Famine, pestilence and flagellation: What can we learn from the climate of the last 2,000 years?

Steven J. Phipps

Climate Change Research Centre
ARC Centre of Excellence for Climate System Science
University of New South Wales, Sydney, Australia

CLIMATIC AND DEMOGRAPHIC CONSEQUENCES OF THE MASSIVE VOLCANIC ERUPTION OF 1258

RICHARD B. STOTHERS
Institute for Space Studies, Goddard Space Flight Center, NASA, 2880 Broadway, New York, NY 10025, U.S.A.

Abstract. Somewhere in the tropics, a volcano exploded violently during the year 1258, producing a massive stratospheric aerosol veil that eventually blanketed the globe. Arctic and Antarctic ice cores suggest that this was the world's largest volcanic eruption of the past millennium. According to contemporary chronicles, the stratospheric dry fog possibly manifested itself in Europe as a persistently cloudy aspect of the sky and also through an apparently total darkening of the eclipsed Moon. Based on a sudden temperature drop for several months in England, the eruption's initiation date can be inferred to have been probably January 1258. The frequent cold and rain that year led to severe crop damage and famine throughout much of Europe. Pestilence repeatedly broke out in 1258 and 1259; it occurred also in the Middle East, reportedly there as plague. Another very cold winter followed in 1260–1261. The troubled period's wars, famines, pestilences, and earthquakes appear to have contributed in part to the rise of the European flagellant movement of 1260, one of the most bizarre social phenomena of the Middle Ages. Analogies can be drawn with the climatic aftereffects and European social unrest following another great tropical eruption, Tambora in 1815. Some generalizations about the climatic impacts of tropical eruptions are made from these and other data.

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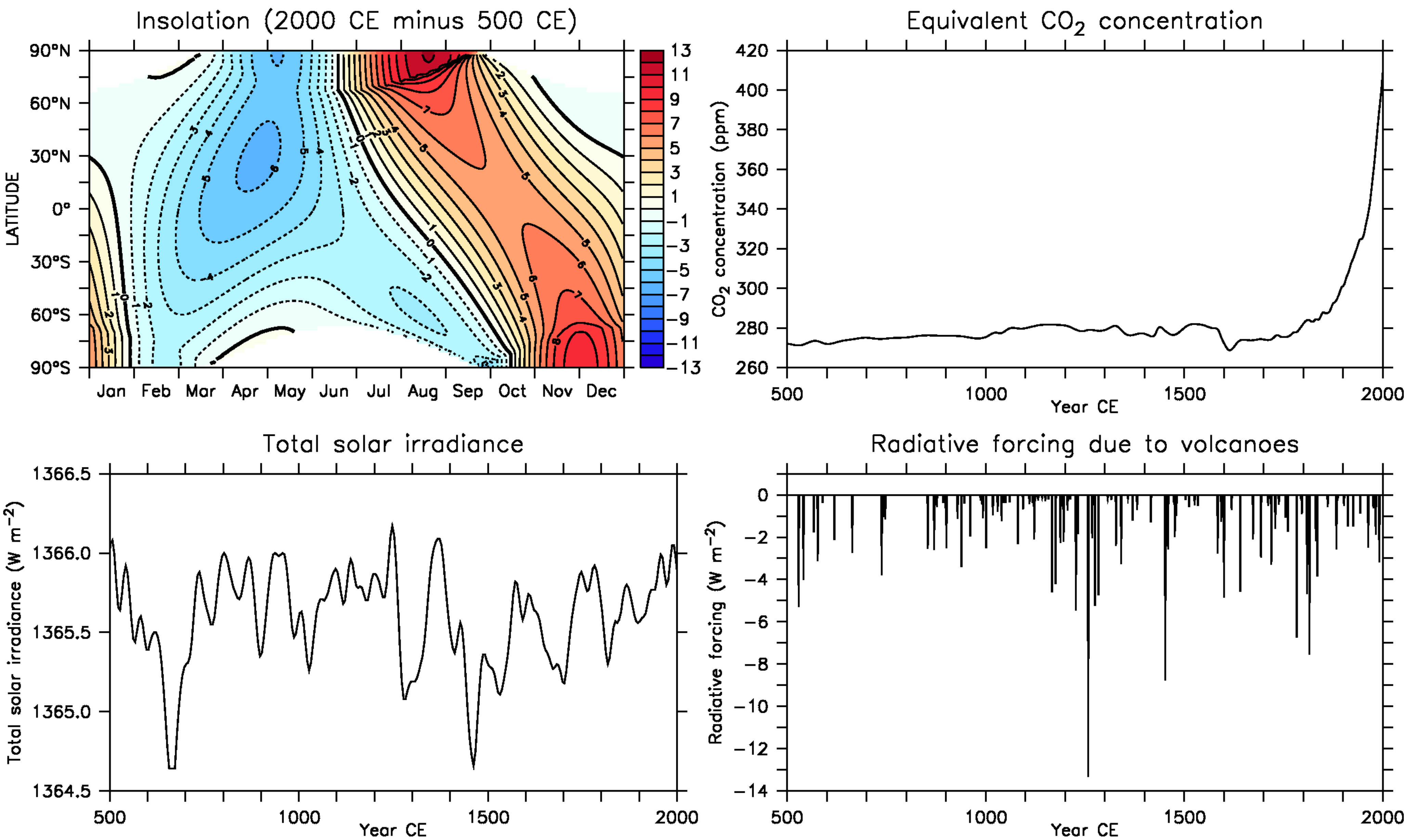
Makīn, 1260; Bar-Hebraeus, 1286). Because the Middle East has been historically prone to epidemics of bubonic plague, possibly that is what it was.

6. The Flagellants

Flagellation, or scourging, had long been practiced as an occasional form of discipline or penance within Christian monastic communities. In the spring of 1260, however, a popular penitential movement of self-flagellation arose in Perugia, central Italy, and spread south, in the autumn, to Rome and north toward central Europe. Wholly orthodox at first, it attracted not only members of the clergy but all ranks and ages of pious lay people. Early in the following year, though, it degenerated into a heterodox movement of peasants and malcontents, which was put down finally by the ecclesiastical and civil authorities. In its typical manifestation, bands of unshirted male flagellants marched through the streets in double file, uttering hymns and religious slogans and flogging their backs with whips until blood began to flow. Troops of flagellants traveled from town to town. It was one of the oddest mass social phenomena of the Middle Ages.

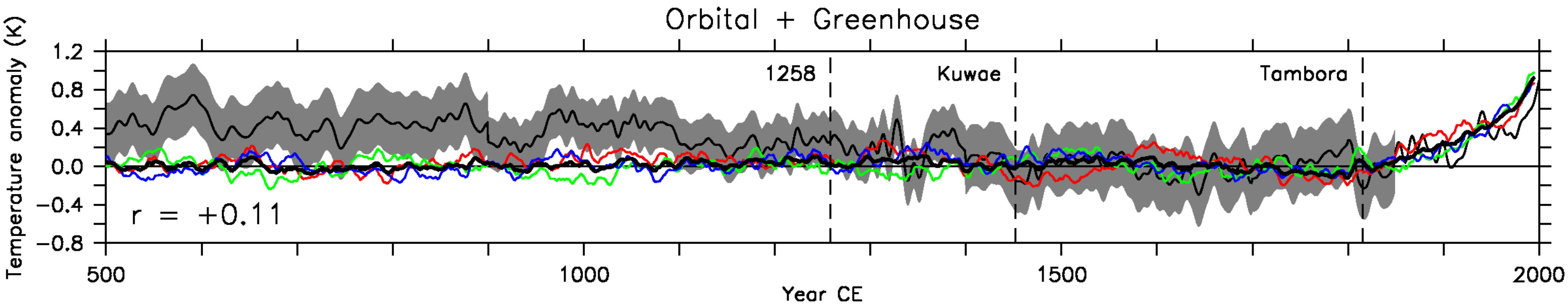
Boundary conditions over the past 1500 years



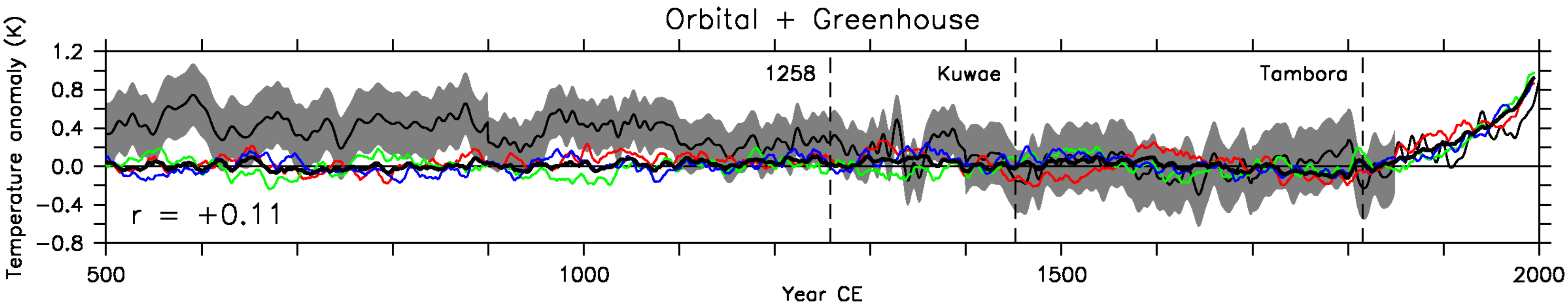
Climate modelling and proxy data

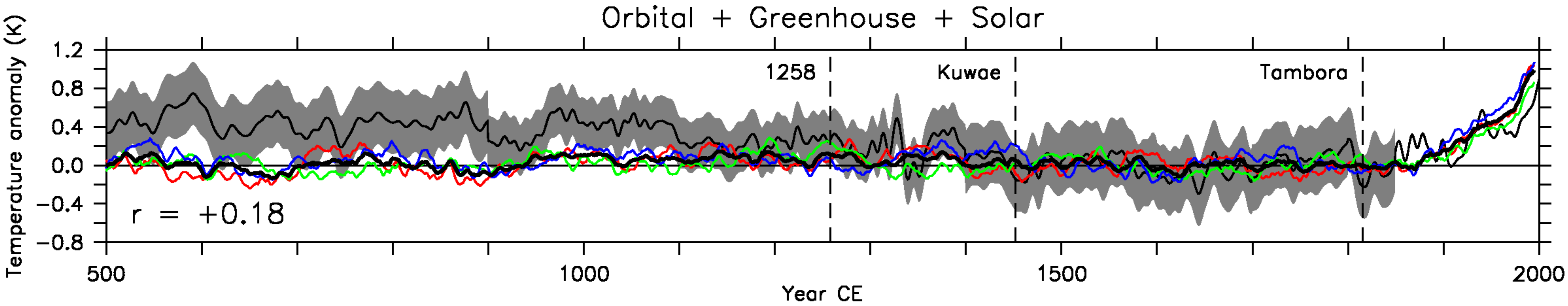
- The CSIRO Mk3L climate system model (Phipps et al, 2011a,b)
  - Atmosphere-land-sea ice-ocean general circulation model
  - Multiple transient simulations of the past 1500 years
  - Orbital, greenhouse gas, solar and volcanic forcing
- Northern Hemisphere temperature reconstruction (Mann et al, 2009)
  - Network of 1209 annually- and decadally-resolved proxies
  - Used to reconstruct annual-mean NH temperature for 500–2006 CE
- Australasian temperature reconstruction (Gergis et al, submitted)
  - Network of 27 annually-resolved terrestrial and marine proxies
  - Used to reconstruct Australasian warm-season (September to February) temperature for 1000–2001 CE

Annual-mean Northern Hemisphere temperature

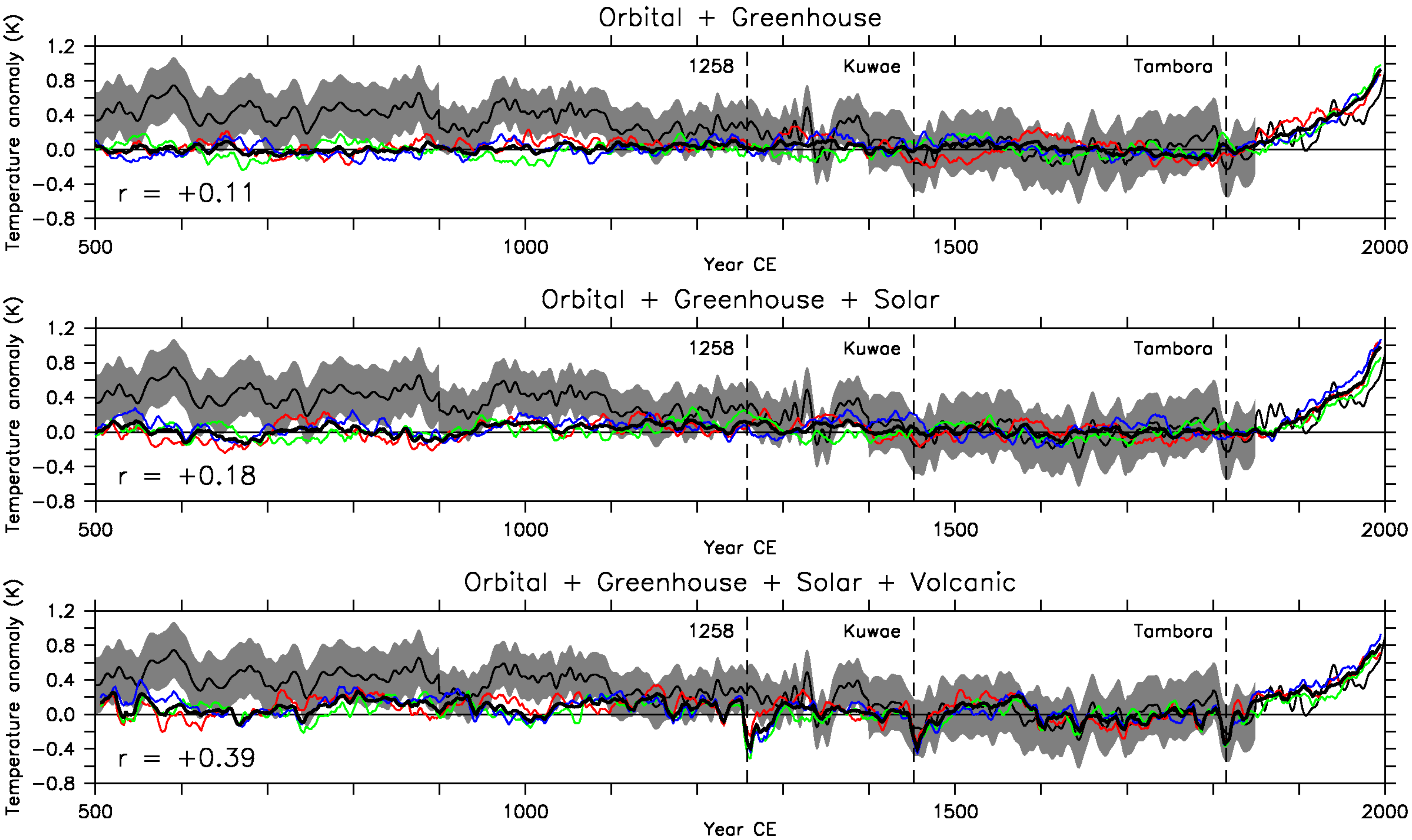


Annual-mean Northern Hemisphere temperature

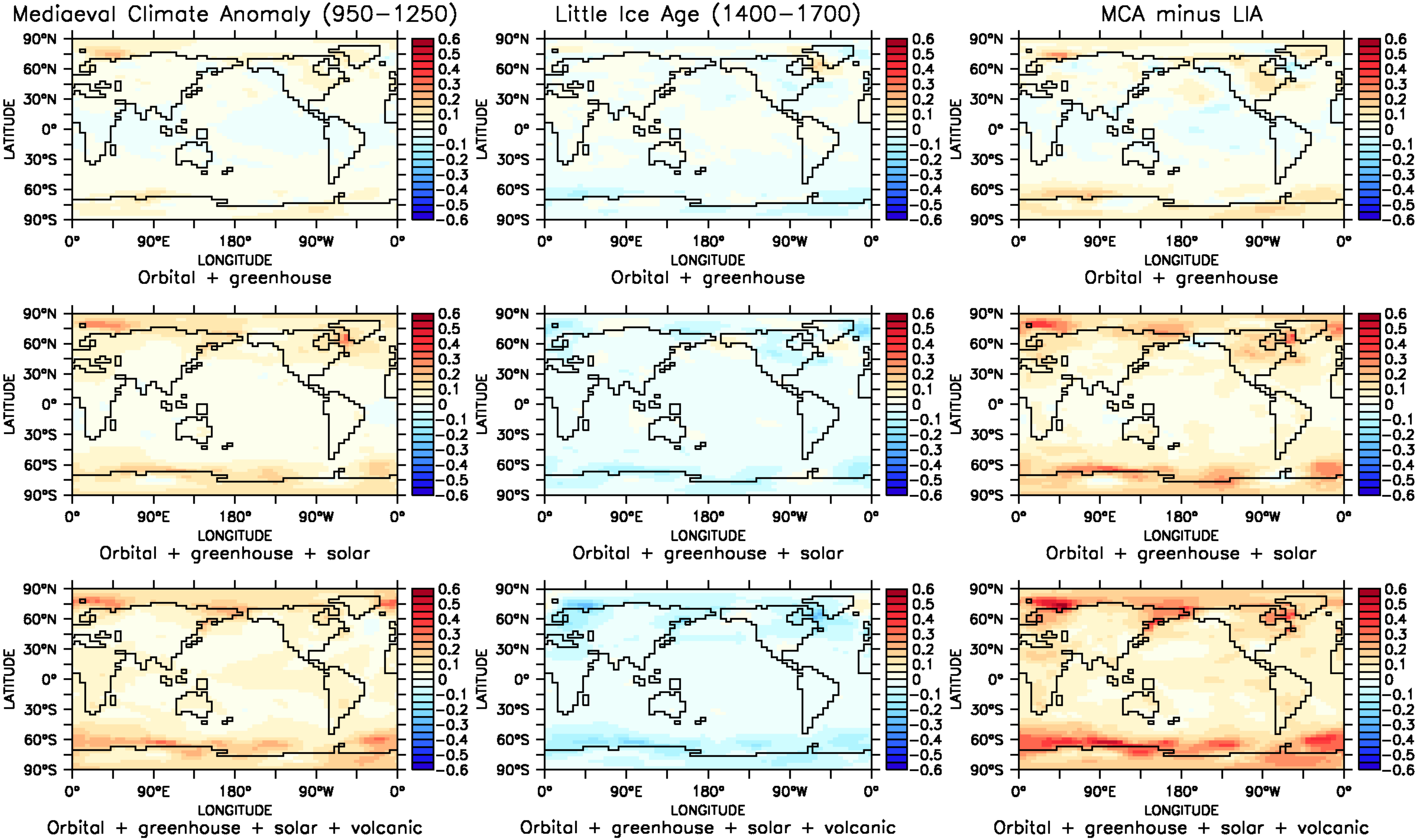




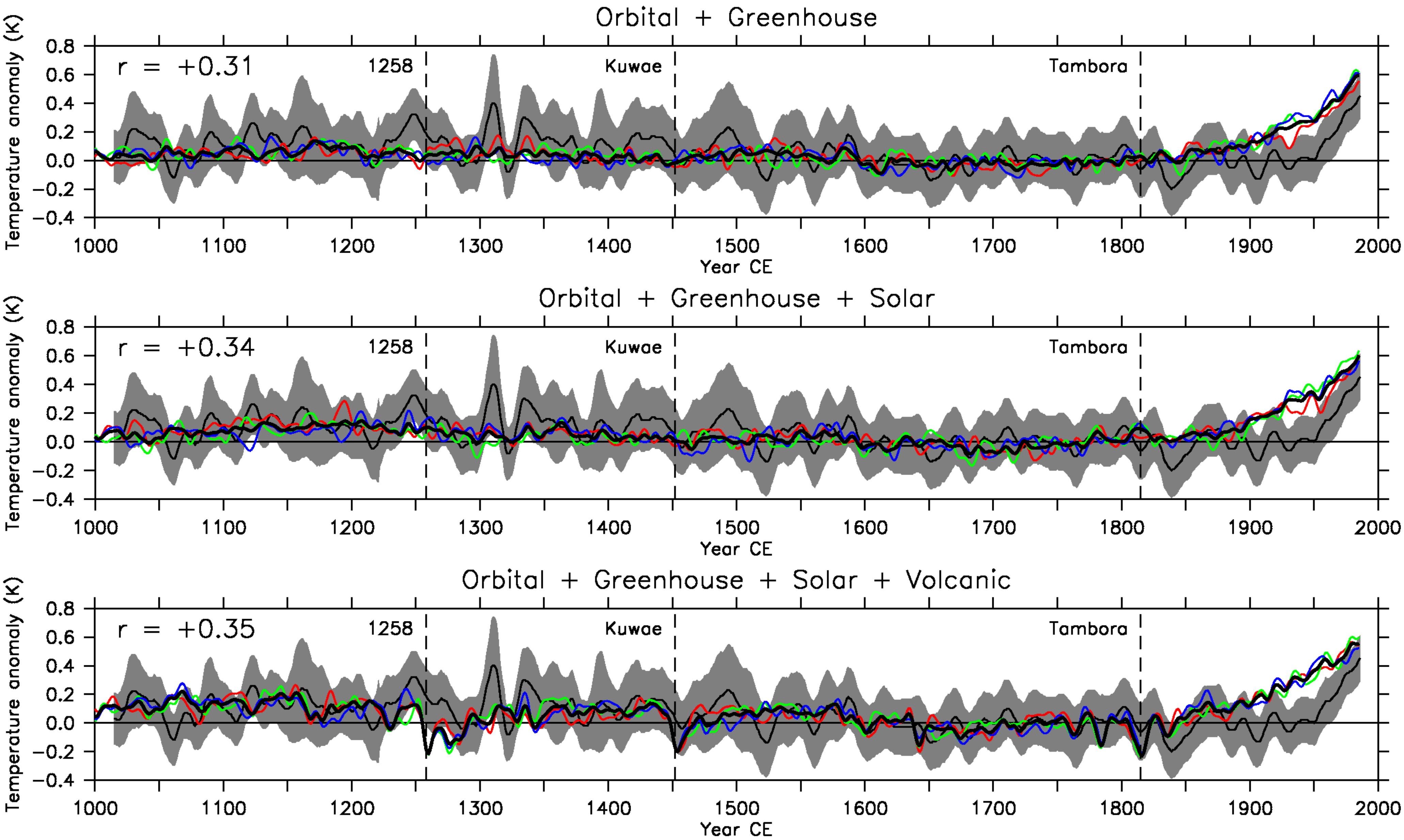
Annual-mean Northern Hemisphere temperature



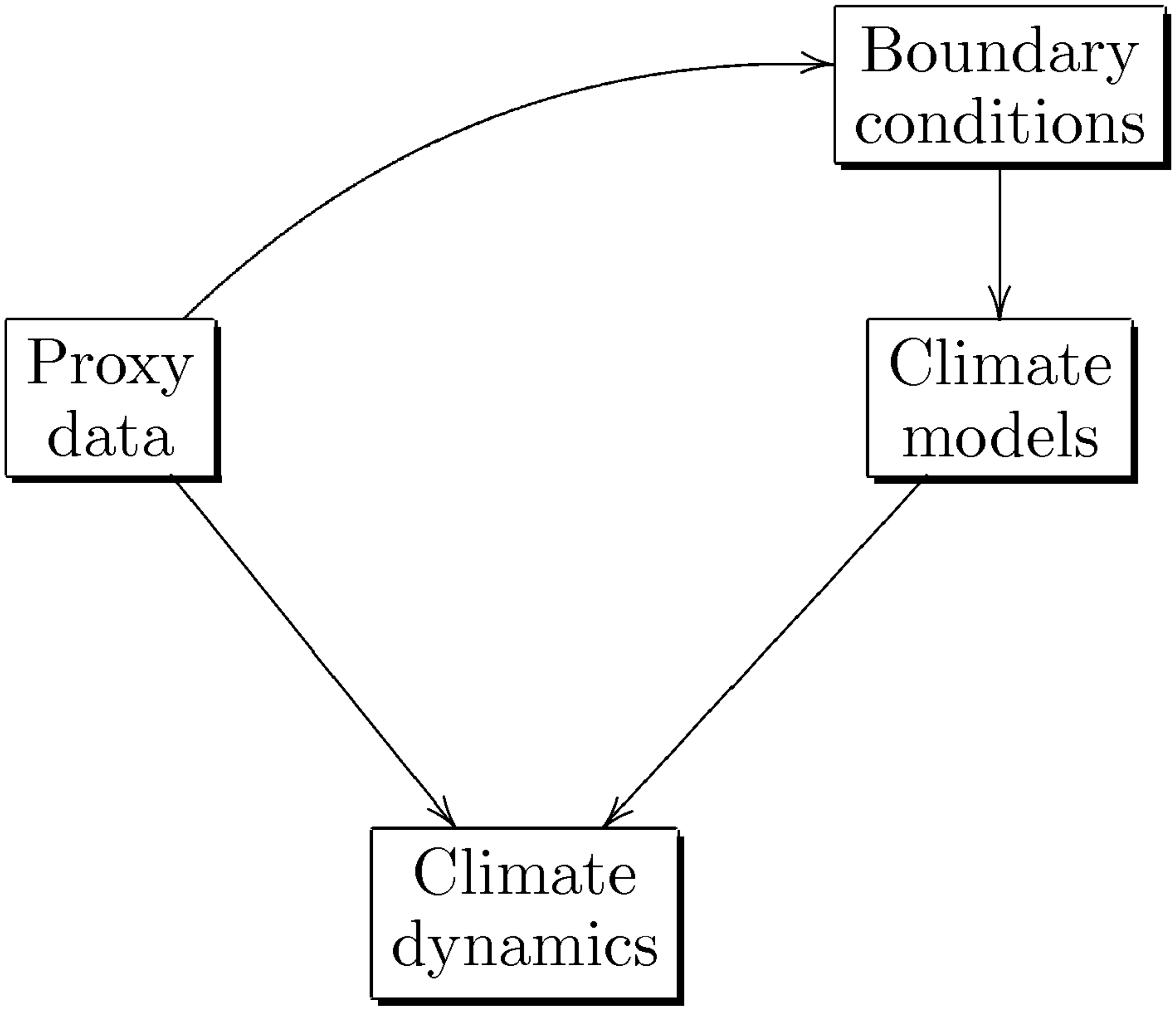
Mediaeval Climate Anomaly and Little Ice Age



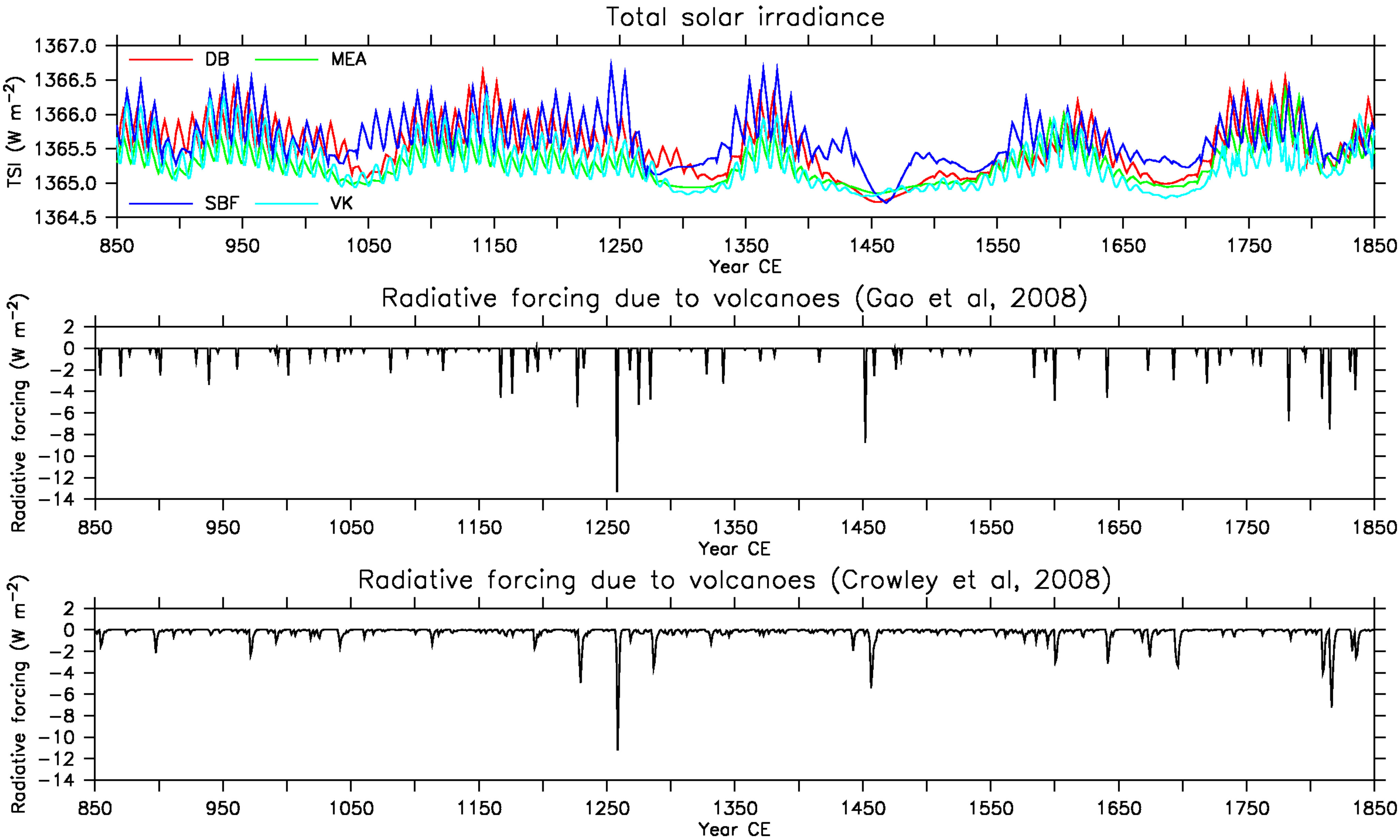
Warm-season Australasian temperature



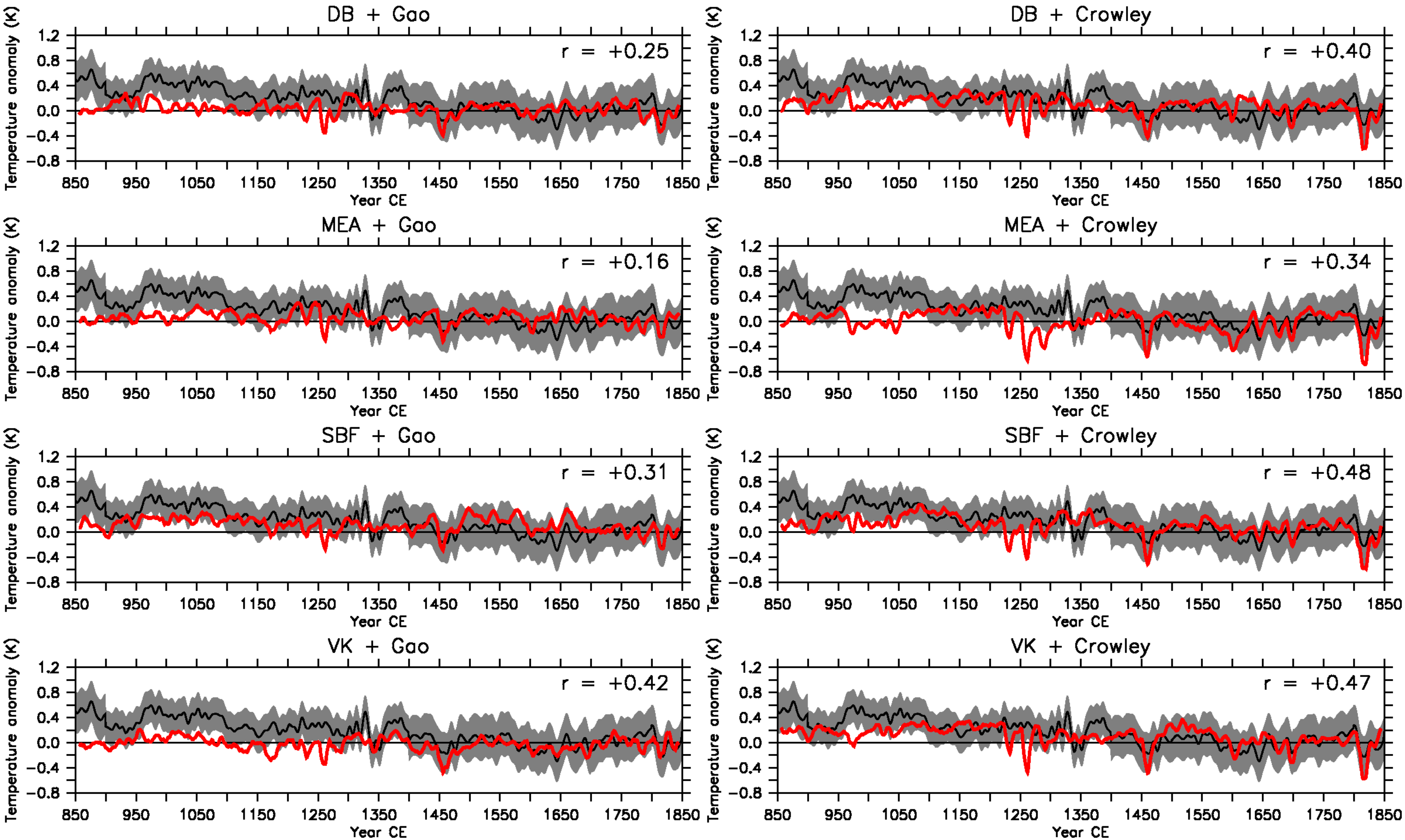
Unlocking the secrets of the past...



CMIP5/PMIP3 Last Millennium experiment



Annual-mean Northern Hemisphere temperature



Conclusions

- It's all about volcanoes (and maybe the sun too).
- Our ability to understand past changes in the climate system depends upon the availability of reliable boundary conditions to drive the climate models.
- There is a critical need for better and longer reconstructions of past changes in solar and volcanic activity.