



Synchronous natural climate cycles observed for European glaciers, temperature proxies for China, and for a global temperature proxy covering the Common Era

Michael Asten (1), Kuan-Hui Elaine Lin (2), and Carl Otto Weiss (3)

(1) Monash University, School of Earth Atmosphere and Environment, Melbourne, Australia (michael.asten@monash.edu),

(2) Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan (khelin@gate.sinica.edu.tw), (3)

CINVESTAV Queretaro, Qto. Mexico (carl.weiss@gmx.de)

We compare proxy temperature cycles for four data sets within the Common Era:

- 1) the Great Aletsch glacier, western Europe (termed “Alps”)
- 2) a multi-proxy reconstruction for China by Ge et al, 2017 (“all-China”)
- 3) two reconstructions for North China and Central China using historical meteorological data, by Wang et al, 2018, after Zhang, 2013 (“N-China”, “C-China”)
- 4) the seven-proxy global temperature reconstruction G7 of Ludecke and Weiss, 2017 (“G7”).

N-China and C-China have the highest resolution, and cover years 1392-1896 (after 31-year smoothing). Alps, all-China and G7 cover most of the Common Era from 16-1995CE.

For the time-span 800-2000CE the retreat/advance of alpine glaciations recorded in Alps correlates closely with temperature changes for all-China, with the obvious visual correspondence of some six maxima and minima in the two data sets showing a high quantitative correlation ($r=0.76$). Similar correlations are obtained for Alps with the higher-resolution proxies N-China and C-China for the time-span 1550-1896.

For the time-span 800-2000CE the correlation of Alps with G7, and all-China with G7, are smaller ($r=0.55$, 0.62 respectively). It is visually obvious that the reduced correlations are associated with a weaker correspondence for the post-Medieval time-span 1500-2000CE. Thus the northern hemisphere Little Ice age as recorded in Alps and all-China appears to have a lesser representation in the southern hemisphere temperature proxies used to construct G7.

Power spectra for Alps, all-China and G7 for the time-span 16-2000CE each show similar dominant periods of 1000 yr, 500 yr and 190 yr; these periods have previously been reported for the G7 global proxy. However the two northern hemisphere spectra for Alps and all-China contain an additional maximum at a 230-250 yr period, not evident in the global proxy. This poses the questions, what global forcing mechanisms are driving the three common periods, and is the anomalous 230-250 year period attributable to continent-ocean differences between the hemispheres?