Clim. Past Discuss., 11, C64–C66, 2015
www.clim-past-discuss.net/11/C64/2015/

Climate of the Past Discussions

Interactive comment on "Strong winter monsoon wind causes surface cooling over India and China in the Late Miocene" *by* H. Tang et al.

Anonymous Referee #2

Received and published: 5 March 2015

Using model simulations and reconstructions based on plant and mammal fossil data, the authors concluded that the Asian winter monsoon was stronger during the late Miocene than today and that this stronger winter monsoon was responsible for a cooling over India and China. This paper deals with an interesting topic which involves the orography of the Tibetan Plateau and the East Asian monsoon during a relatively warm period (ice free in the northern hemisphere). Such a topic has been paid a lot of attention and many relevant modelling and data papers have been published during the past 30 years. However, there is a serious confusion in this paper of Tang et al which is critical for the conclusion. This is at the basis of my hesitation to recommend its publication. Uncertainties exist in the interpretation of proxy data and in the experiment design, which makes the conclusion unconvincing.

1. About the confusion:

Most of the plant and mammal fossil data as well as the model simulations of the authors show that the annual mean and the winter temperatures in both northern and southern China are warmer during the late Miocene than today (Table S1 and Figure 3), but why did the authors insist to claim that the winter was cooler? The lowering down of the northern Tibetan Plateau and the mountains in the north indeed causes cooling in most of China and India according to their models (Figure 4 e,f), but this cooling is not the climate response to the full boundary conditions of the late Miocene which on the contrary leads to a warming. Moreover, the model simulates stronger winter monsoon in the late Miocene experiment (Fig 4a, b), but it simulates also a warming over China at the same time. According to the conclusion of the authors, stronger winter monsoon must induce a cooling, then how to explain the coexistence of stronger winter monsoon and a warming in their model results?

2.About the interpretation of the proxy records:

I am not convinced of the use of the plant records (eg. pollen) as a proxy only for temperature. In the tropical and subtropical regions like China and India, change in precipitation might be more crucial than temperature on the variation of vegetation, but precipitation is not at all considered in the interpretation of the plant records.

3.About experiment design

The authors referred to several earlier publications for model and experiment design. I suggest giving more information in this paper. The CO2 concentration and orbital parameters used in the late Miocene experiment are the same as present-day. As the focus of this paper is on very regional and seasonal features, I do not think it is appropriate to keep the orbital parameters same as today because changes in insolation are extremely important for the monsoon climate as has been showed by many studies. It was also said in the Tang et al (2013) paper that this late Miocene period covers several million years with many orbital cycles. Different orbital configuration should be

considered to see if the conclusions still hold.

4.About the relationship between winter monsoon wind and temperature

Based on the coexistence of stronger winter monsoon wind and a cooling over China in both present-day observation and in model simulations, the authors claimed that the stronger wind is the cause of the cooling. More explanation should be given to demonstrate the robustness of this cause-effect relationship. Figure 1 and 5 show that for the present-day, stronger winter monsoon is associated with a cooling in both northern and southern China, but in the late Miocene experiment, the similar strong monsoon is associated only with a cooling over the western Pacific and the coastal regions of China. If we agree that strong winter wind causes cooling in China, it would be more logical if the northern China also gets cooler because the wind blows from the north to the south. Is it possible that the cooling over the western Pacific in the late Miocene experiment is due to other reason?

5.For claiming that “the modern-like interannual variation of the winter monsoon with a strong association with the Siberian High and the surface temperature changes in the monsoon region may not have been fully established in the Late Miocene”, the authors need to explain what causes the interannial variability in monsoon winds and in temperature for both present-day and the late Miocene.

Interactive comment on Clim. Past Discuss., 11, 63, 2015.