Supporting Information for

Intensification of the pre-Meiyu rainband in the late 21st century

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Contents of this file

Figures S1 to S6

Introduction

Supplementary Figures S1 through S6 are included here
Figure S1. Histogram of daily rainfall (mm) occurrence over southeastern China (averaged over 22°N-26°N, 112°E-120°E, and including only land points) in June, for the early (blue) and late (red) 21st century. The vertical lines represent percentiles with the numbers denoting the percentile. It shows that the probability of extreme rainfall increases in the late 21st century.
Figure S2. Early 21st century climatological rainfall in the CESM LENS RCP8.5 simulations, for the various intraseasonal stages: (a) Spring (April 1 - May 26), (b) Pre-Meiyu (May 27 – June 23), (c) Meiyu (June 24 – July 18), and (d) Midsummer (July 19 – September 5). We use daily rainfall for 20-member ensemble CESM LENS simulations, taken over years 2006-2015, to form the climatology. The timing of the intraseasonal stages follows Kong et al. (2017), derived from a self-organizing map analysis of observed climatological rainfall. This figure can be directly compared to figure 1 (c)-(f) in Kong et al. (2017), which shows the same but using the APHRODITE observed gridded land rainfall dataset averaged from 1951-2007 (Yatagai et al. 2009). The simulated spatial patterns have qualitative similarity to the observed rainfall but differ in detail, in particular a noticeable peak in rainfall over the Sichuan basin that is not apparent in observations. However, the pre-Meiyu rainband over southeastern China extending to southern Japan is clearly visible, and the rainband continues to exist in the Meiyu stage but with a northward shift into the Yangtze river valley. These rainbands are indicated by red dashed lines in (b) and (c).
Figure S3. Similar to figure 2, but for July. (a-f) Ensemble mean change to the July vertically integrated (surface to 100mb) components of the moisture budget, late 21st century (2091-2100) minus early 21st century (2006-2015). Moisture flux are shown in vectors, and its convergence is shaded. (a) Moisture flux (qv) and its convergence. (b) Contribution by the change to q. (c) Contribution by change to v. (d) Contribution by change to v and q. (e) Contribution by change to transients. (f) Contribution by change to the zonal wind. (g) Contribution by change to the meridional wind; this term is in turn broken up into the contribution by (h) meridional advection of moisture, and (i) meridional wind convergence term. Note that the color scale for (f), (g) and (i) span twice the range of the other panels.
Figure S4. a) June climatological wind vectors at 850mb over East Asia, and 500mb meridional winds (shaded), for the early 21th century. (b) Same as (a), but for late 21st century minus early 21st century. (c) and (d): same as (a) and (b) respectively, but for July. Note in particular the near-complete absence of the mid-tropospheric northerly anomalies in July.
Figure S5. Hovmoller of 200mb zonal winds at 80°E. (a) Early 21st century climatology. (b) Late 21st century. Pentad data was used to generate this plot. Green dots show the latitudinal location of zonal wind maximum (or maxima) for a given time, and the black dashed lines indicate the approximate latitudes of the Tibetan Plateau at 80°E.
Figure S6. Same as figure 4, but for July.