

Development of tree-ring chronologies over the last 2ka in Japan

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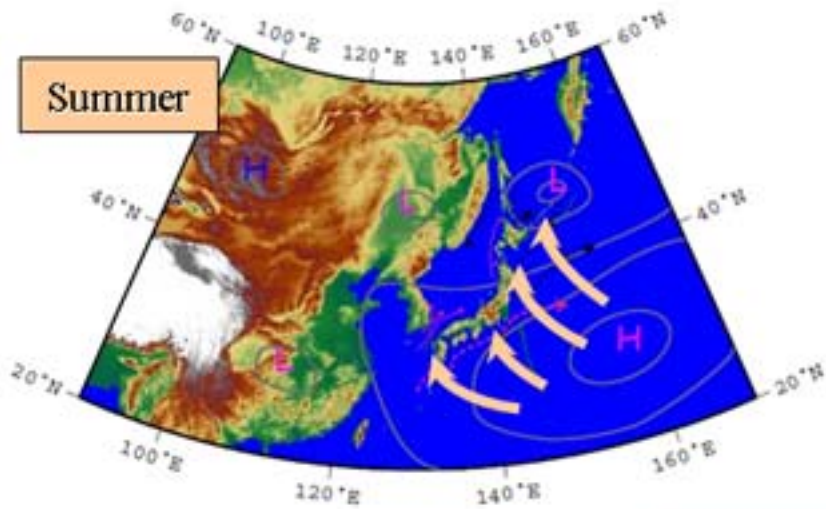
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2: JSPS Research Fellow

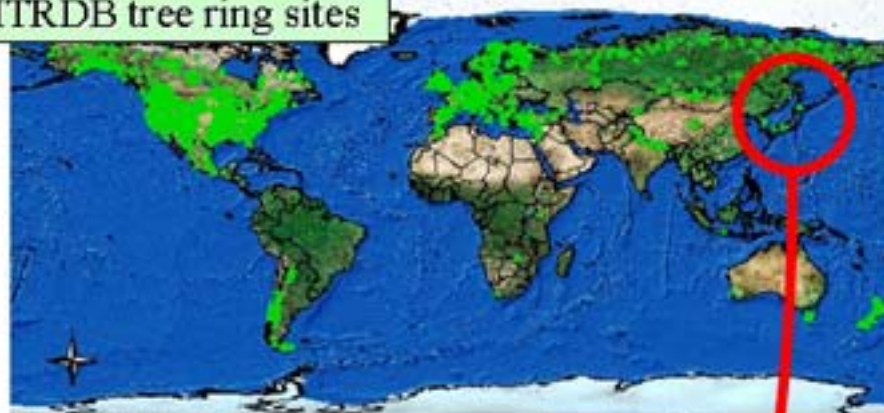
3: Graduate School of Education, Naruto University of Education

Background

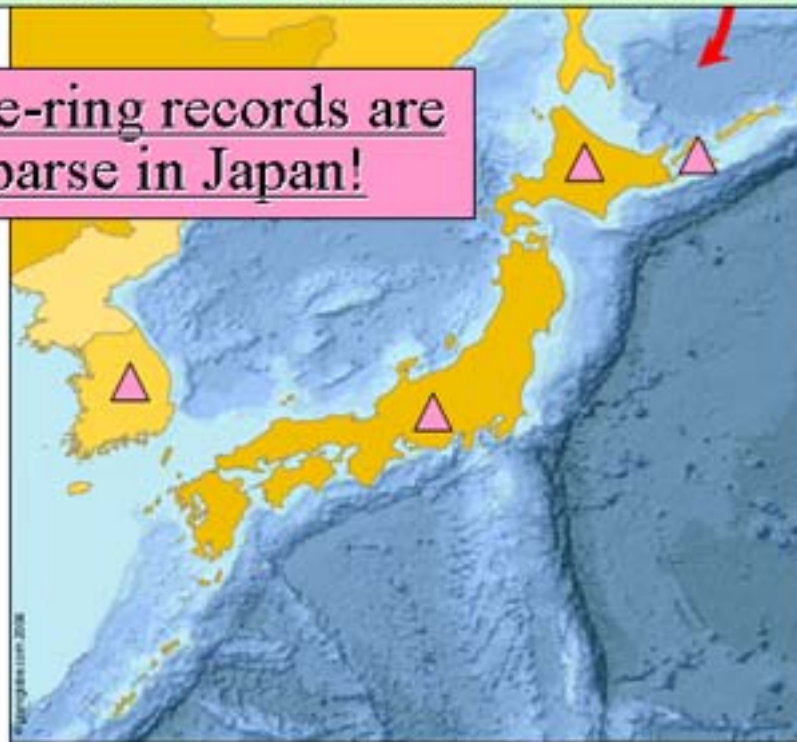
Summer



ITRDB tree ring sites

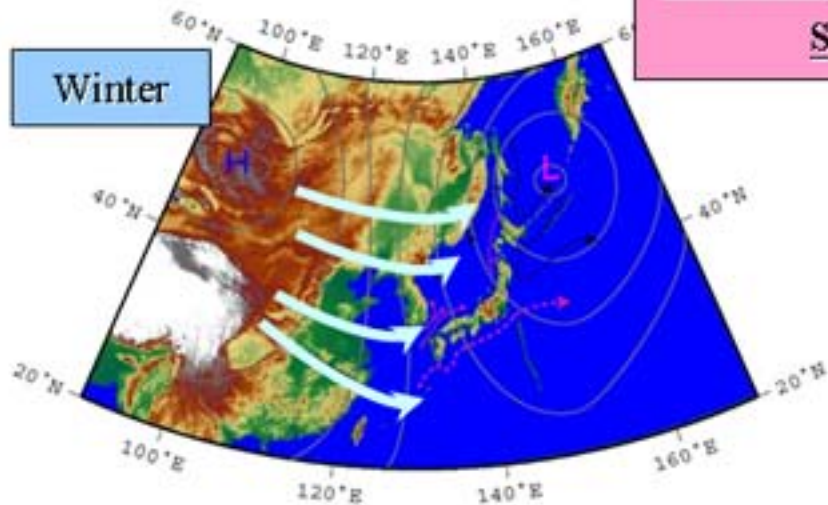


Published sites of dendroclimatic reconstruction



Existing tree-ring records are still sparse in Japan!

Winter



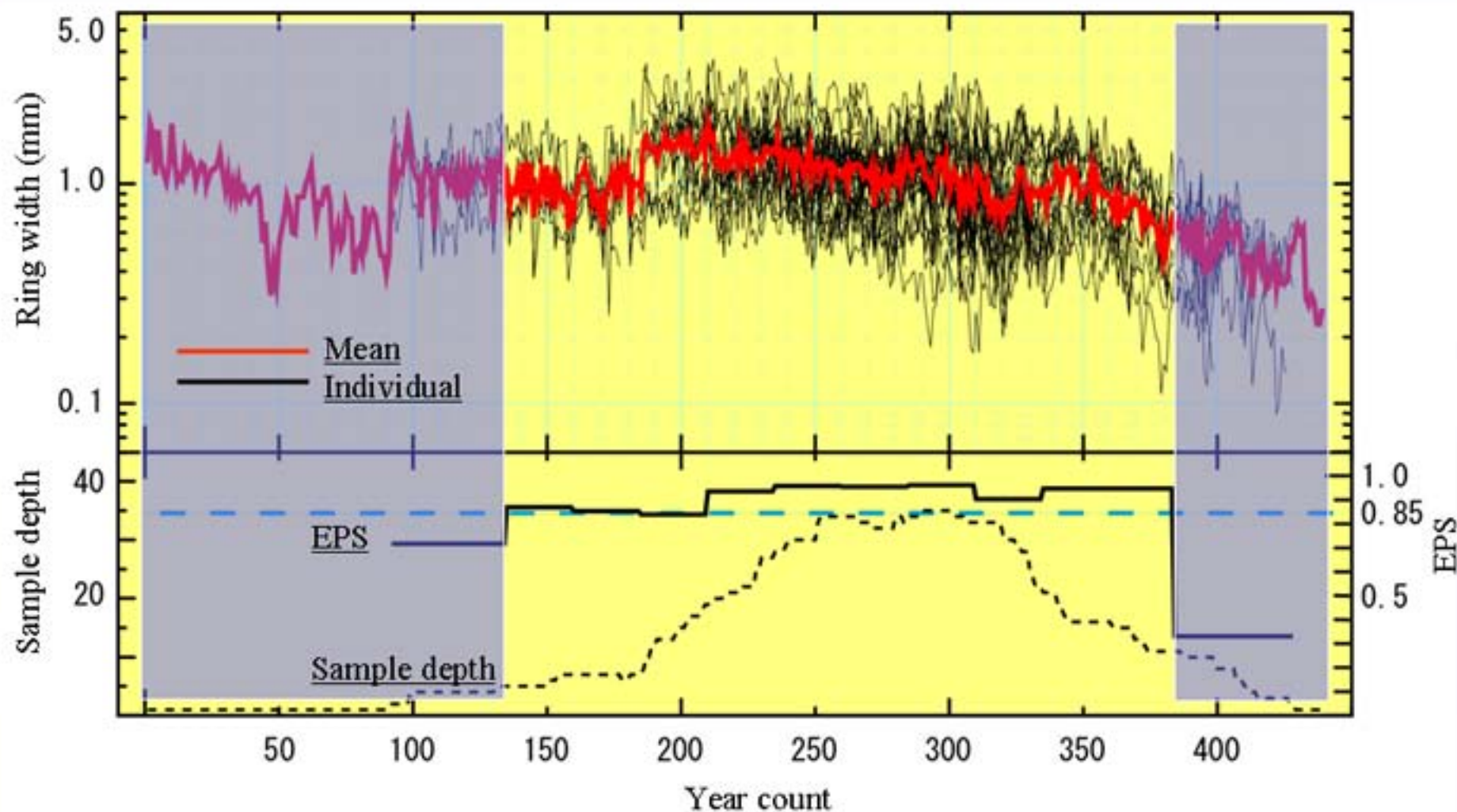
Air pressure pattern of summer and winter around EA region

Aims of this study

- 1: Development of long tree-ring chronologies
 - We compiled newly developed tree-ring chronologies in order to develop long tree-ring chronologies for Japan.
- 2: Potential of dendroclimatic reconstruction
 - We also present the potential of dendroclimatic reconstructions using living trees in Japan.

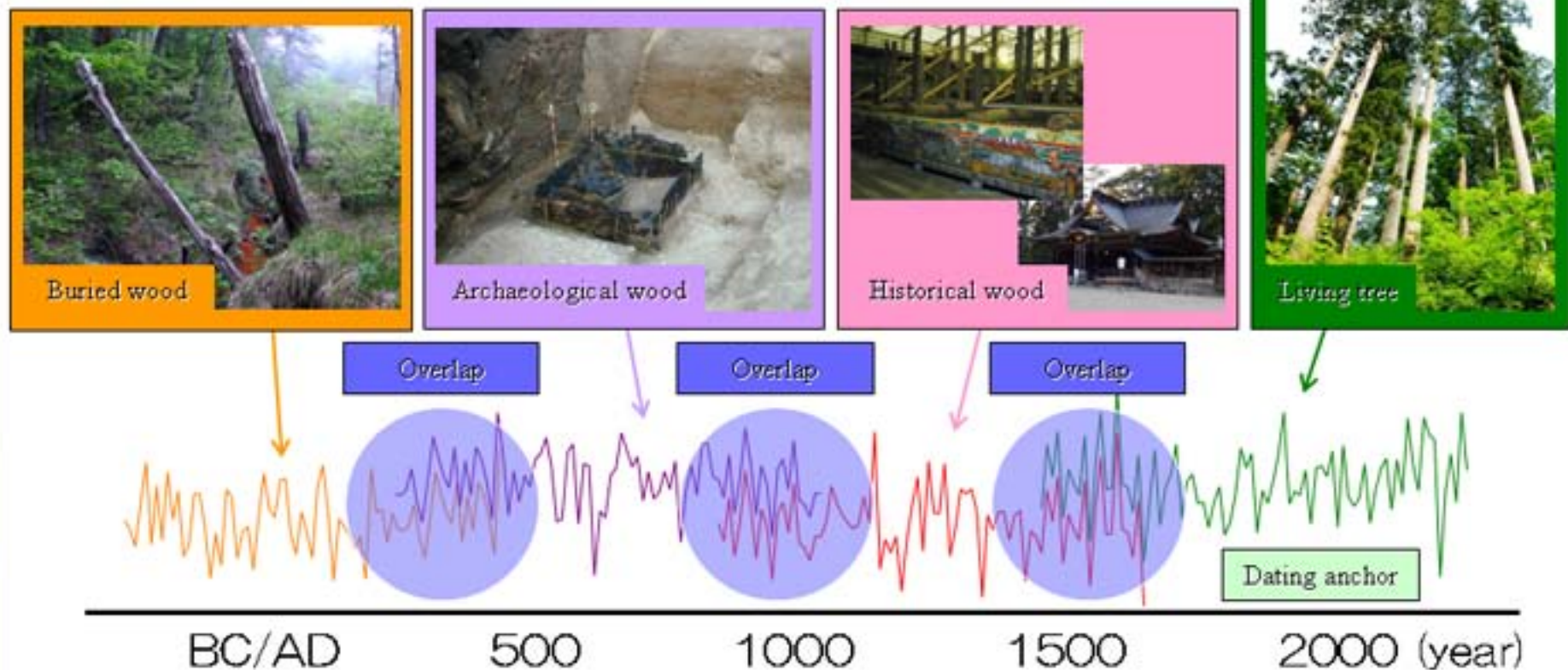
1: Development of long tree-ring chronologies

Development of site chronologies



Example for ring-width chronologies; archaeological site in northeast Japan (Japanese cedar)

Extending a tree-ring chronology



Thus, a long tree-ring chronology can be developed!!

Tree species

● Conifers

- Hinoki cypress (*Chamaecyparis obtusa*)
- Sawara cypress (*C. pisifera*)
- Hiba arbor-vitae (*Thujopsis dolabrata* var. *hondae*)
- Japanese cedar (*Cryptomeria japonica*)

Important species in the natural forest

Historical and archaeological use

● Broad-leaved tree

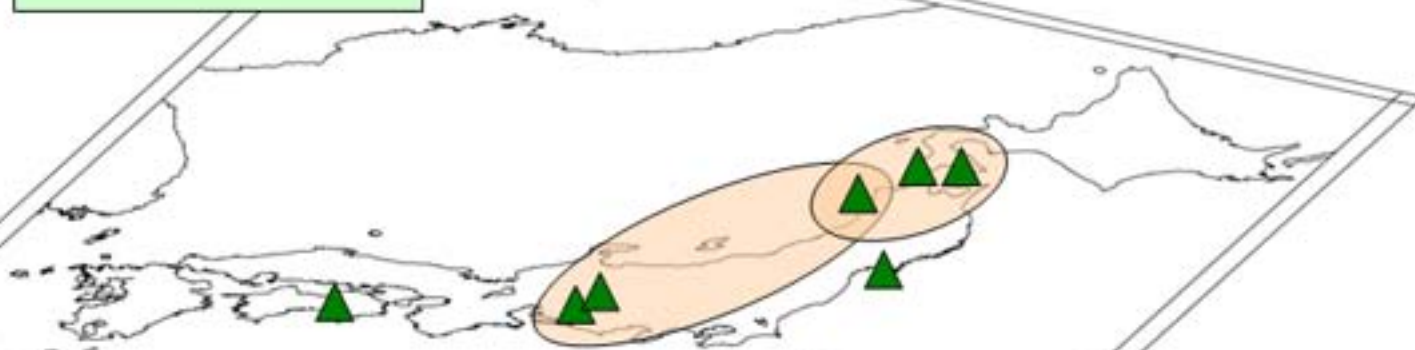
- Japanese beech (*Fagus crenata*)

Natural forest in NE Japan



Developing chronologies for living trees

Conifers



Crossdatable among
these neighbouring sites

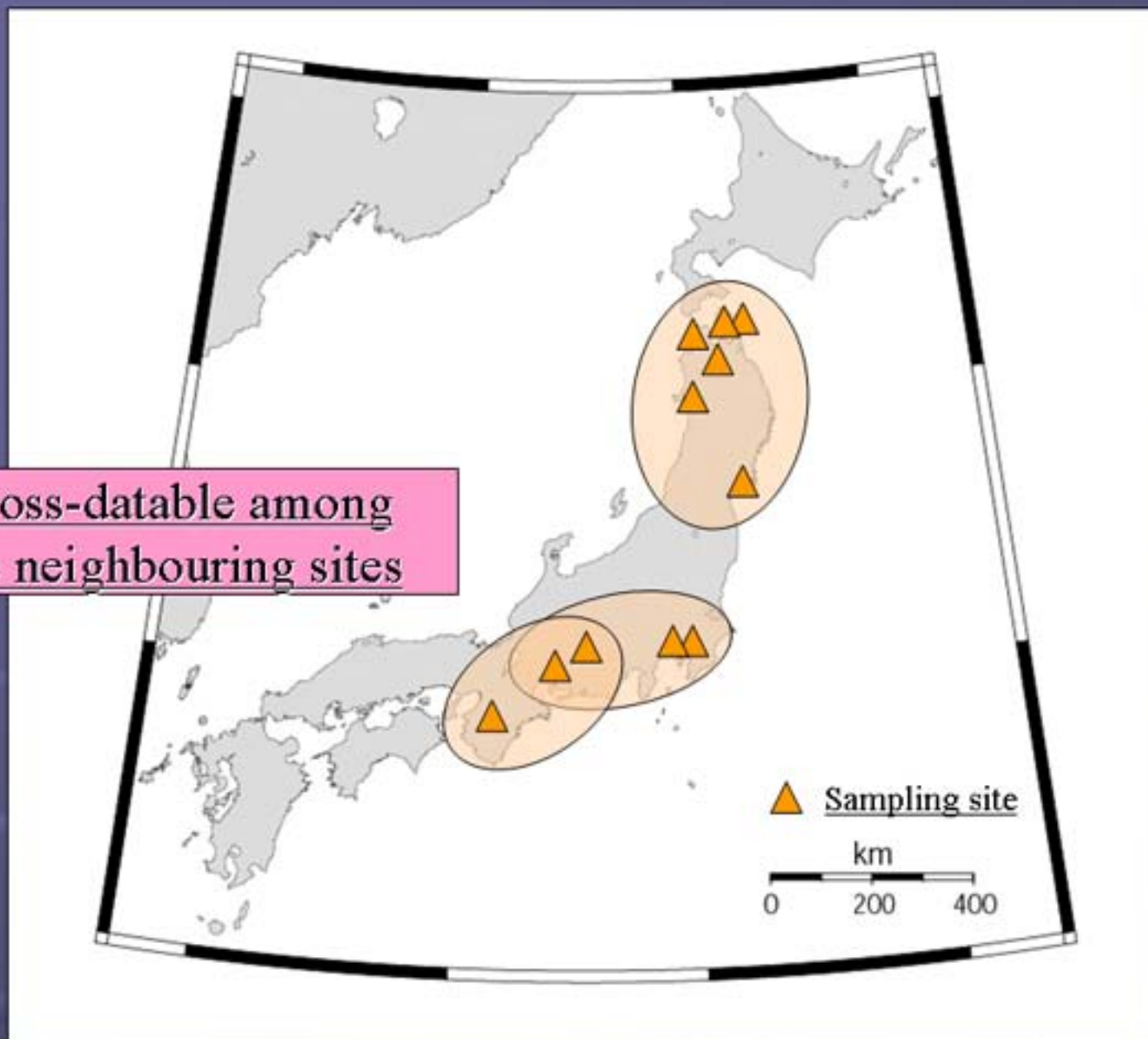


Broad-leaved trees
(Japanese beech)

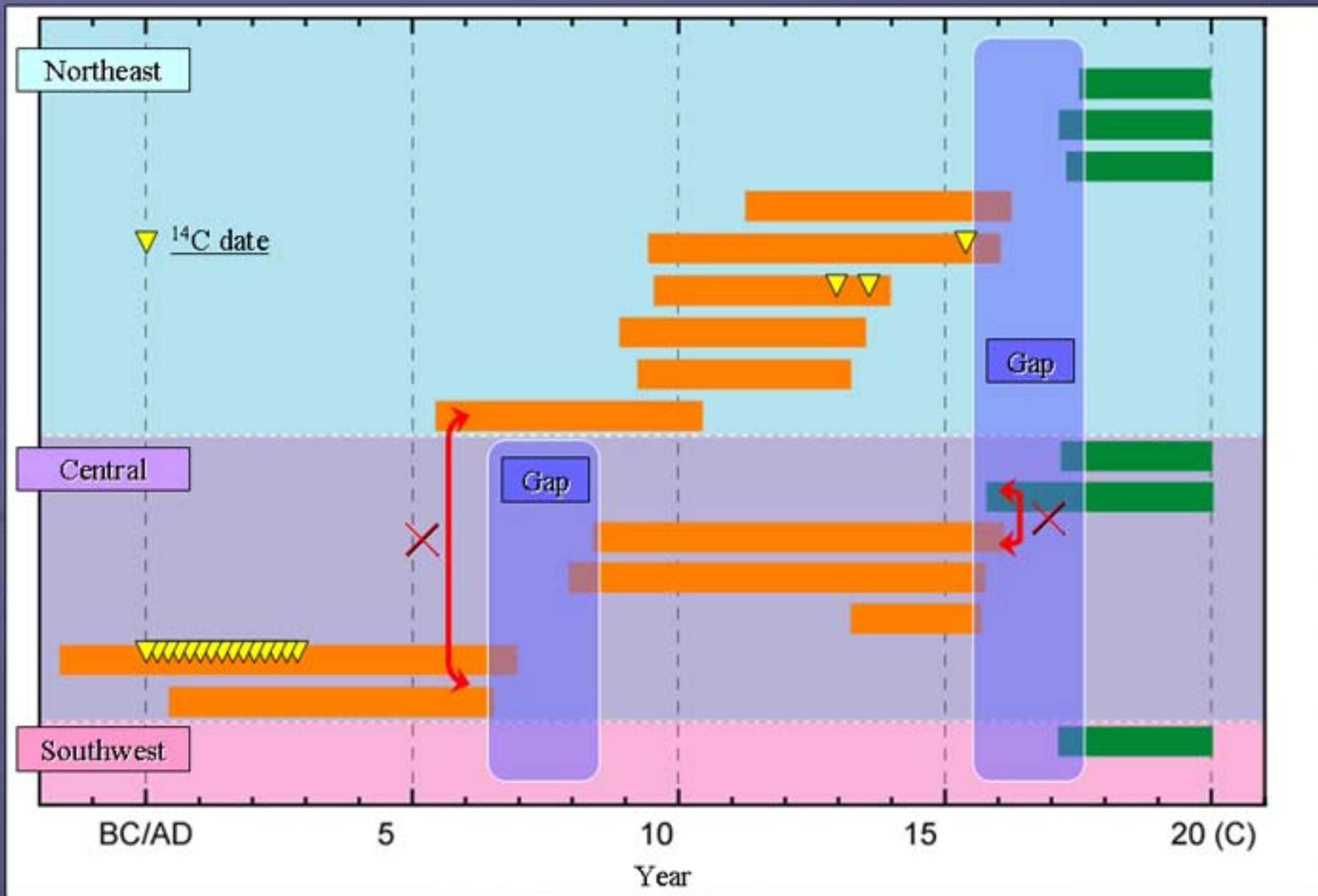
▲ ▲
Sampling site

Developing chronologies for wooden remains

Cross-datable among
the neighbouring sites



Problems in our chronology

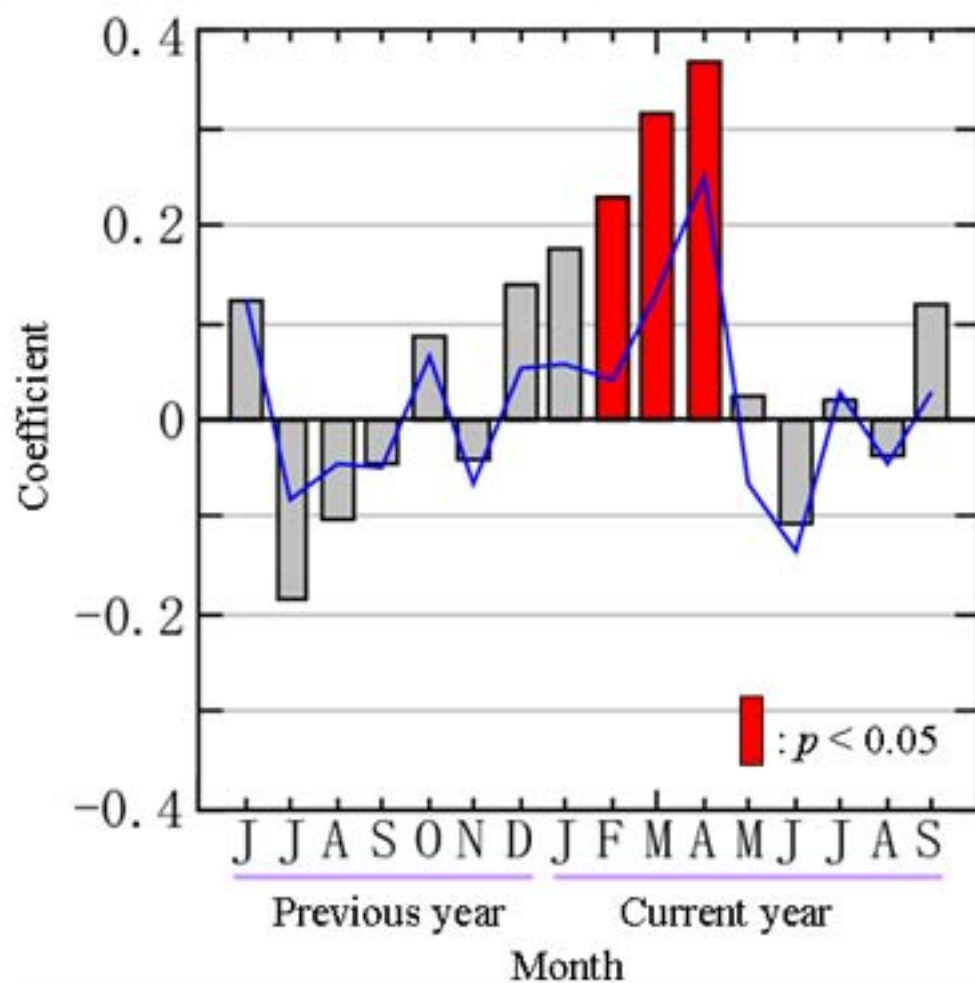


2: Potential of dendroclimatic reconstruction

Climate - growth relationship of Japanese cedar in NE Japan

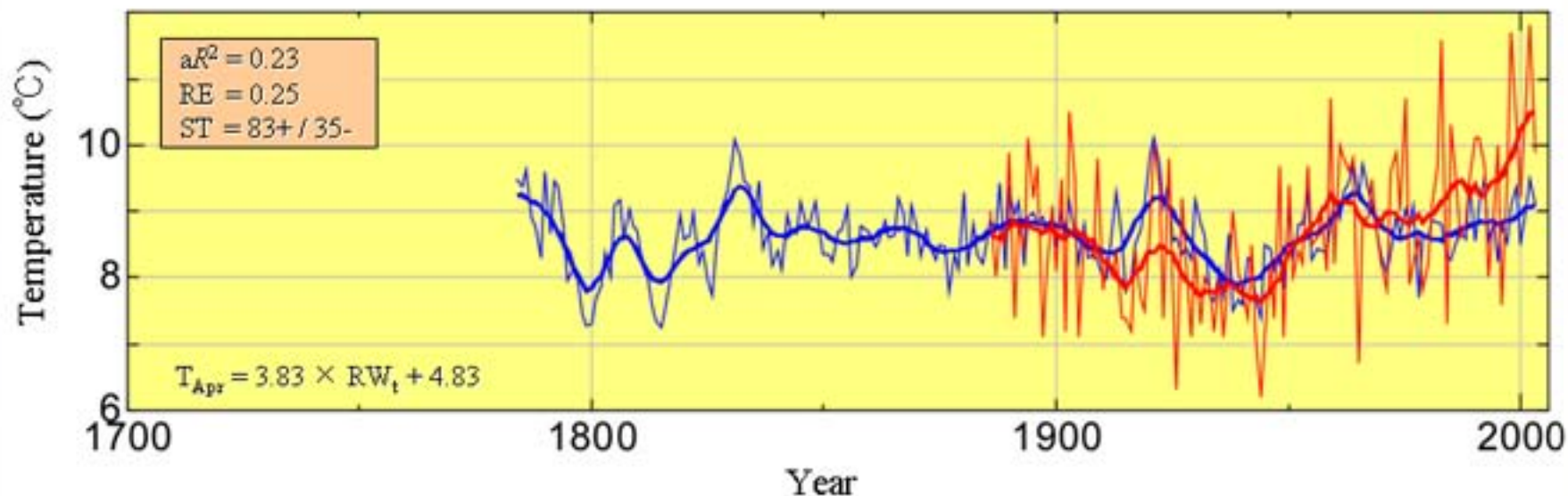


Climate - growth relationships for monthly temperature



And its dendroclimatic reconstruction

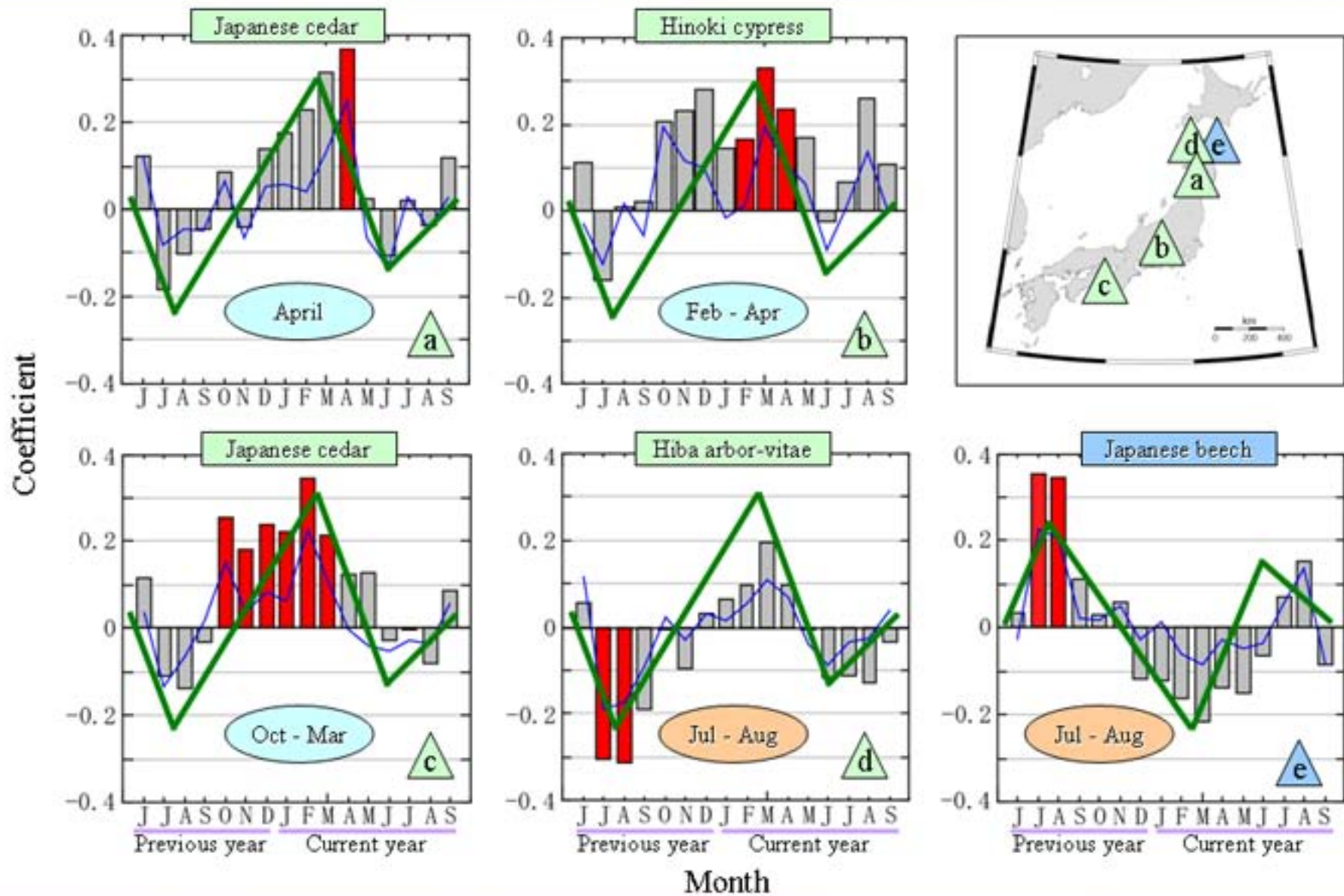
April temperature from Japanese cedar in northern part of Japan



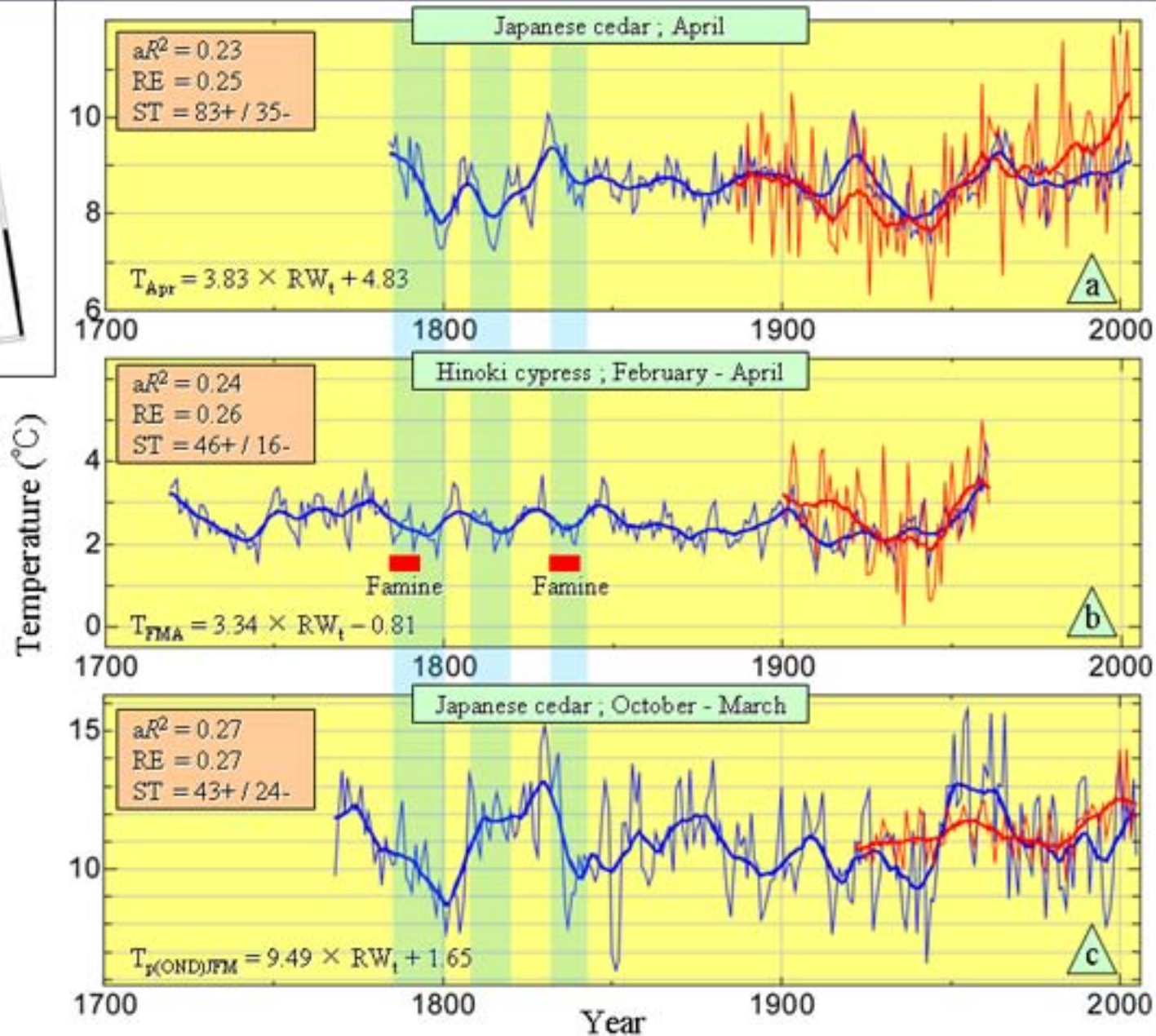
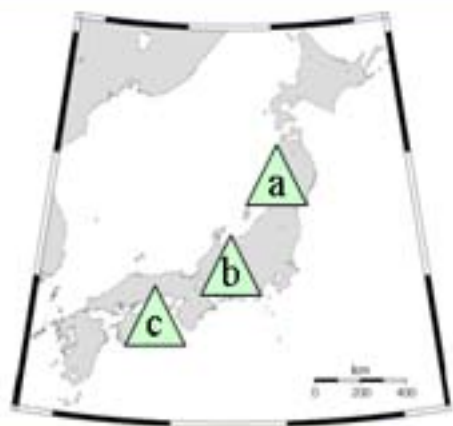
— Actual, — Estimate

- Passed all statistical tests
- With a visibly good agreement in the inter-decadal variability

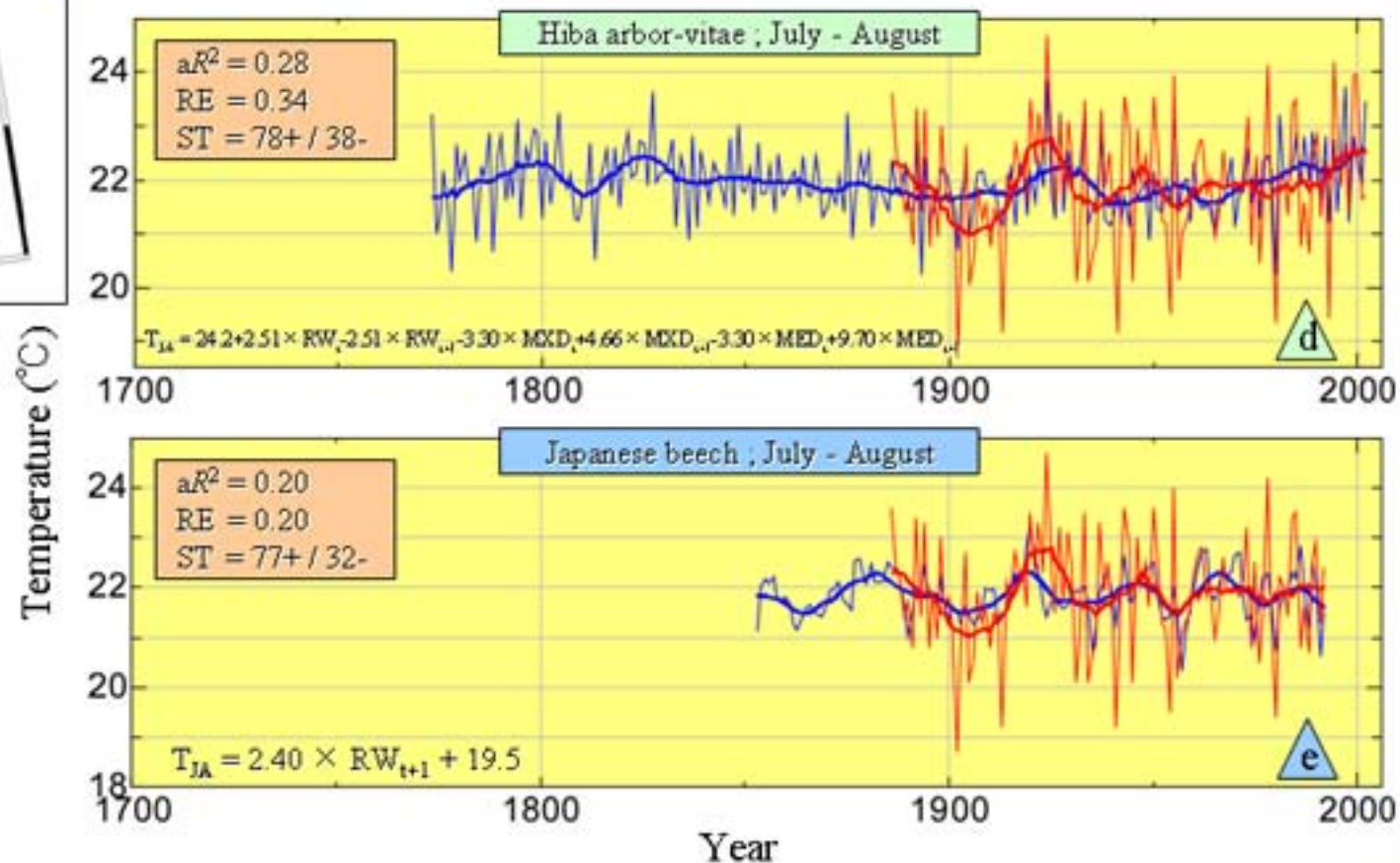
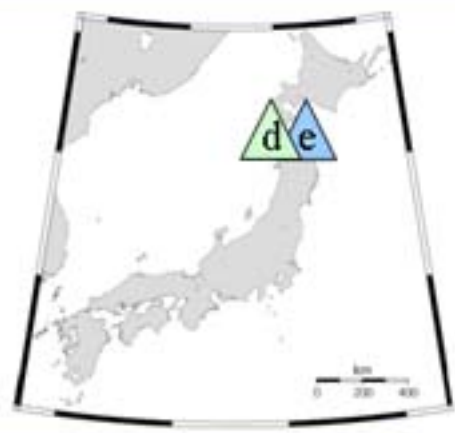
Summary of the climate - growth relationships



Autumn - spring temperature reconstructions



Summer temperature reconstructions



Our chronologies have sufficient potential to reconstruct climatic variability

Conclusion

● 1: Development of long tree-ring chronologies

- We've presented recent progress in the development of tree-ring chronologies for the last two thousand years in Japan.
- The development of chronologies should be continued because the existing chronologies have to be connected without gaps.

● 2: Potential of dendroclimatic reconstruction

- On the basis of these dendroclimatological results, it is worth examining the potential of our chronologies as proxies for reconstructing past climate variability.
- Future efforts should concentrate on climate field reconstruction in East Asia as they extend dendroclimatic reconstructions back into the past.

