Last Millennium/Last 2k temperatures in China based on reconstructions and compared to simulations

E. García Bustamante (CIEMAT)
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Source: http://www.co2science.org/data/mwp/studies/l1_gisp2.php

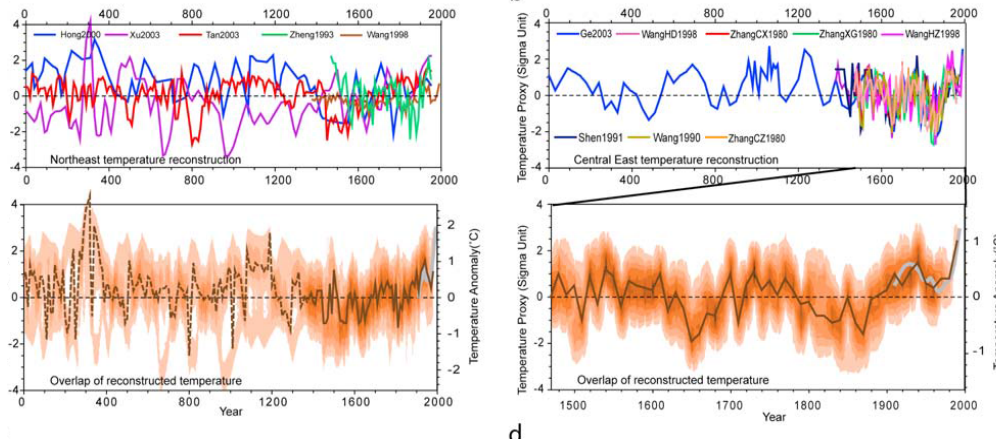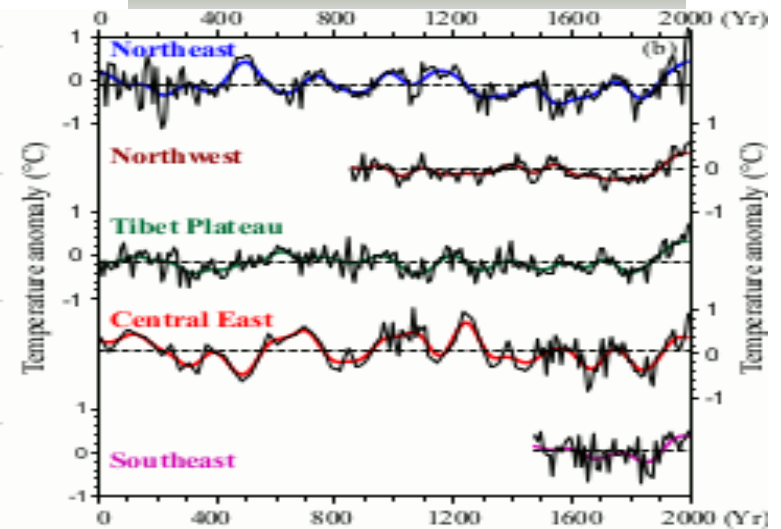Chinese Dynasty/Solar Minimum Overlay by David DuByne

Temperature Reconstructions in China from literature
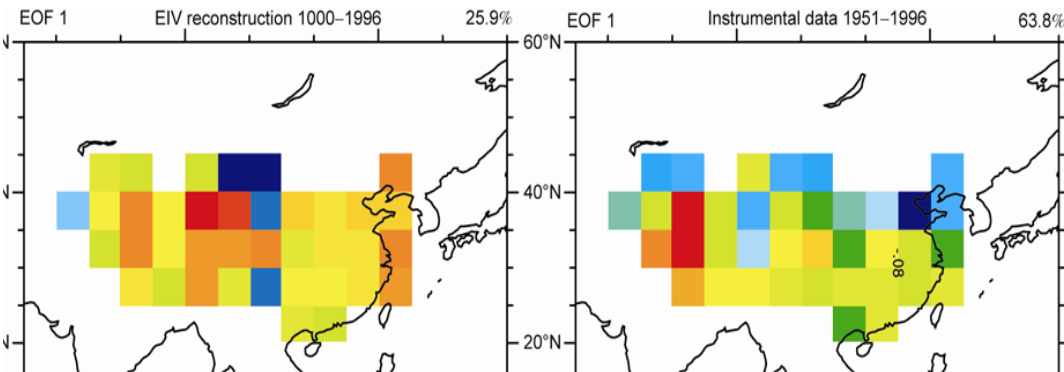
Regional reconstructions

Ge et al., Geophys. Res Lett., 2010

Ge et al., Clim. Past, 9. 2013
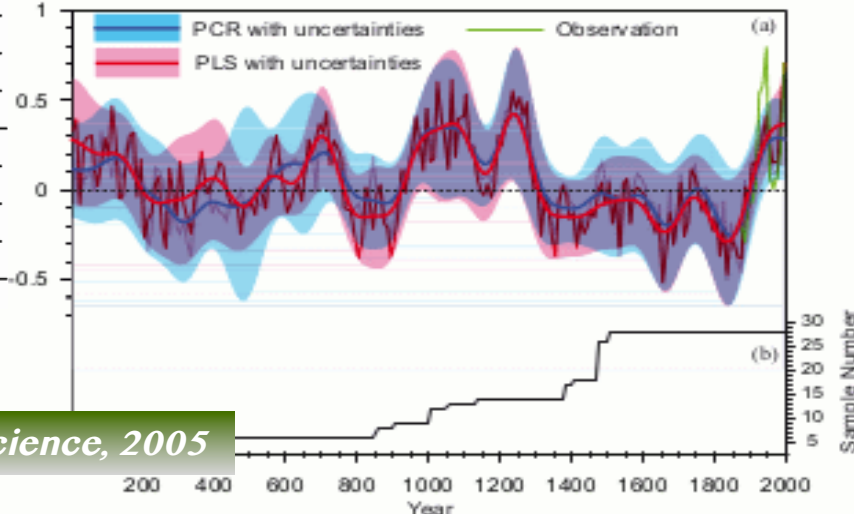
China reconstructions

Shi et al., Science China, 2013

Rutherford et al., J. Clim,. 2005

Moberg et al., Science, 2005

Ge et al., Clim. Past, 9. 2013

China reconstructions

Ge et al., Clim. Past, 9.

\#   A **review** of the state-of-the-art of last millennium/last 2k
     temperatures in China from reconstructions

\# A **revised database** of temperature reconstructions + updated
    T reconstruction of whole China and at the regional scale

Shi et al., Science China, 2013

\# A discussion about **the subjectivity in the methods**
   and it impacts in temperature estimates:
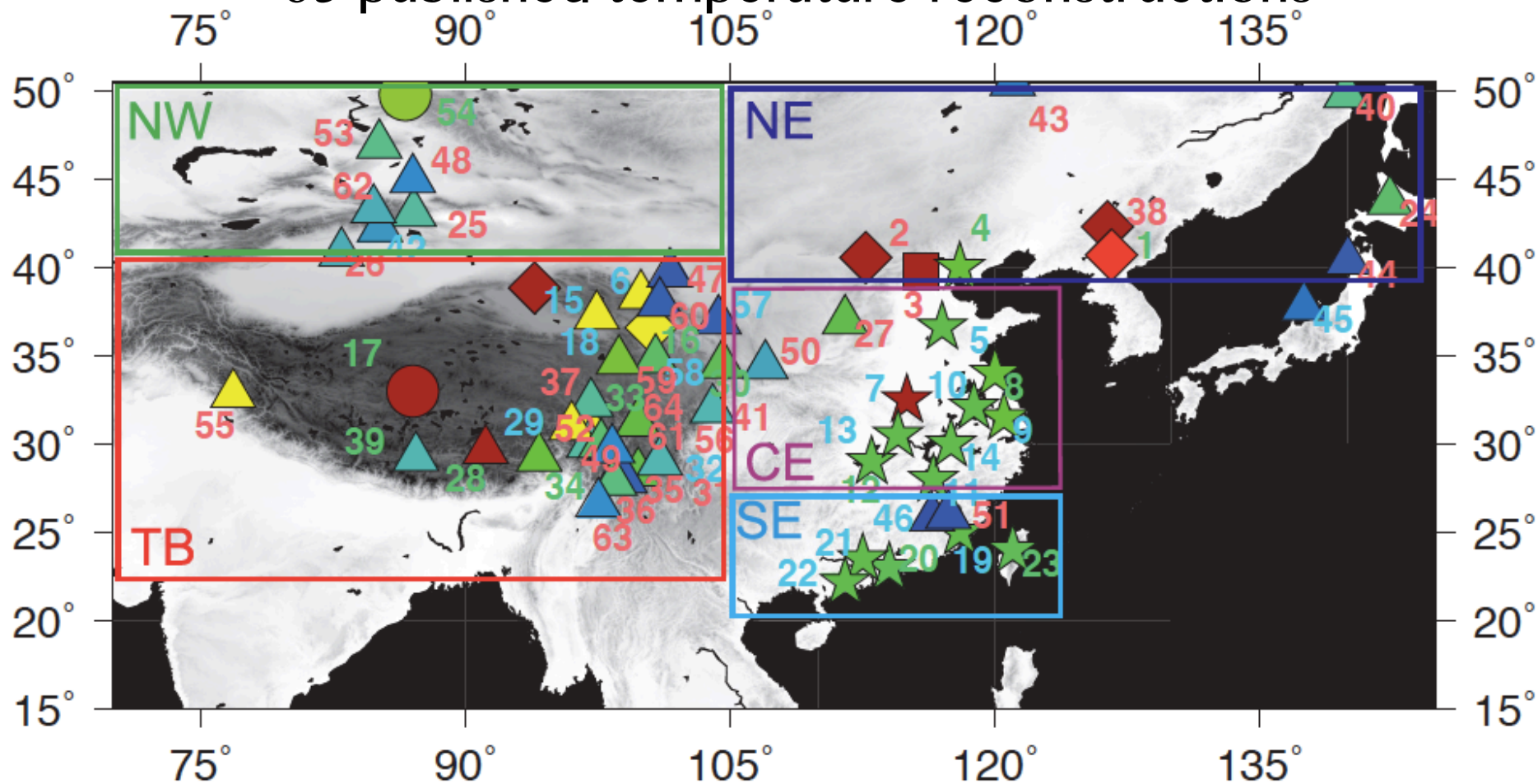   - selection of proxies,
   - calibration method
   - instrumental target (Fernandez-Donado et al., in prep.)
   - seasonality (Chu et al, 2012)
   - …

Regional reconstructions

\# Associated **uncertainty**

\# Comparison to PMIP3 **simulations**
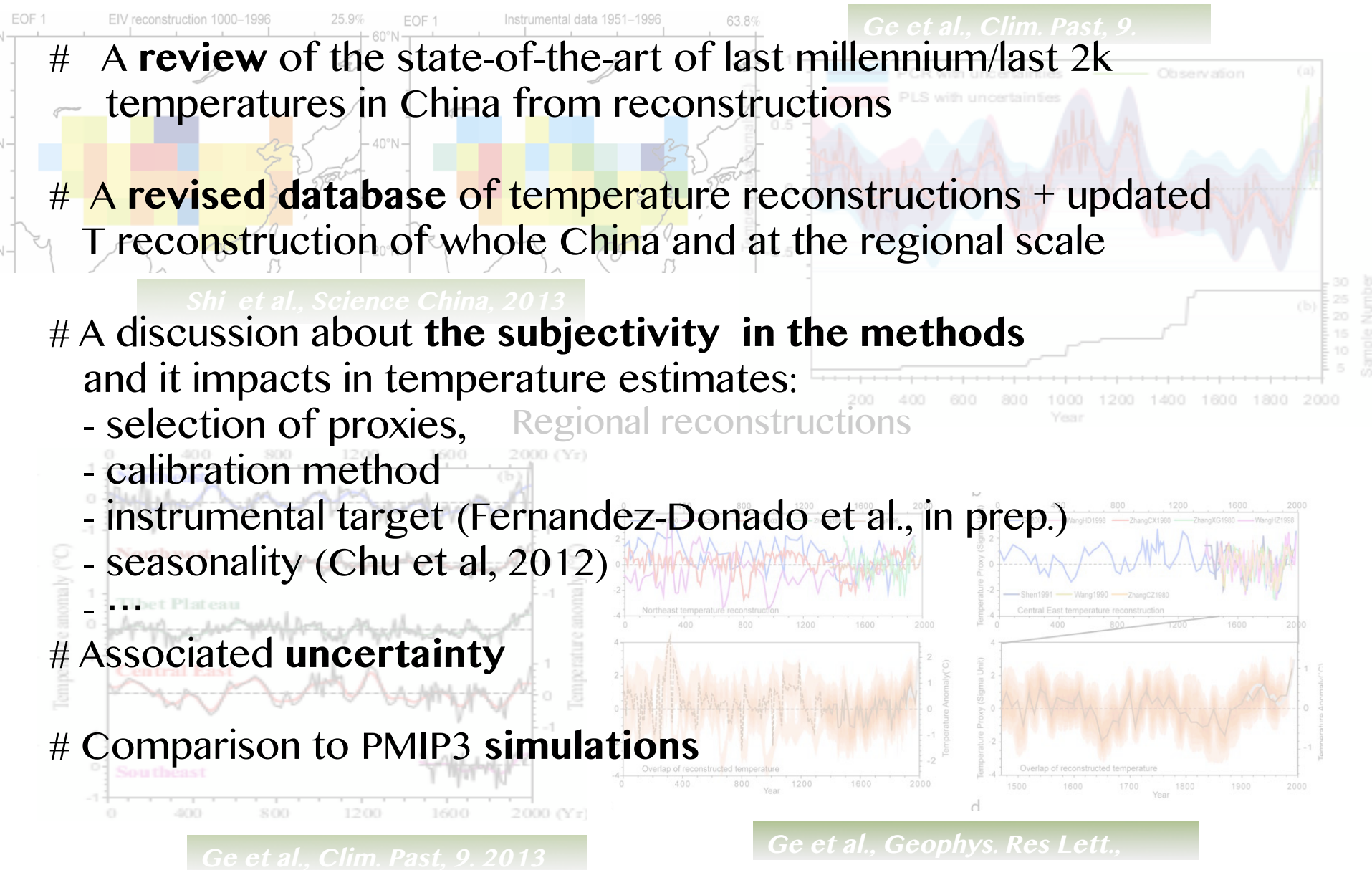
Ge et al., Clim. Past, 9. 2013

Ge et al., Geophys. Res Lett.,

65 published temperature reconstructions

65 published temperature reconstructions & the statistical uncertainty

30-dec anomalies w.r.t 1850-1990
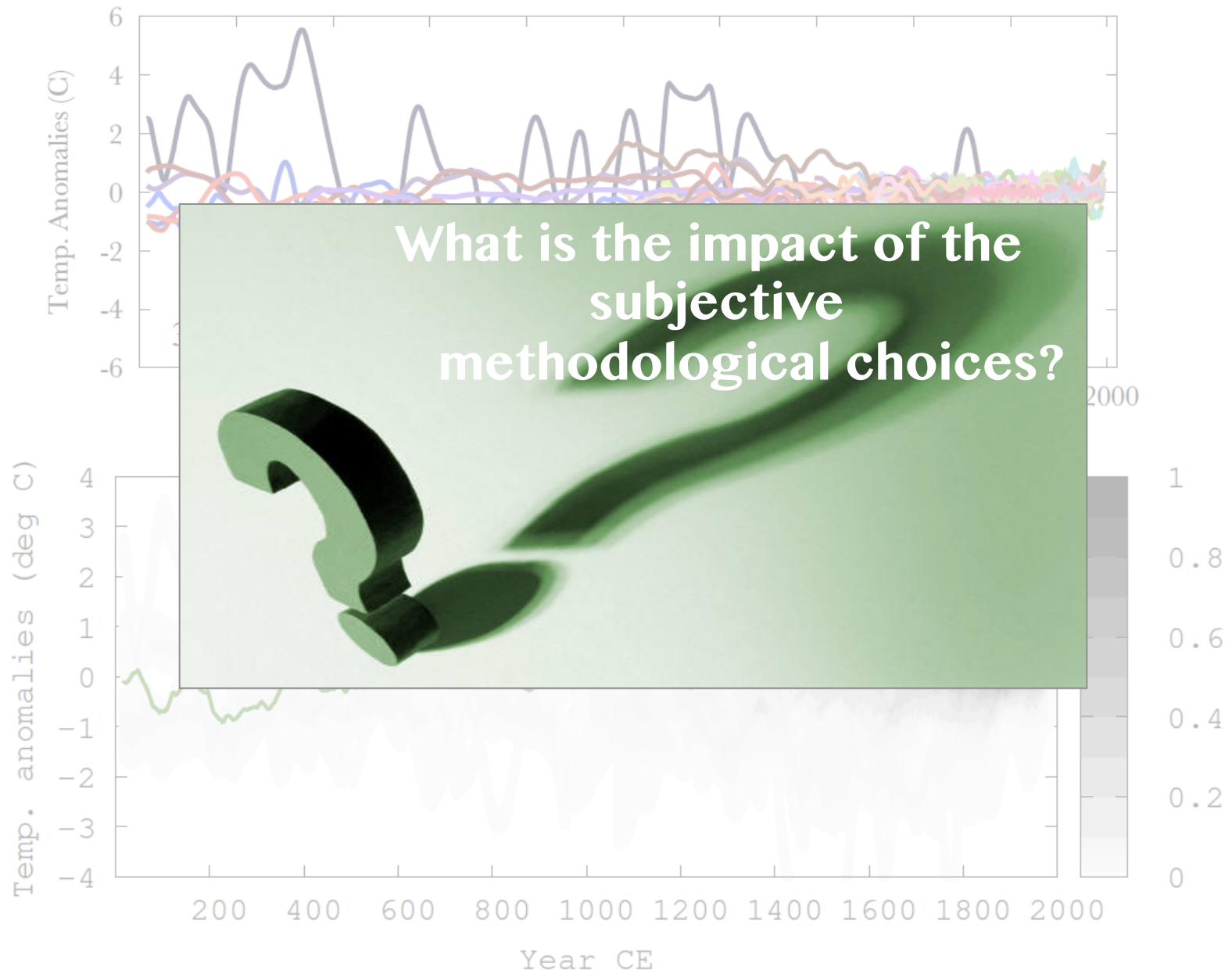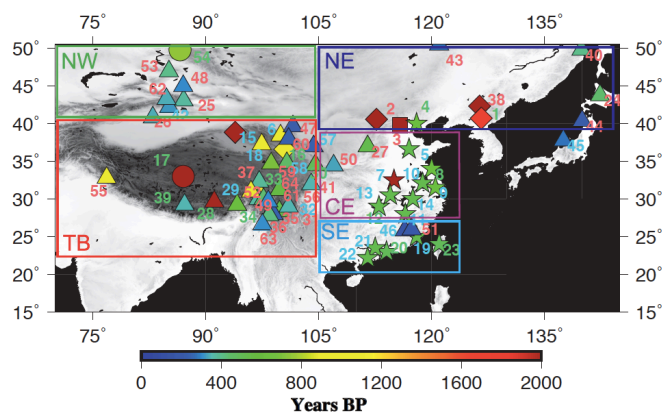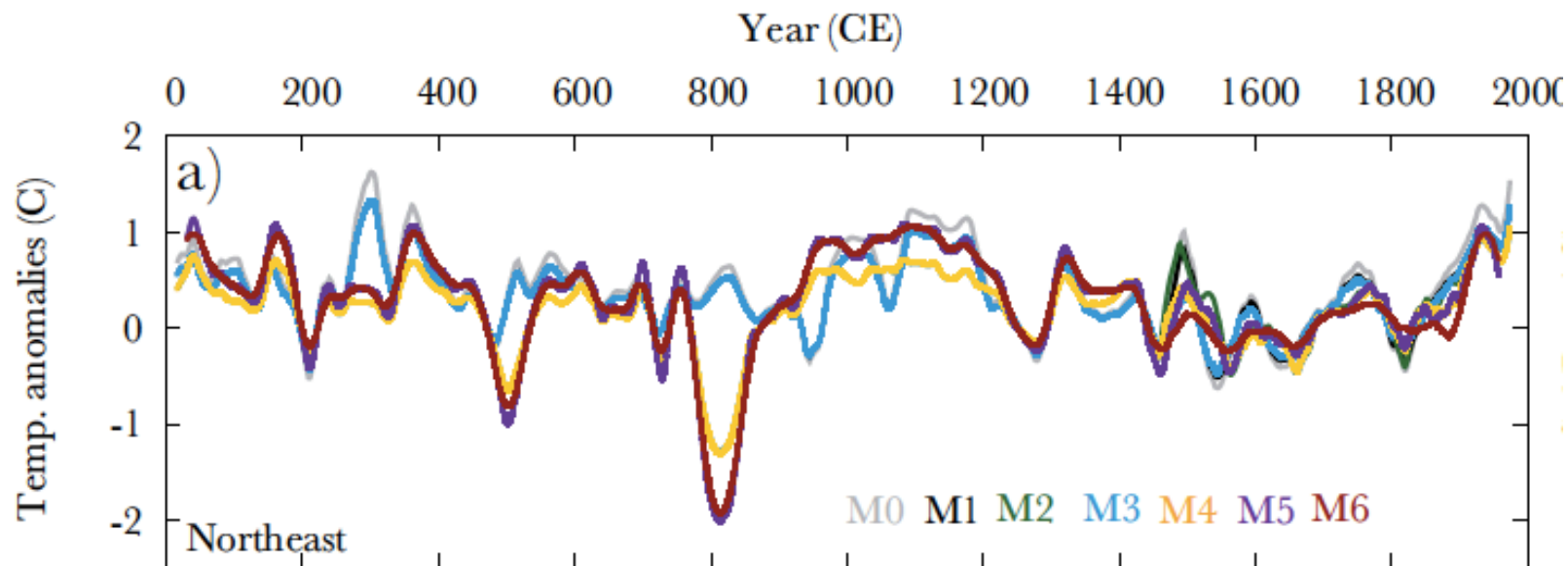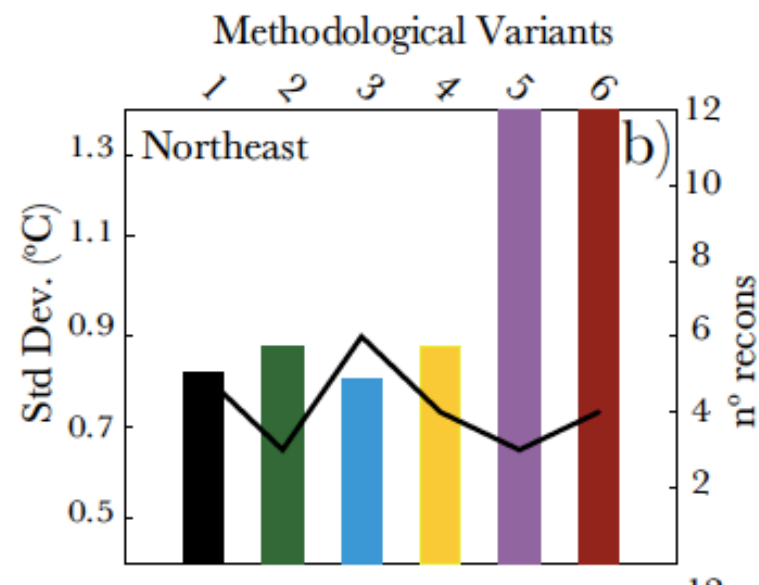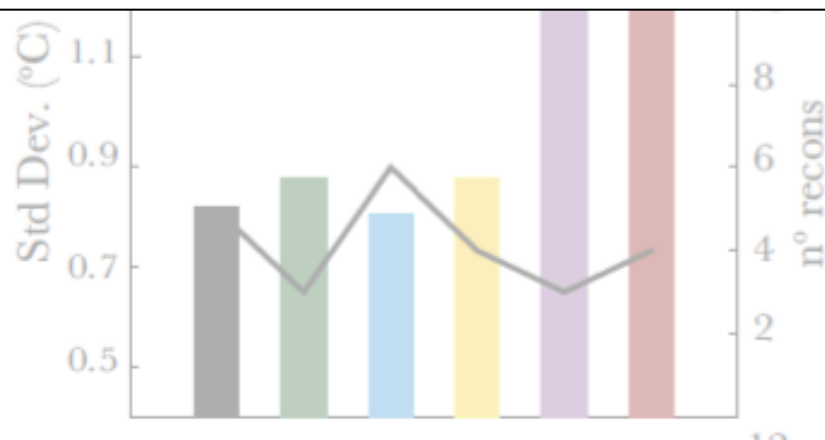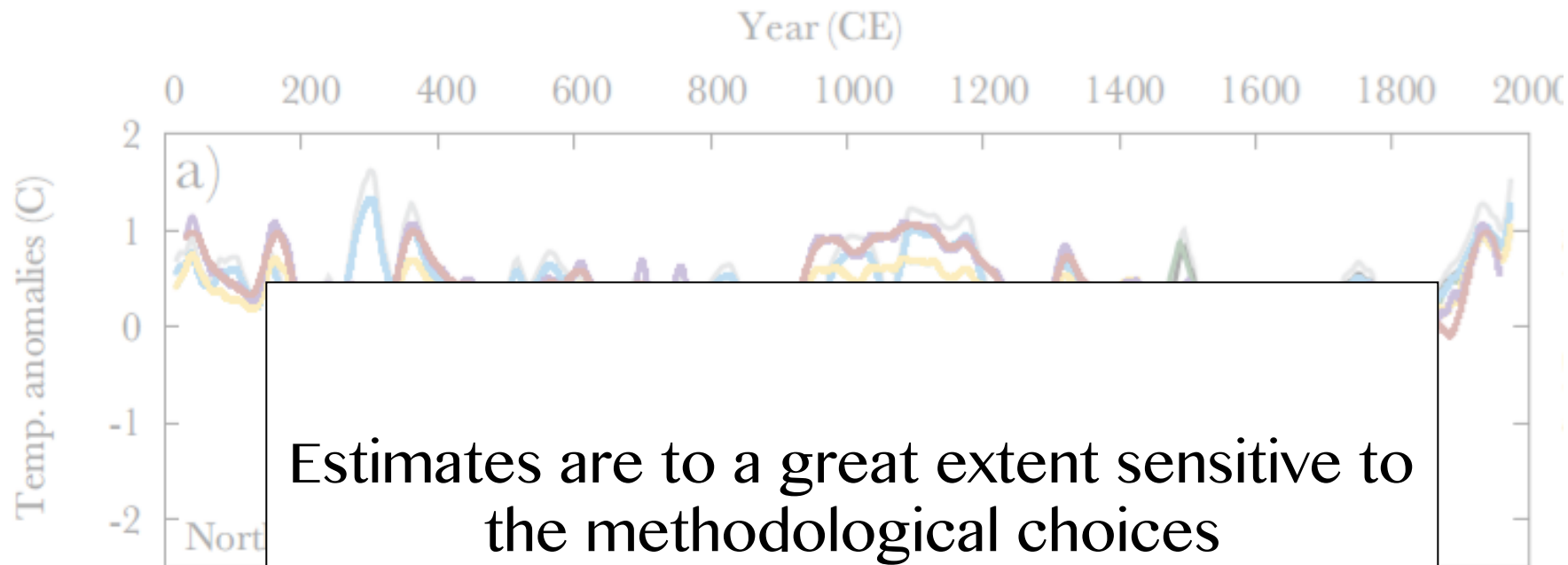
65 published temperature reconstructions & the statistical uncertainty

30-dec anomalies w.r.t 1850-1990

What is the impact of the subjective methodological choices?

Methodological sensitivity

a) Temp. anomalies (C) — Northeast. M0 M1 M2 M3 M4 M5 M6

b) Northeast — Methodological Variants 1 2 3 4 5 6; Std Dev. (°C); n° recons
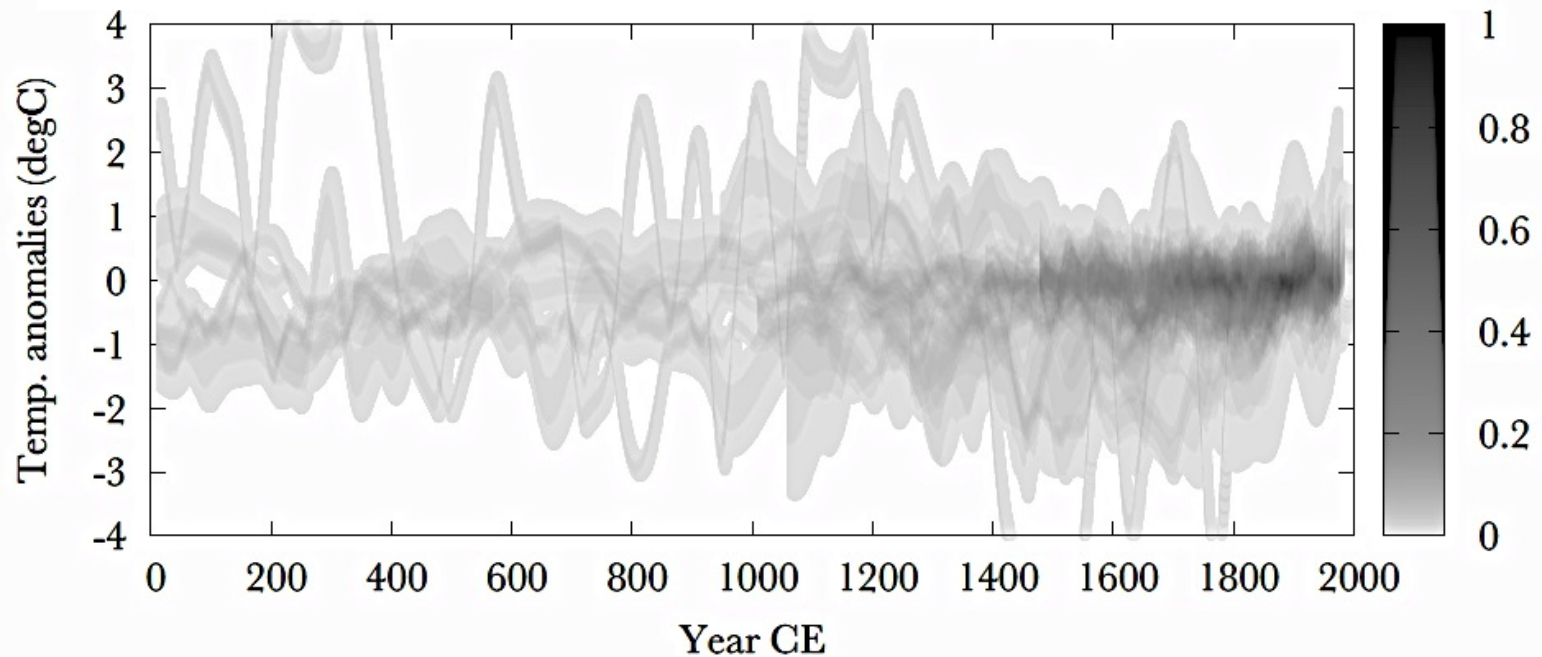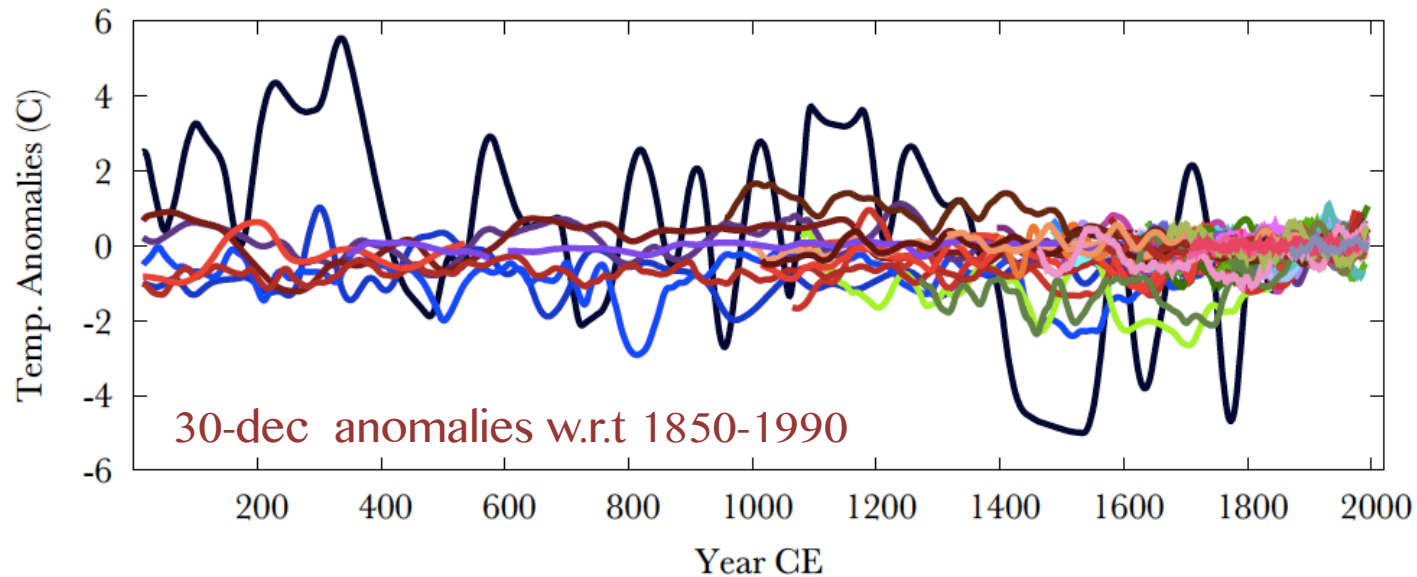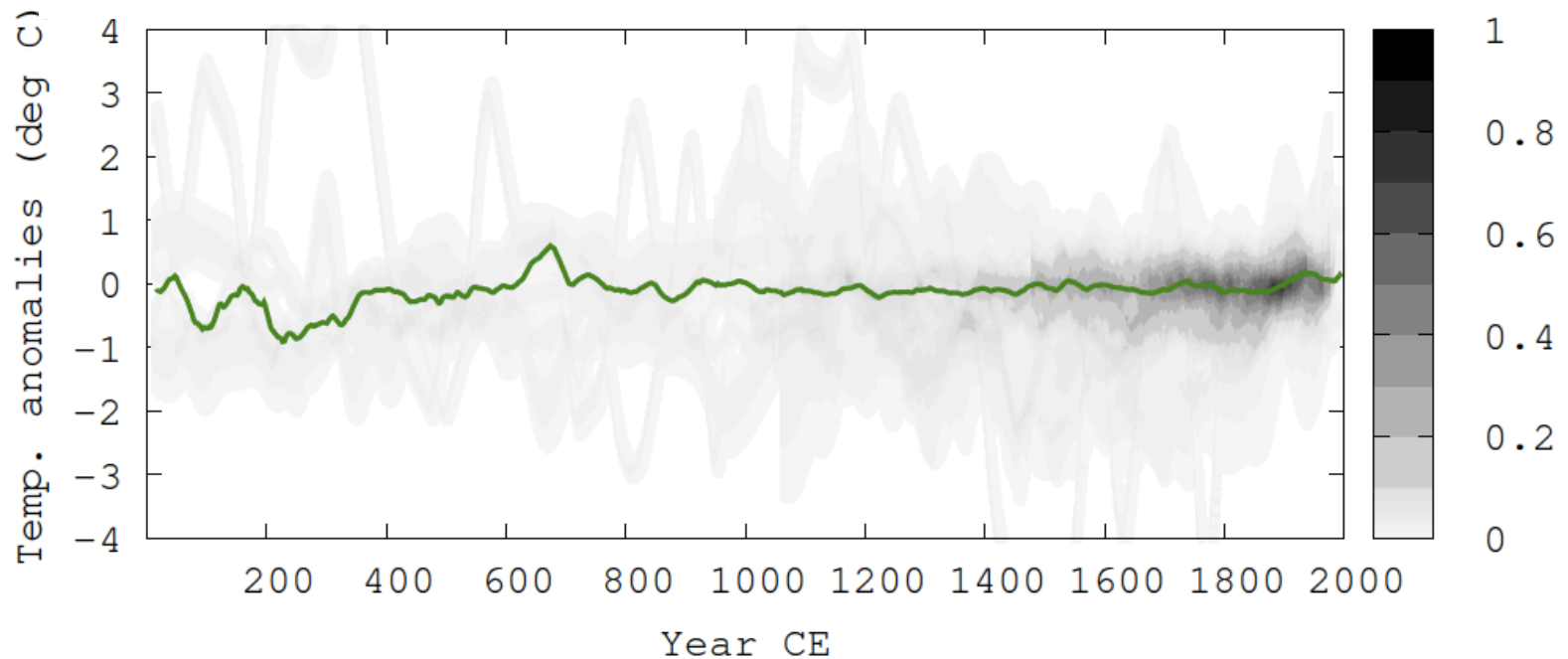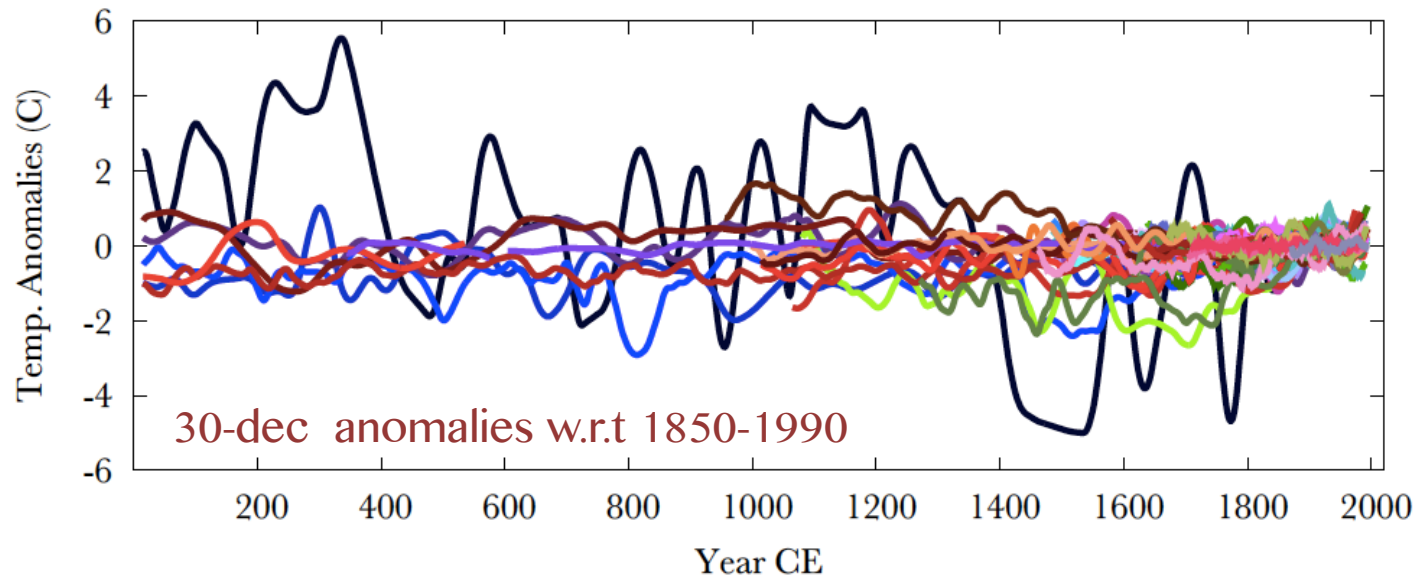
Version	Reconstructions	Re-calibration method
M0	[Ge10,13]	Regional
M1	[Ge10,13$_{pseudo}$]	Regional
M2	[Ge10,13$_{pseudo}$] - NRR	Regional
M3	[Ge10,13$_{pseudo}$] + N	Regional
M4	[Ge10,13$_{pseudo}$] - NRR + N	Regional
M5	[Ge10,13$_{pseudo}$] - NRR	Local
M6	[Ge10,13$_{pseudo}$] - NRR + N	Local

Methodological sensitivity

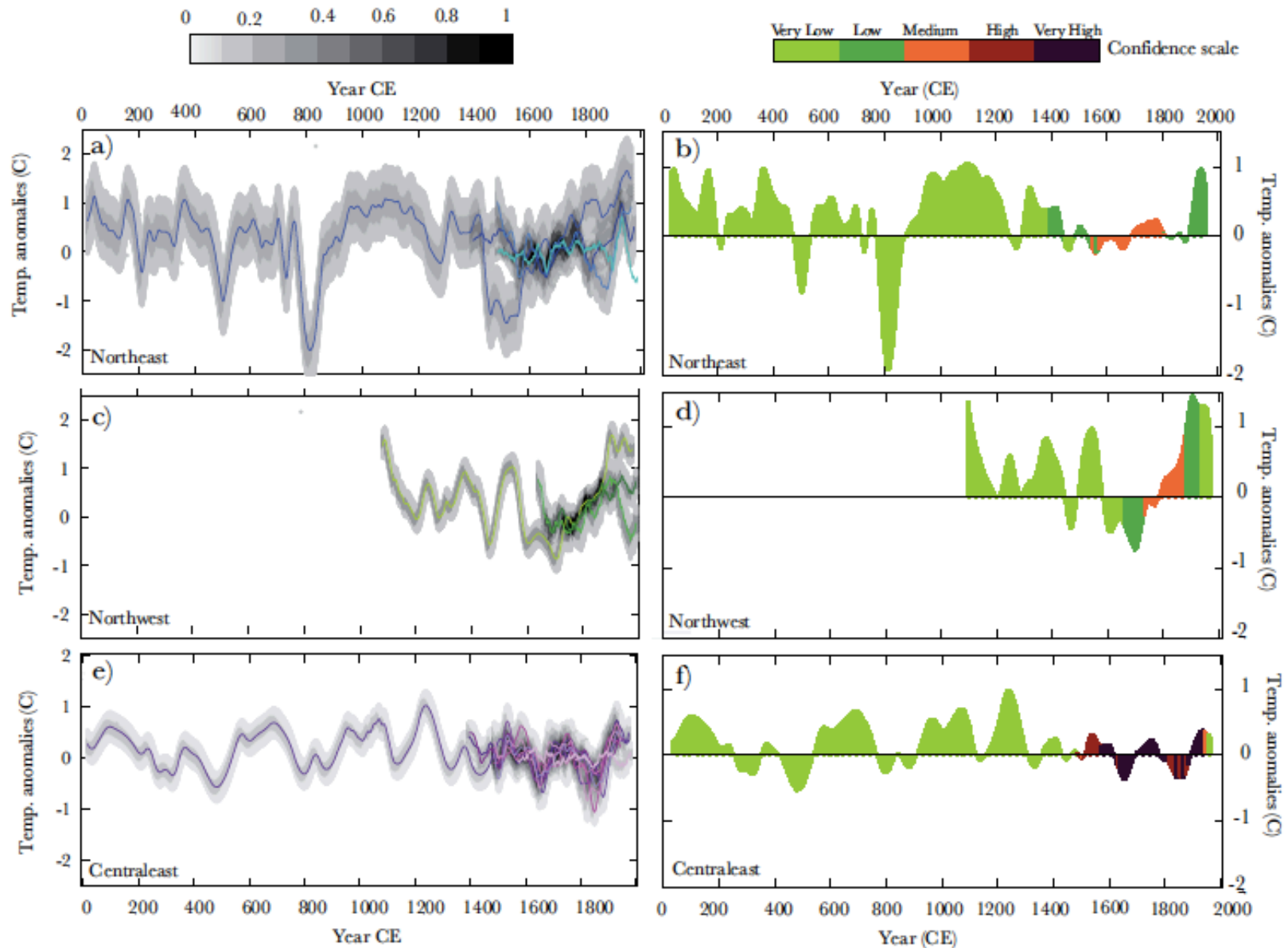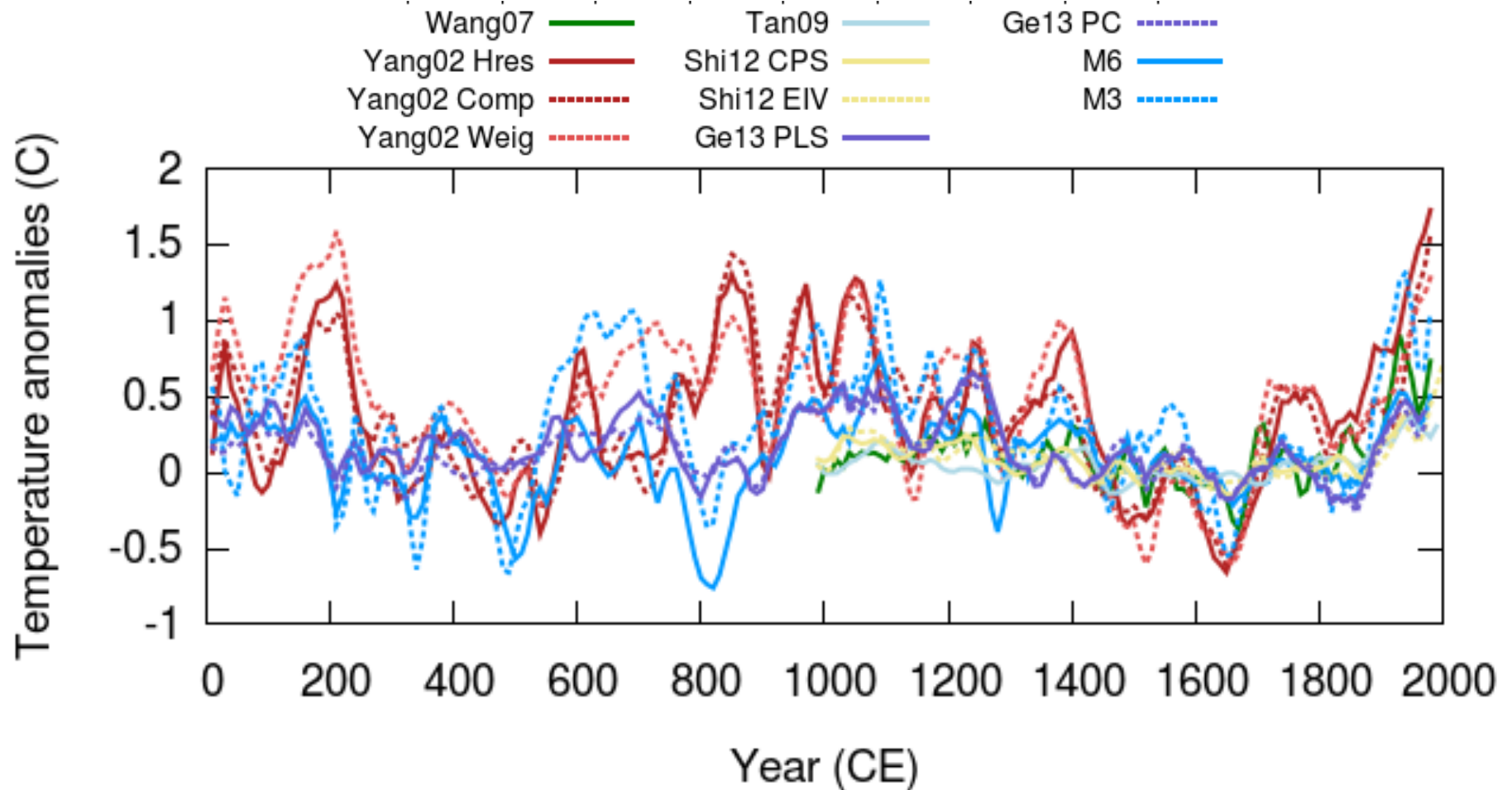Estimates are to a great extent sensitive to the methodological choices

Regional variability of the last 2k: confidence?

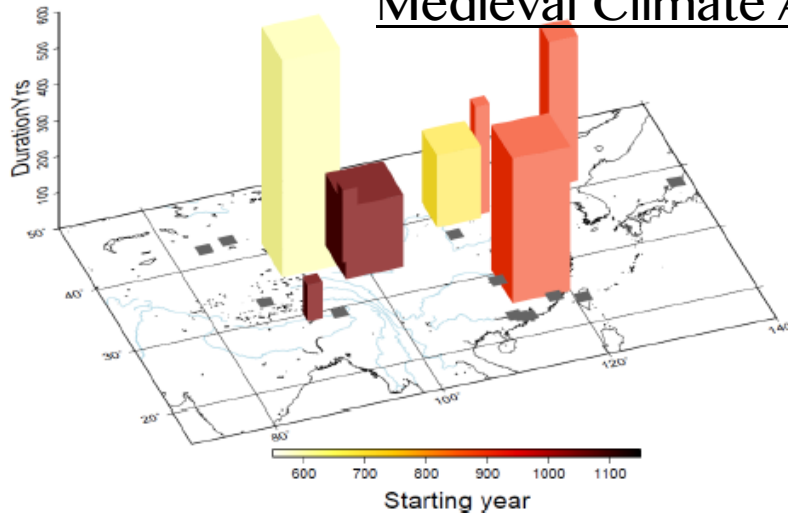**Qualitative *vs* quantitative uncertainty?**

China temperature reconstructions

China temperature reconstructions

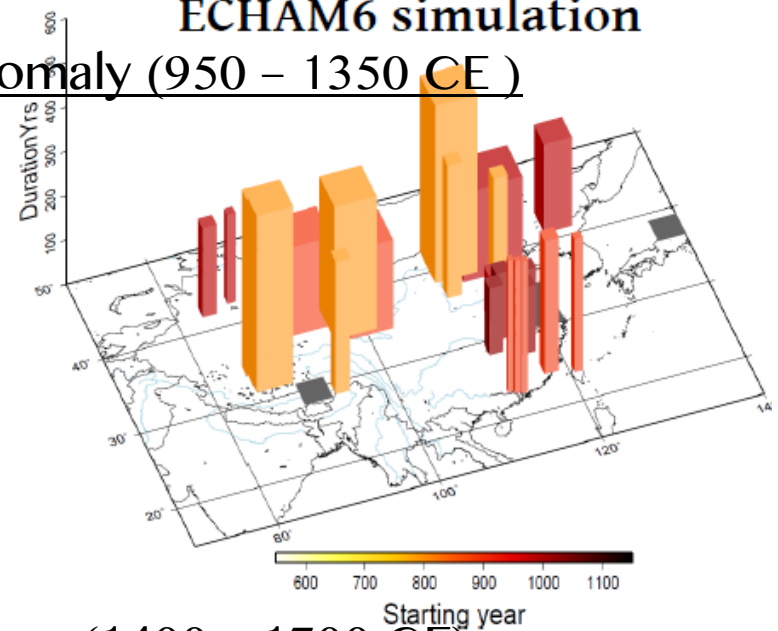|		
Wang07	Tan09	Ge13 PC
Yang02 Hres	Shi12 CPS	M6
Yang02 Comp	Shi12 EIV	M3
Yang02 Weig	Ge13 PLS	
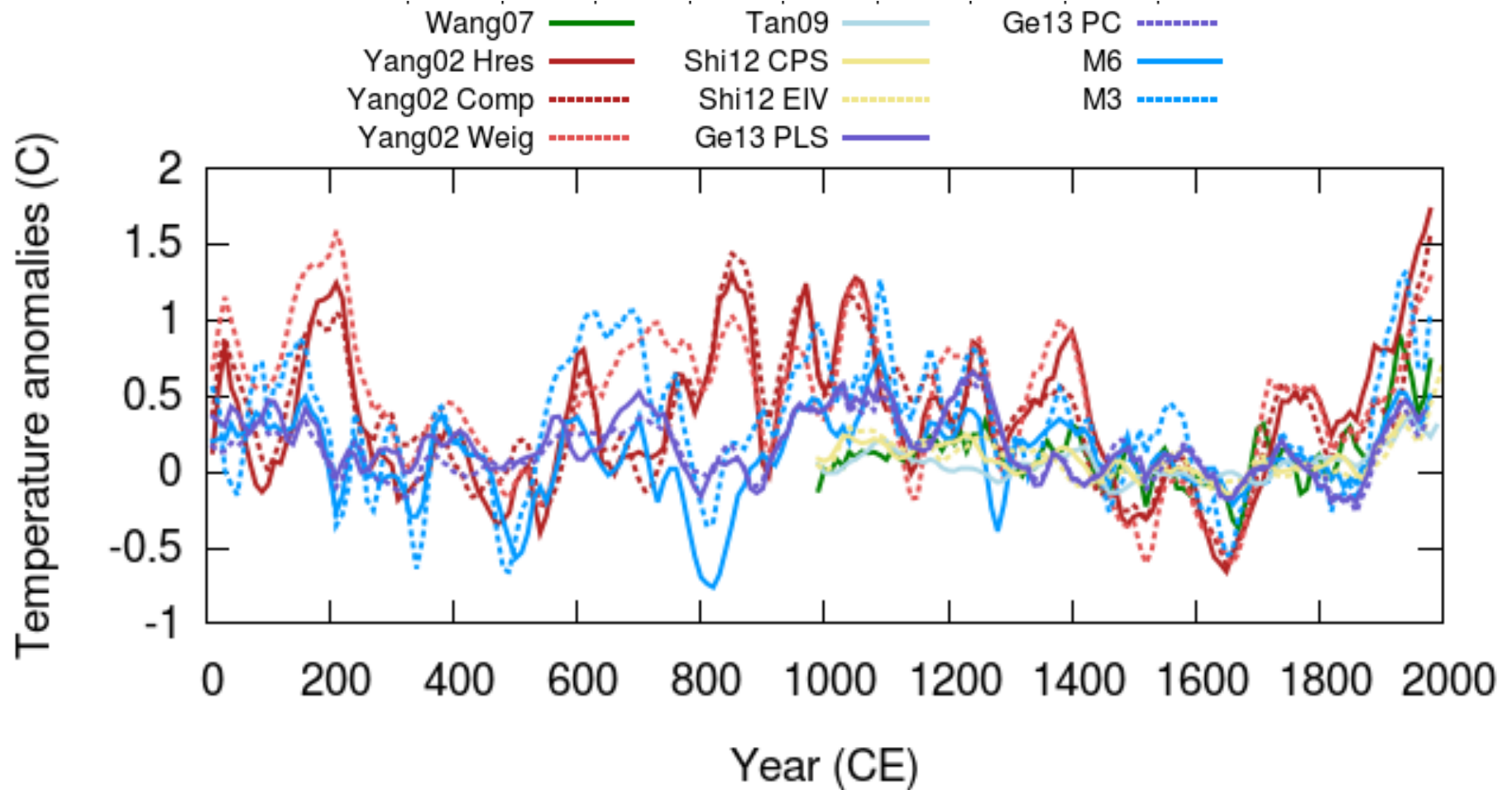
Last Millennium key periods in China from simulations and reconstructions

Reconstructions

ECHAM6 simulation
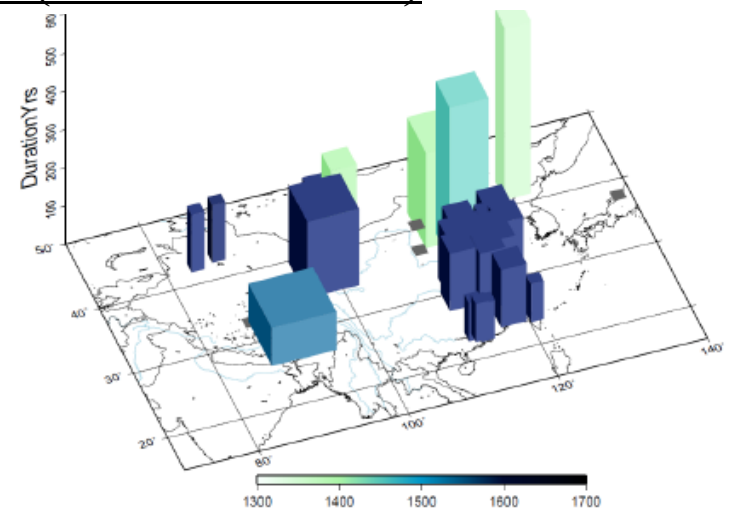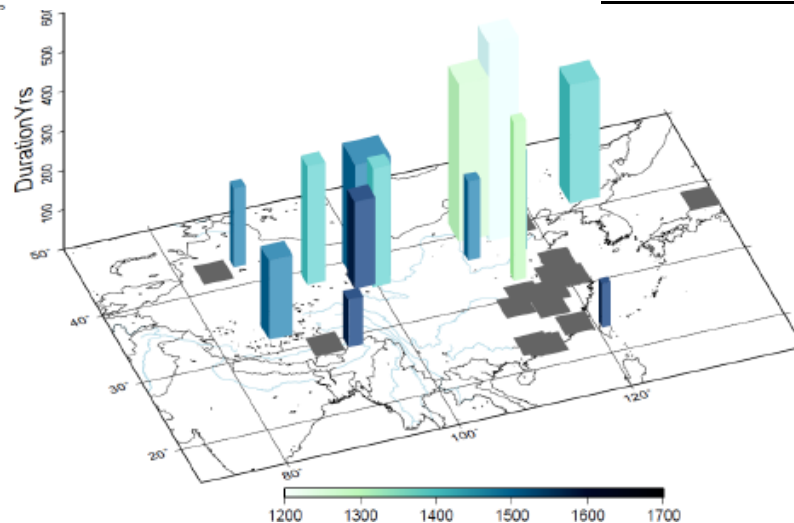
Medieval Climate Anomaly (950 – 1350 CE)

Little Ice Age (1400 – 1700 CE)

<u>CONCLUSIONS</u>

There is a **significant impact** in temperature estimates of the various methodological decisions that needs to be assessed

The **methodological sensitivity** for a multiproxy recon **implies living with a degree of uncertainty**: optimizing the selection criteria might be difficult but, for instance in a comparison frame a **consensus** about criteria should be reached.

Seasonal variations, uncertainty in **the instrumental target** are to a great extent still unexplored in this area
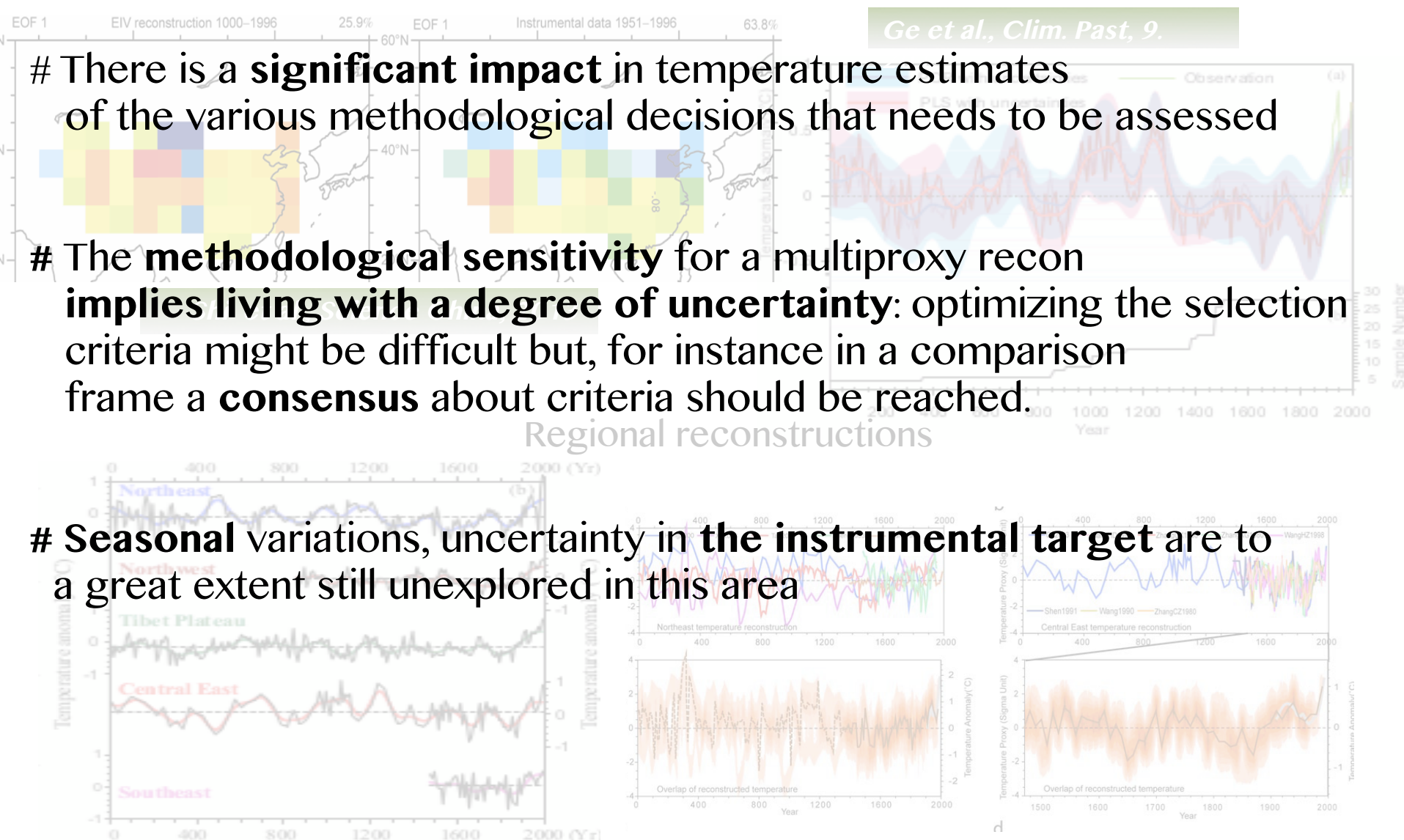
Ge et al., Clim. Past, 9.

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EMS 2016. 12-16 Sep, Trieste, Italy

Source: http://www.co2science.org/data/mwp/studies/l1_gisp2.php

Chinese Dynasty/Solar Minimum Overlay by David DuByne