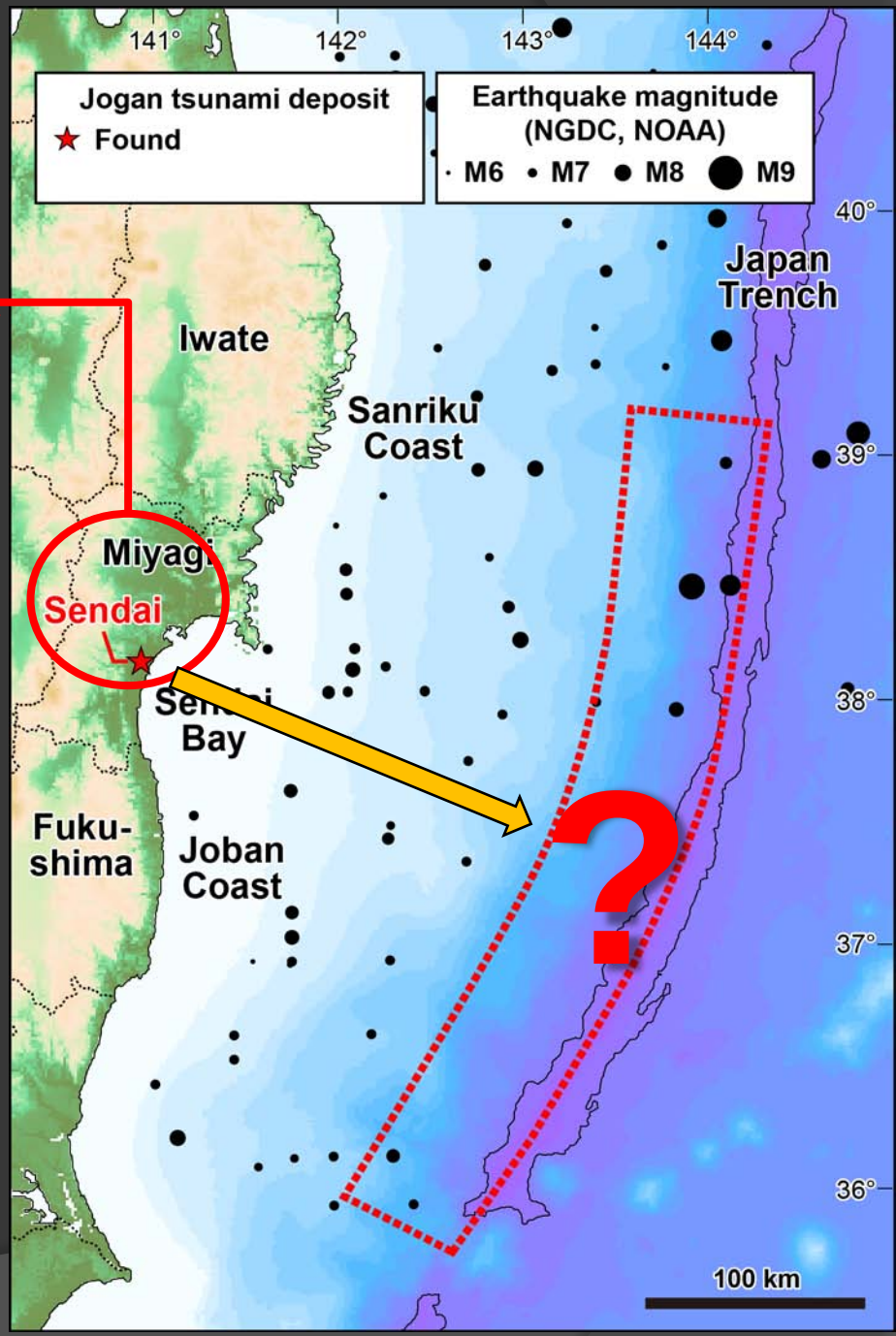
[1] Yoshida (1906), [2] Imamura (1934), [3] Kawasumi (1951), [4] Usami & Kayano (1970)



Recognition of the Jogan event (2)

First discovery of the Jogan tsunami deposit in Sendai (1990)





[1] Abe et al. (1990), [2] Minoura (1990), [3] Minoura & Nakaya (1991)

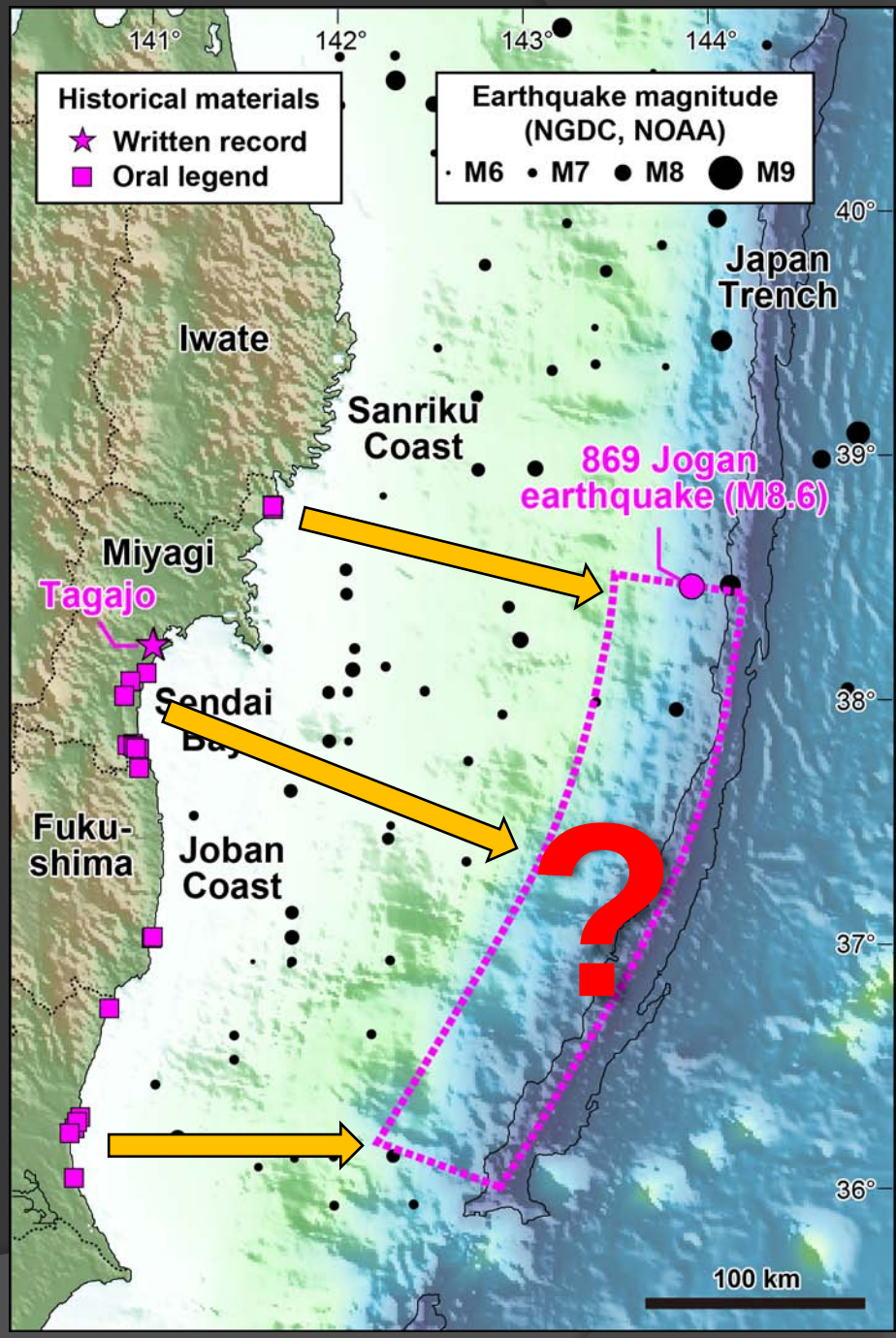
Recognition of the Jogan event (3)

Investigation of oral legends of past tsunamis (2000-)

Type of tsunami-related oral legends (N = 25) [1][2]

- Drifted god (N = 8)
- Tsunami-related toponymy (N = 7)
- Episode of tsunami evacuation (N = 4)
- Epidemic after tsunami (N = 1)
- Other (N = 5)

No information available for tsunami heights and run-ups



[1] Watanabe (2000), [2] Watanabe (2001)

Estimation of the event size (1)

Regional investigations of paleo-tsunami deposits (2001-)

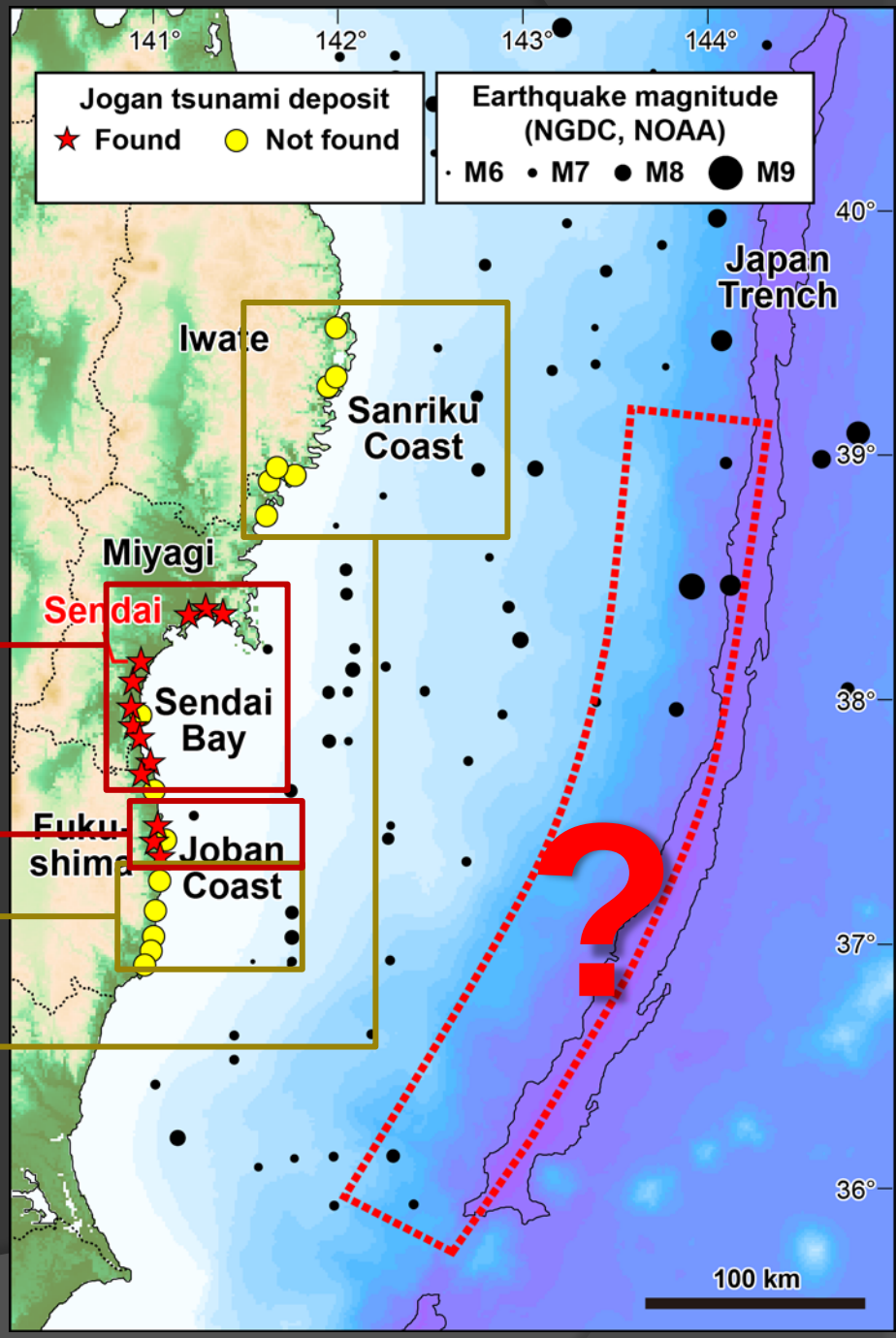
Result of recent field surveys on the Jogan tsunami deposit

Found from

- Sendai Bay (2006-) [2][3]
- Joban Coast (2001-) [1][4]

Not found from

- Southern Joban Coast
- Sanriku Coast



[1] Minoura et al. (2001), [2] Shishikura et al. (2006), [3] Sawai et al. [2006], [4] Imaizumi et al. (2007)

Estimation of the event size (2)

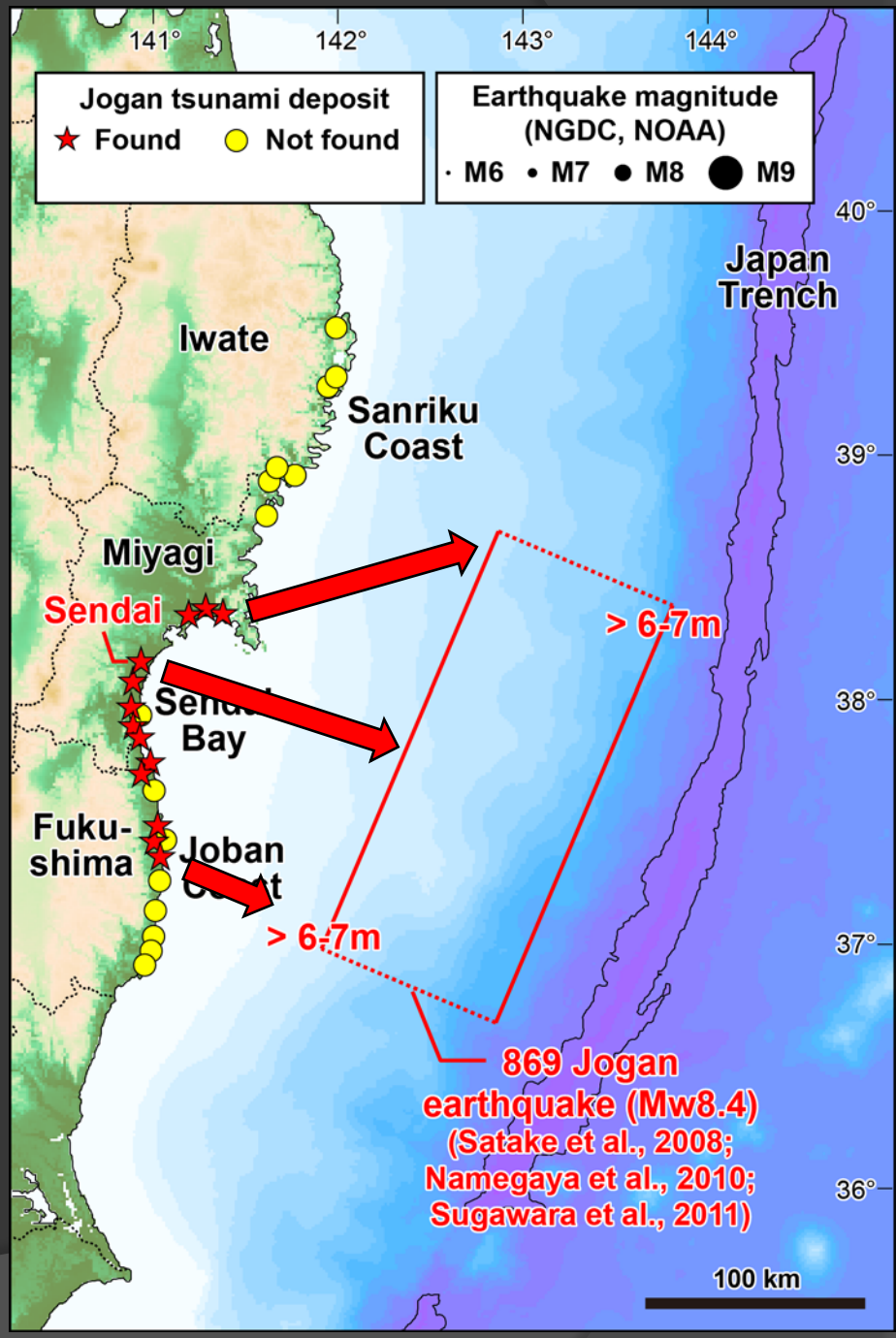
Estimation of fault model from deposit data (2008-)

Framework of modeling [1][2][3]

A. Local distribution of deposit
> Inundation area & fault slip

B. Sedimentological features
> Flow characteristics

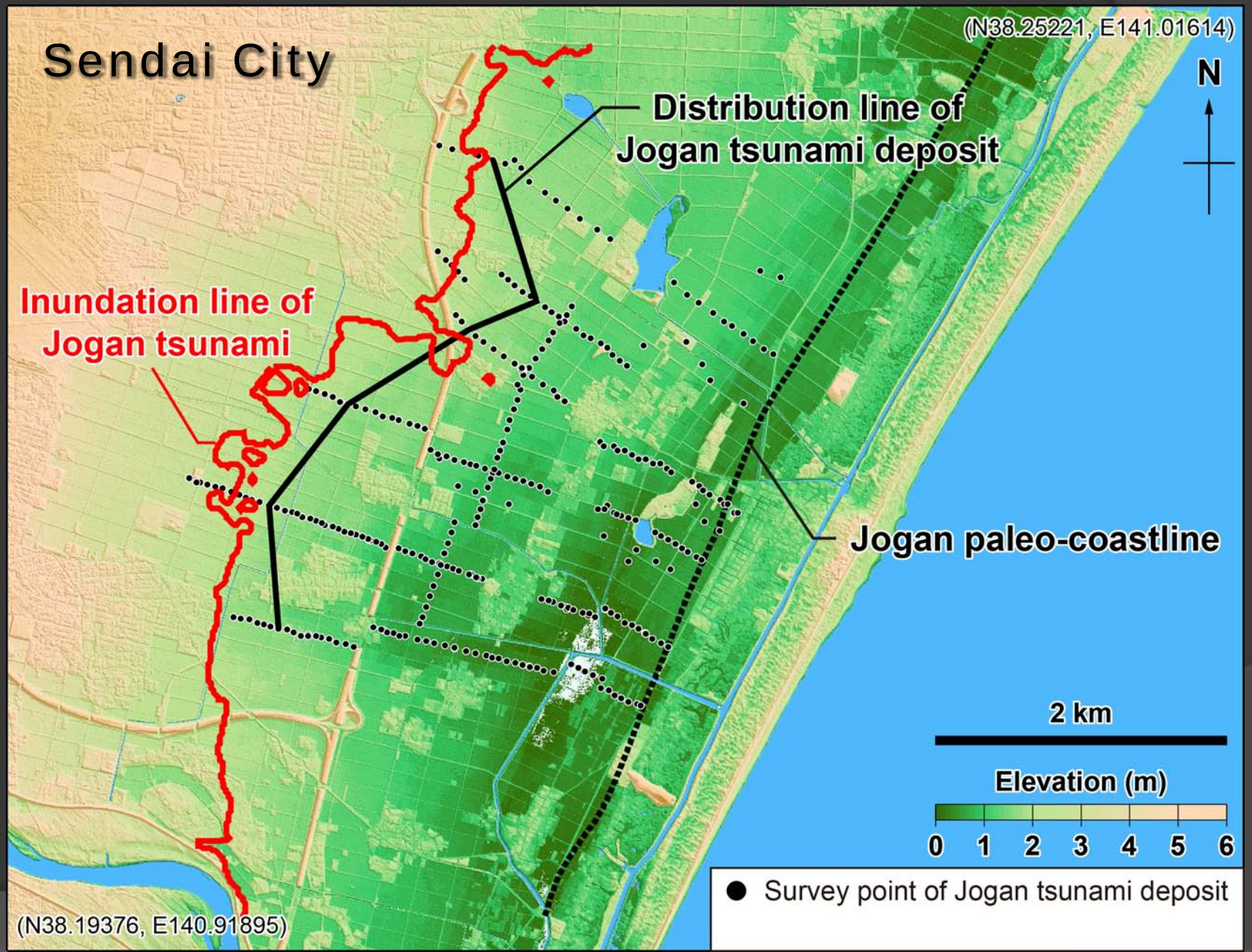
C. Regional distribution of deposit
> Fault size & fault slip



[1] Satake et al. (2008), [2] Namegaya et al. (2010),
[3] Sugawara et al. (2011)

Estimation of the event size (3)

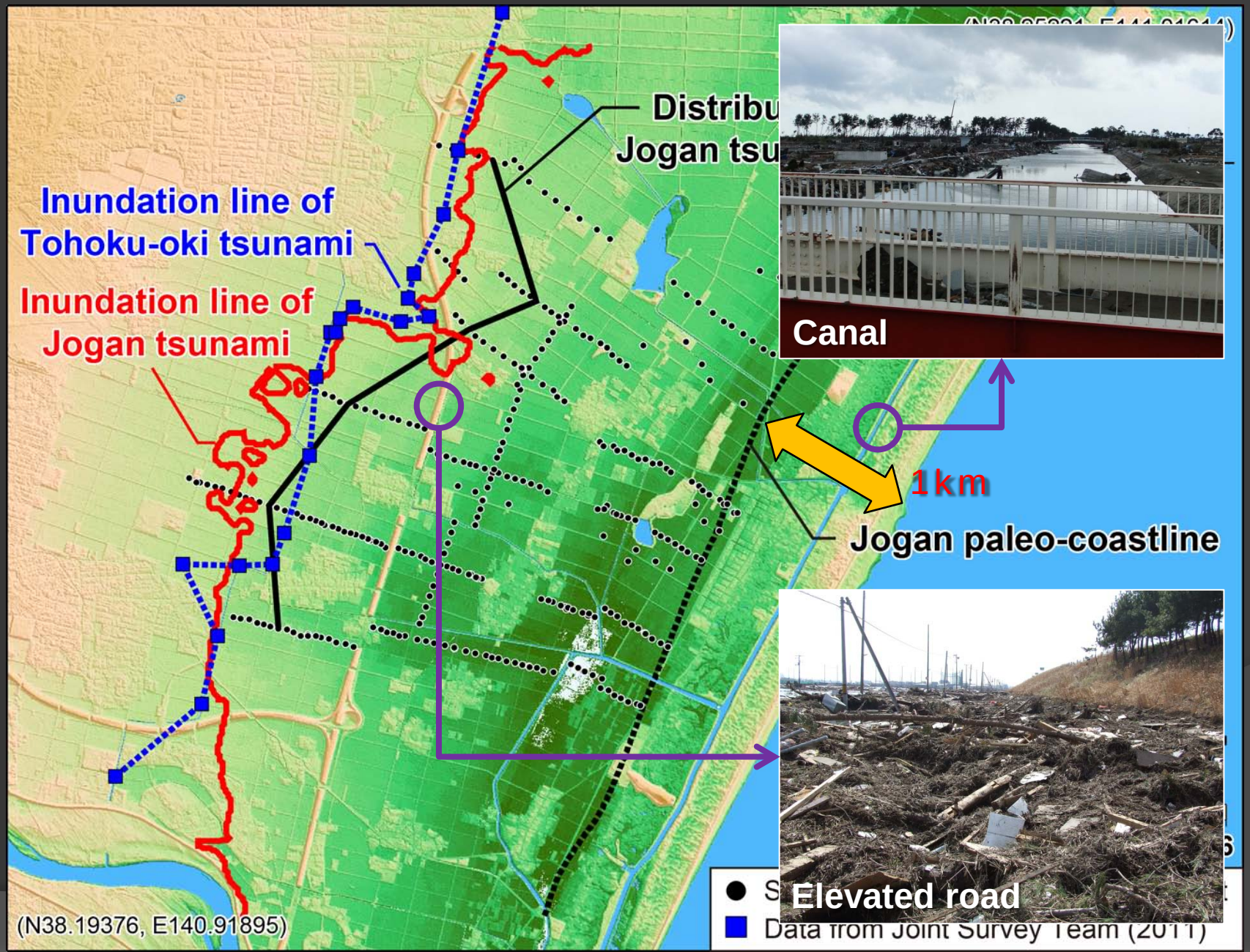
Modeling of tsunami inundation



NH13G-08: Sugawara et al.

Comparison to Tohoku-oki event (1)

Inundation area in Sendai City



NH13G-08: Sugawara et al.

Comparison to Tohoku-oki event (2)

Fault size and amount of slip

869 Jogan earthquake [1][2][3]

Fault length: > 200km

Fault width: 85-100km

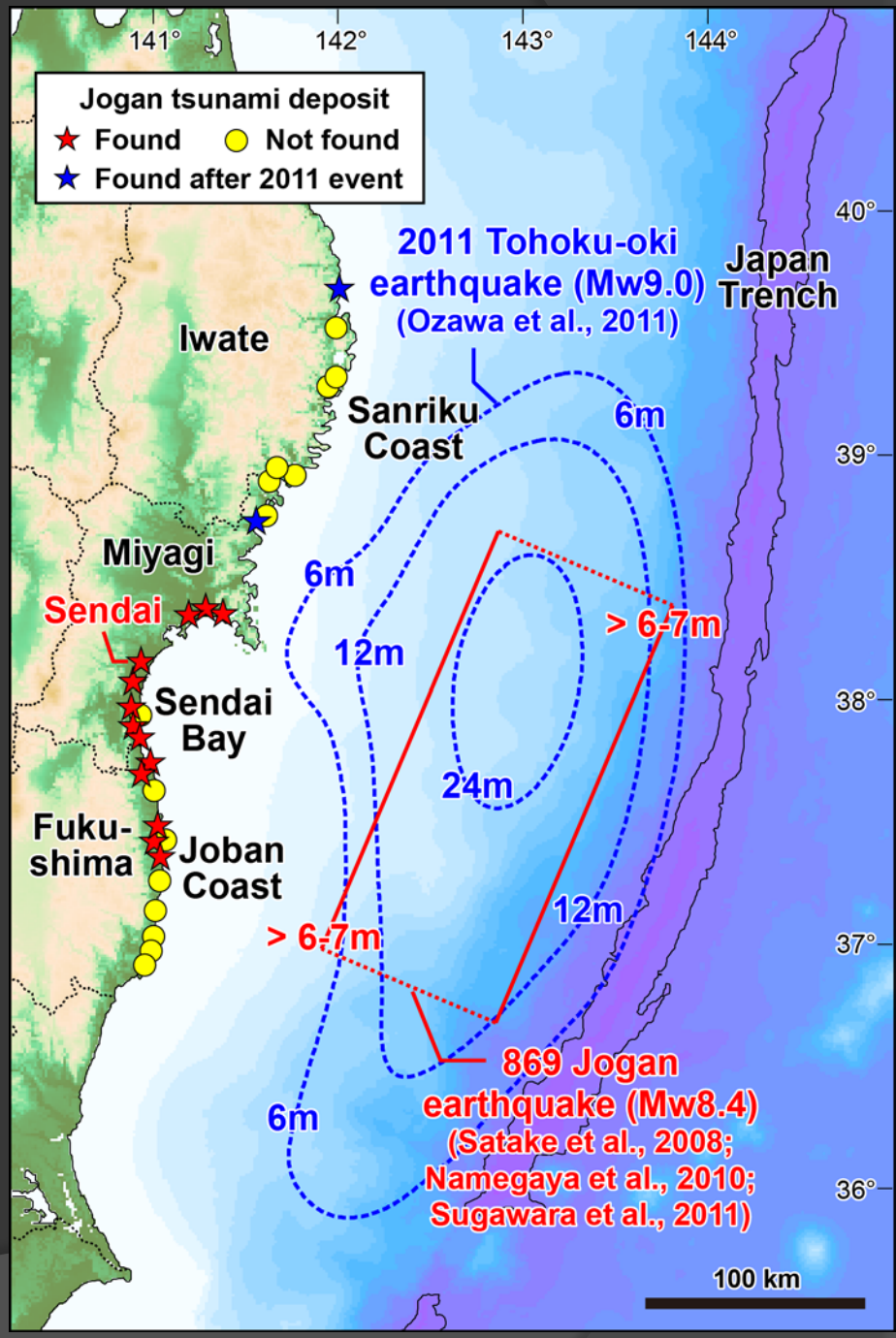
Slip: > 6-7m (Uniform)

2011 Tohoku-oki earthquake [4]

Fault length: ~ 500km

Fault width: ~ 200km

Slip: Max. ~ 50m (non-uniform)



[1] Satake et al. (2008), [2] Namegaya et al. (2010),
[3] Sugawara et al. (2011), Ozawa et al. (2011)

Conclusion

Predictions and consequences

- Inundation area — Jogan = Tohoku-oki ?
- Focal region — Jogan < Tohoku-oki
- Wave source — Jogan < Tohoku-oki

Suggestion for future researches

- Formation and preservation of deposits in steeper coasts
- Relationship between inundation and deposition limits
- Estimation of flow depth and speed from deposit data

Thank you very much for your kind attention.