



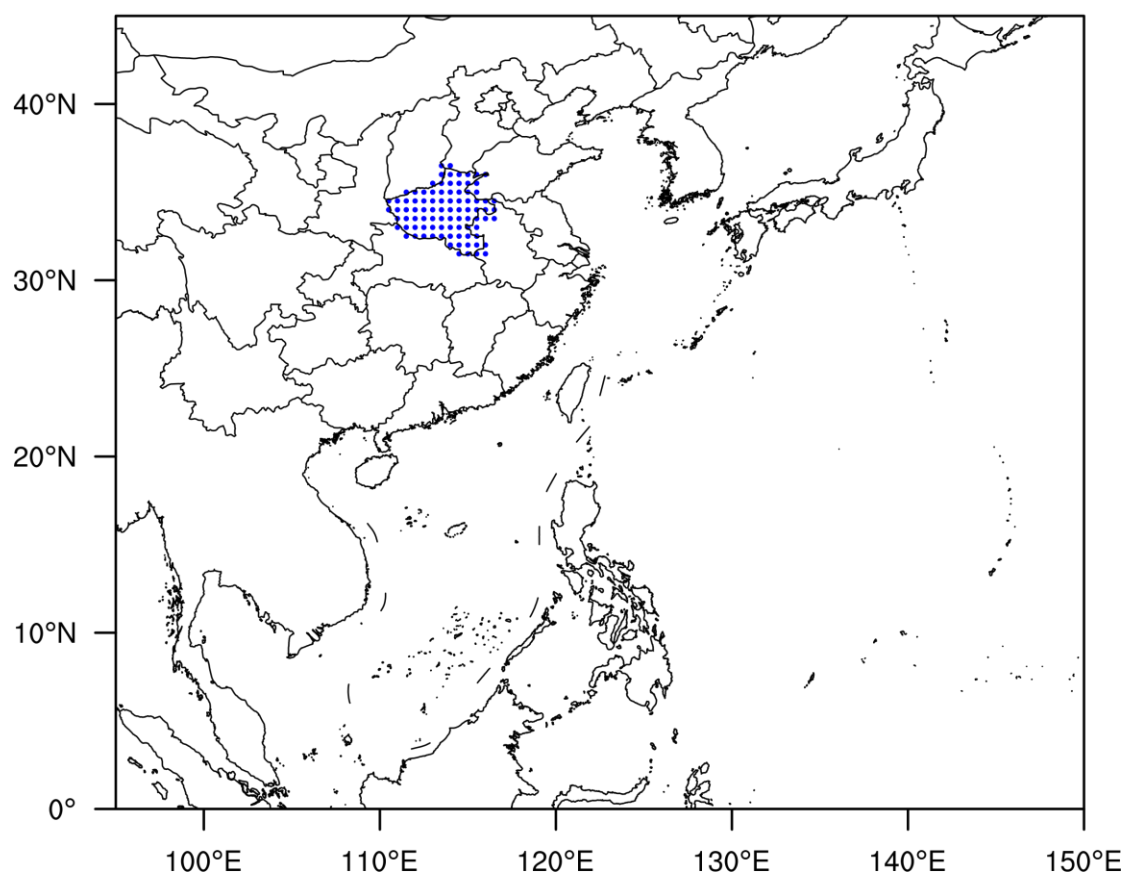
## Supplemental Material

© Copyright 2023 American Meteorological Society (AMS)

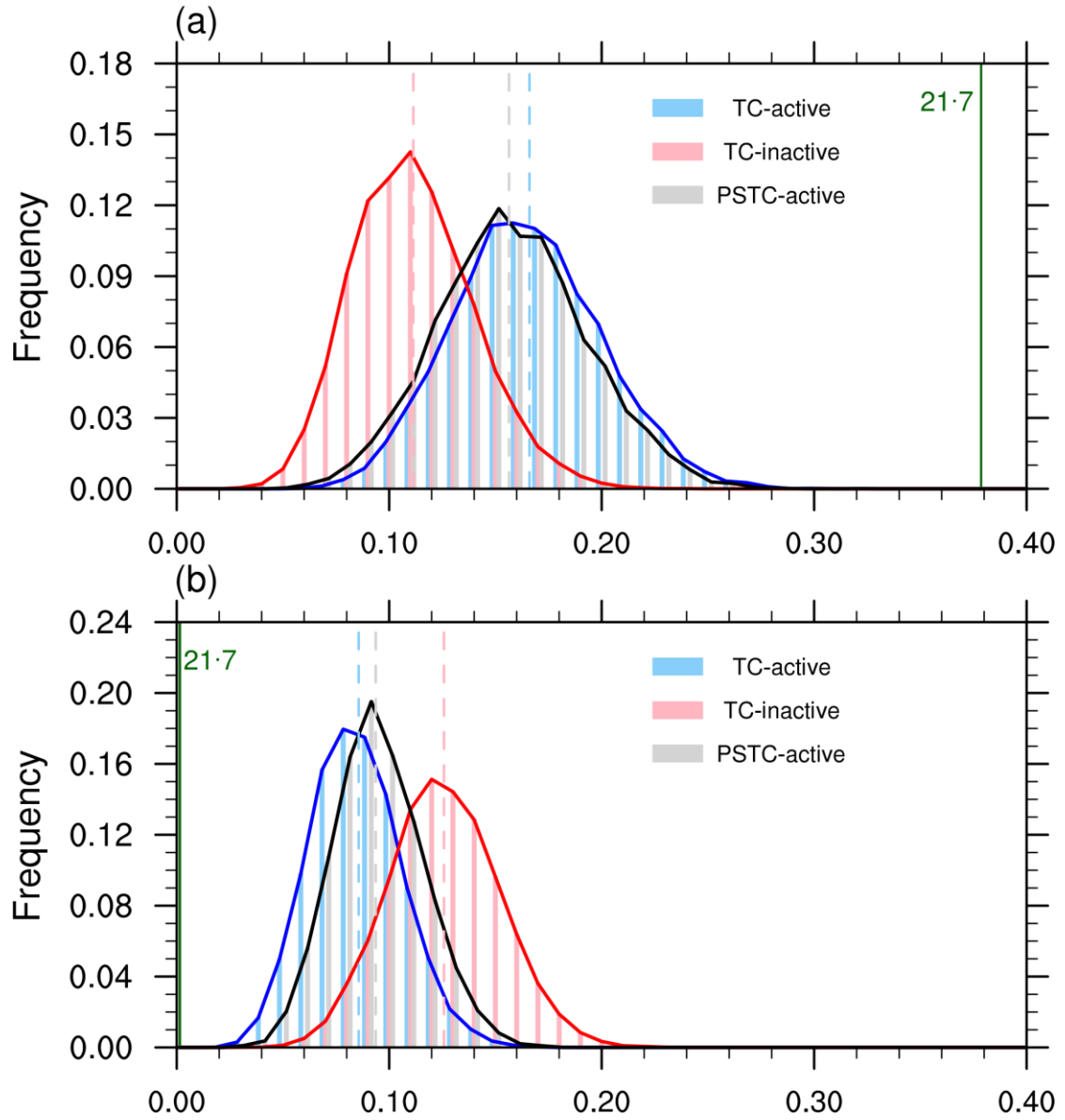
For permission to reuse any portion of this work, please contact [permissions@ametsoc.org](mailto:permissions@ametsoc.org). Any use of material in this work that is determined to be “fair use” under Section 107 of the U.S. Copyright Act (17 USC §107) or that satisfies the conditions specified in Section 108 of the U.S. Copyright Act (17 USC §108) does not require AMS’s permission. Republication, systematic reproduction, posting in electronic form, such as on a website or in a searchable database, or other uses of this material, except as exempted by the above statement, requires written permission or a license from AMS. All AMS journals and monograph publications are registered with the Copyright Clearance Center (<https://www.copyright.com>). Additional details are provided in the AMS Copyright Policy statement, available on the AMS website (<https://www.ametsoc.org/PUBSCopyrightPolicy>).

# Supplemental Material

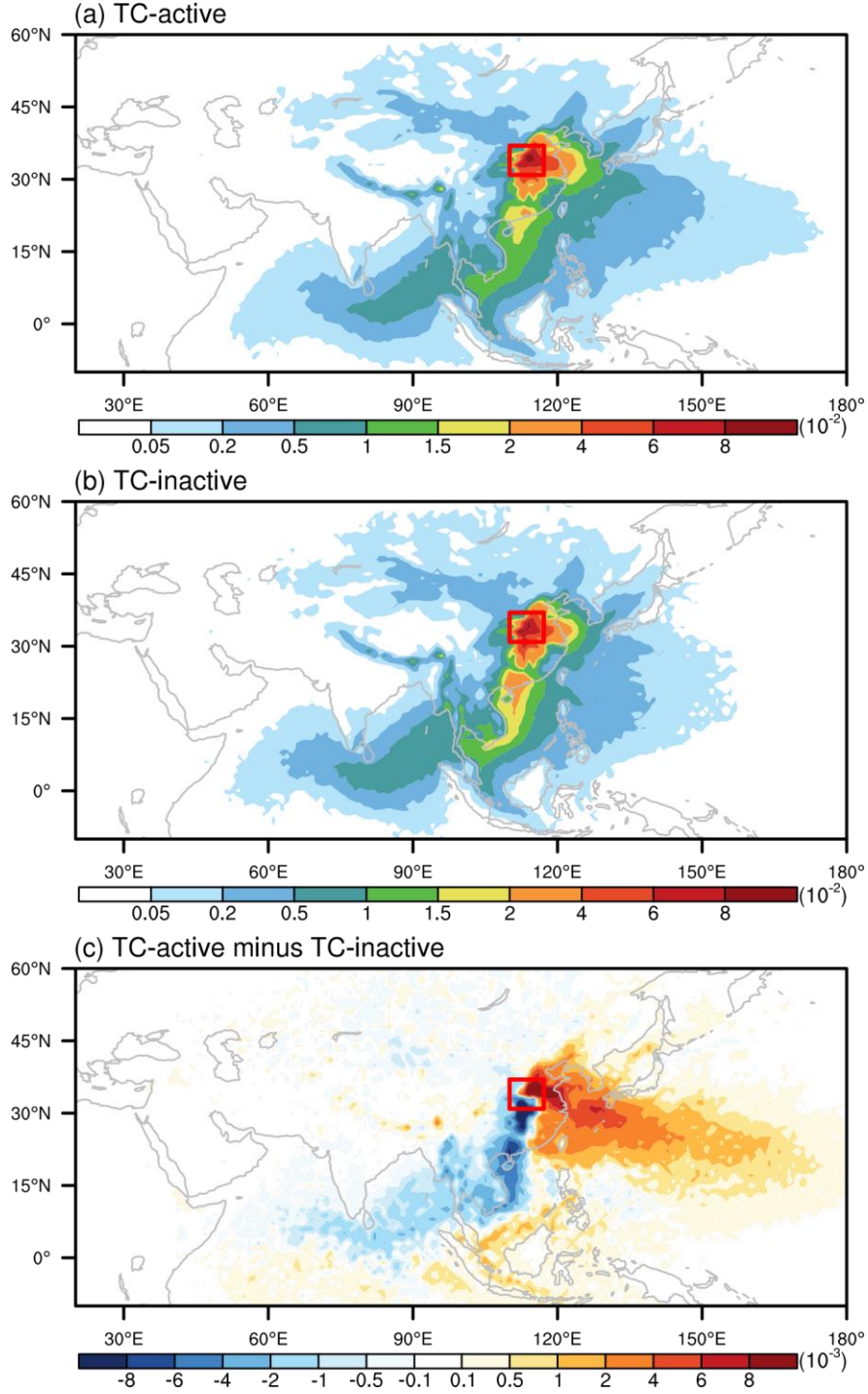
## Target Grids in Henan Province



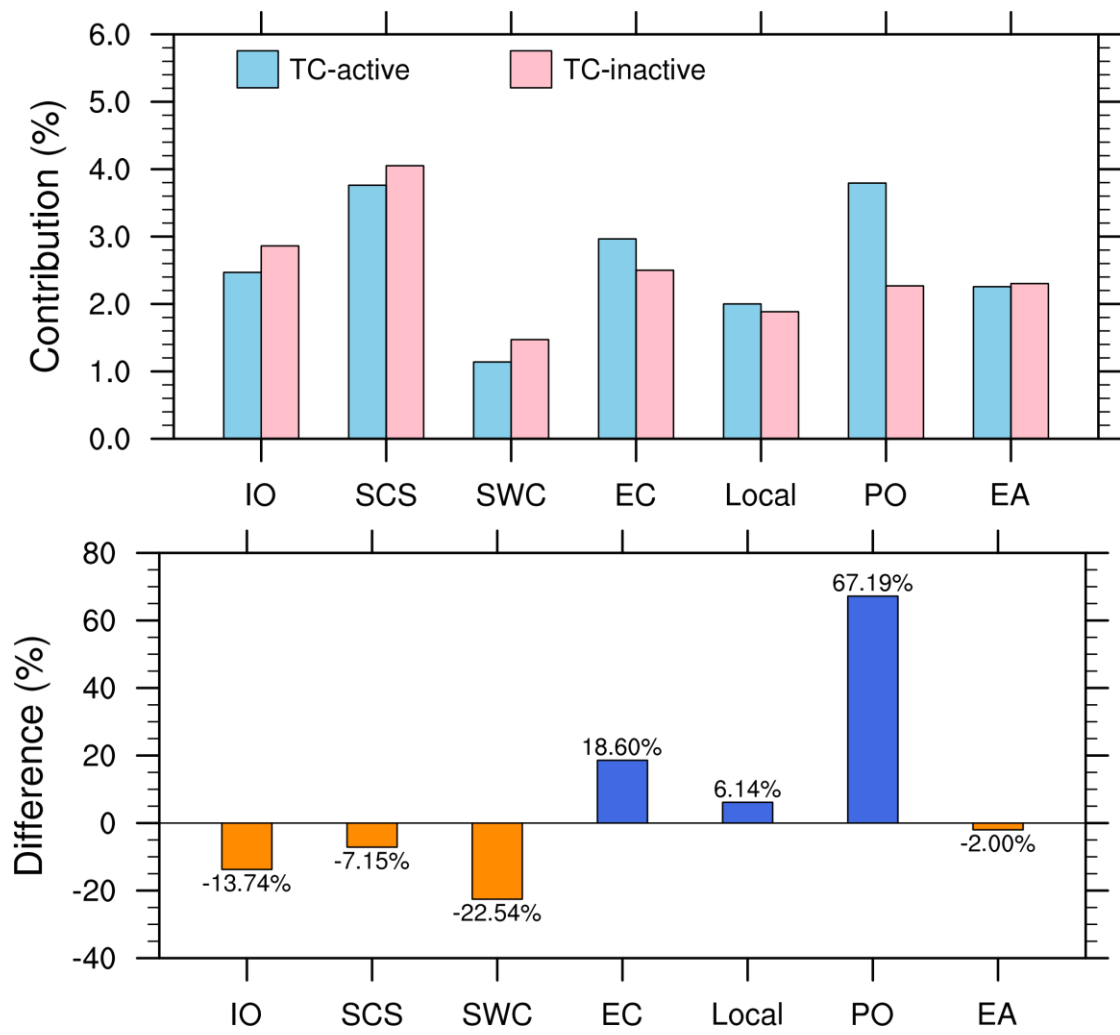
**Fig. S1.** Target grids with the horizontal resolution of 0.5 degree in Henan Province.



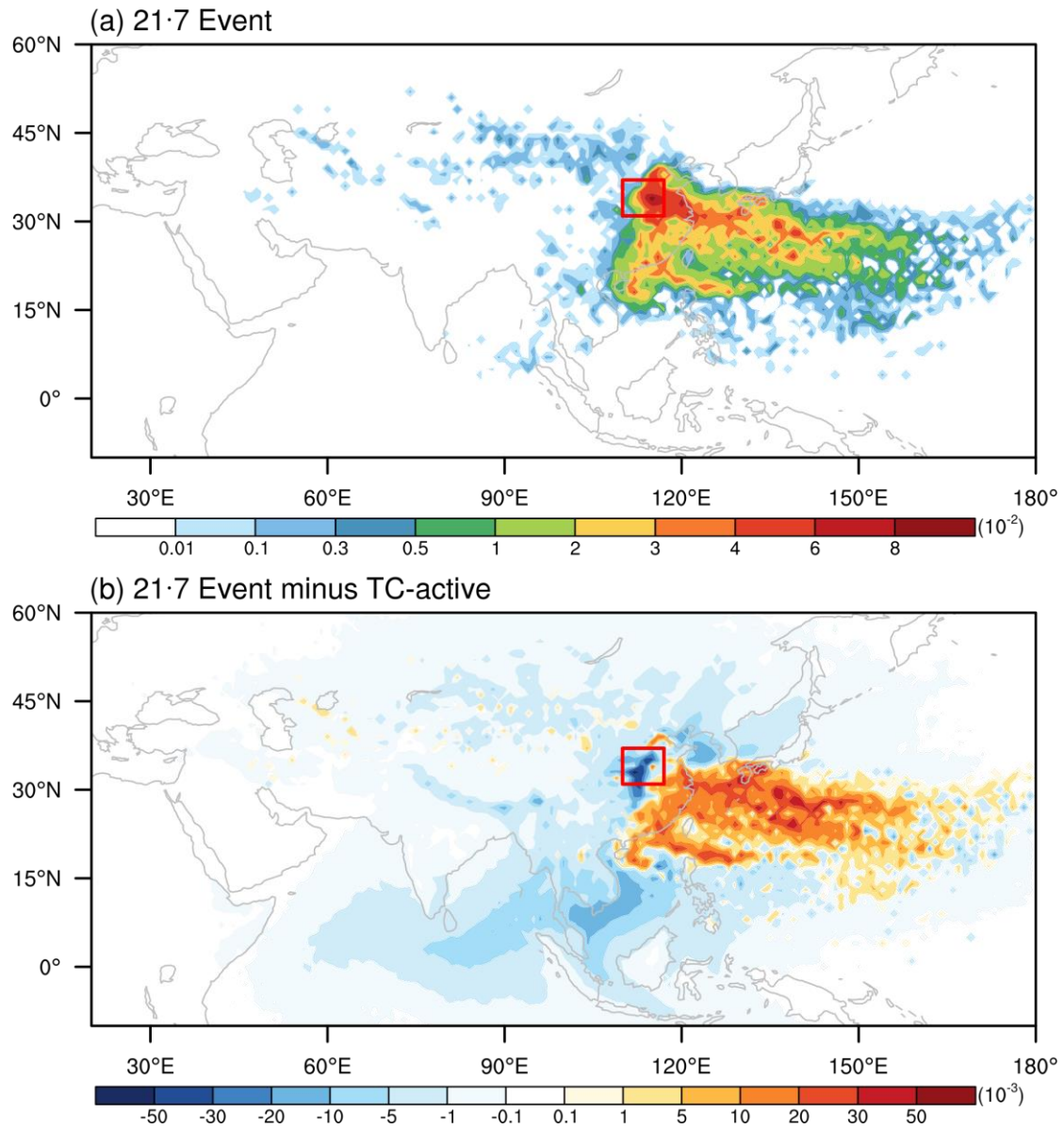
**Fig. S2.** Histograms of moisture contributions from the (a) PO and (b) IO based on the 10,000 samples of the same 6-day blocks, consisting of 24 times of 6-hr results, as same as the time scale of the “21.7” event, using bootstrap resampling (with replacement) technique during TC-active (sky-blue bars), TC-inactive (pink bars) and PSTC-active (grey bars) periods. The sky-blue, pink and grey dashed lines demonstrate the mean value, and dark-green lines indicate the corresponding moisture contribution during the “21.7” event.



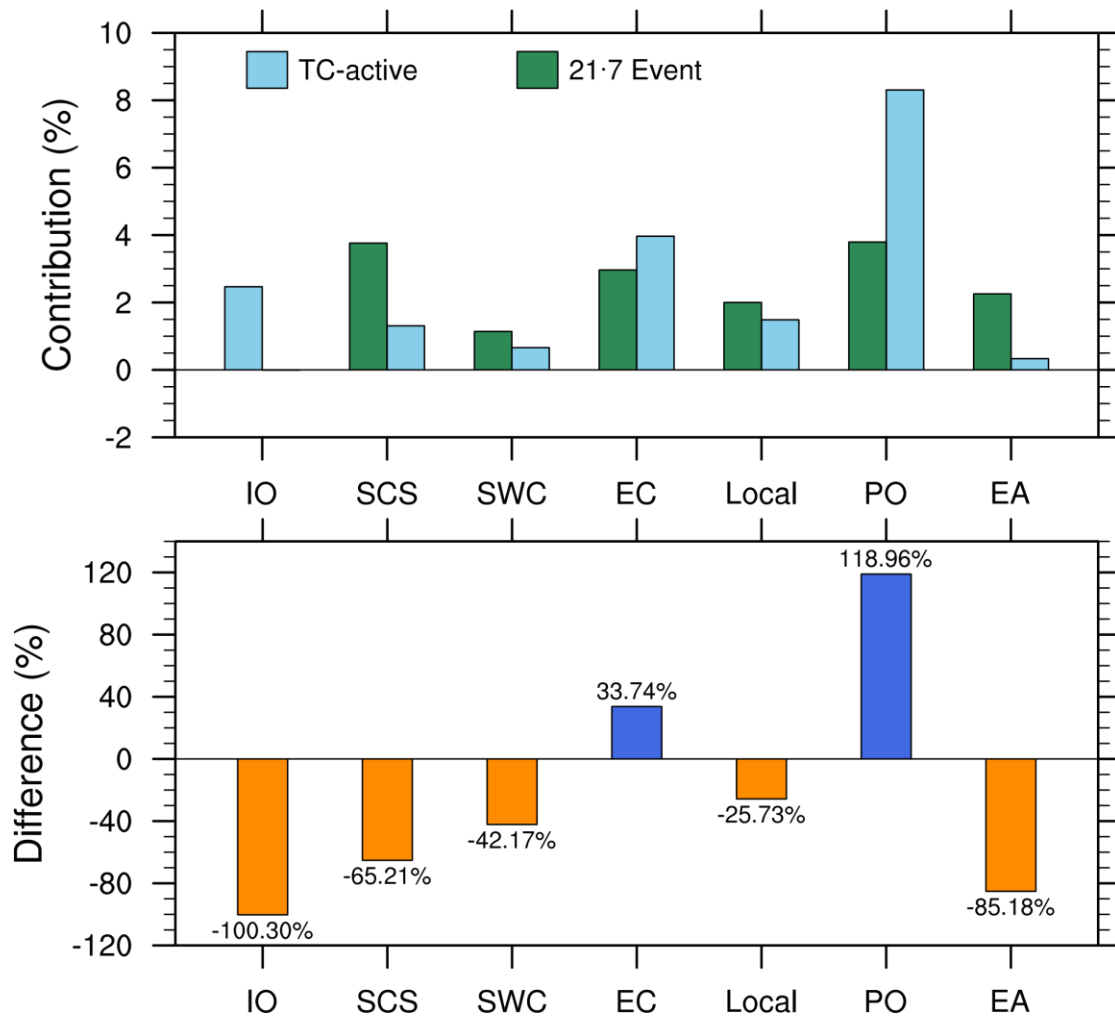
**Fig. S3.** The moisture contribution below boundary layer (shading, units: %) to Henan province during the (a) TC-active periods and (b) TC-inactive periods of 1979-2021, and (c) the associated differences between TC-active periods and inactive-periods of 1979-2021. The red rectangle indicates the target area presented in **Fig. 1b**.



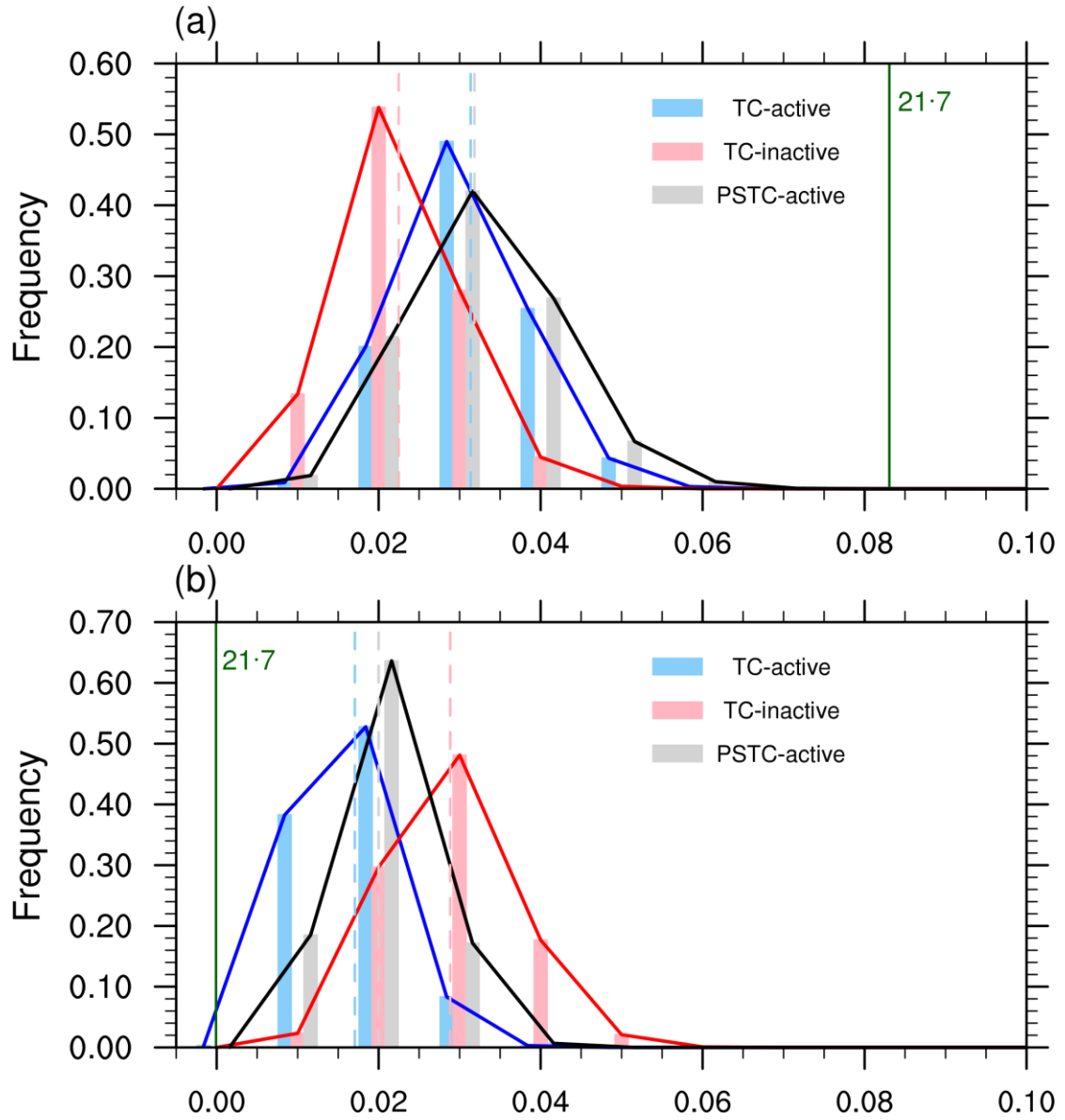
**Fig. S4.** Moisture contributions below boundary layer from the seven sources (divided as **Fig. 5a**) to the total moisture of the rainfall over Henan Province during the TC-active periods (sky-blue columns) and TC-inactive periods (pink columns) and the associated differences (dark-orange and royal-blue columns).



**Fig. S5.** The moisture contribution below boundary layer (shading, units: %) to Henan province during (a) the “21·7” event and (b) the associated differences between the “21·7” event and TC-active periods of 1979-2021. The red rectangle indicates the area presented in **Fig. 1b**.



**Fig. S6.** Moisture contributions below boundary layer from the seven sources (divided as Fig. 5a) to the total moisture of the rainfall over Henan Province during the “21·7” event (sea-green columns) and TC-active periods (sky-blue columns) and the associated differences (dark-orange and royal-blue columns).



**Fig. S7.** Histograms of moisture contributions below boundary layer from the (a) PO and (b) IO based on the 10,000 samples of the same 6-day blocks, consisting of 24 times of 6-hr results, as same as the time scale of the “21.7” event, using bootstrap resampling (with replacement) technique during TC-active (sky-blue bars), TC-inactive (pink bars) and PSTC-active (grey bars) periods. The sky-blue, pink and grey dashed lines demonstrate the mean value, and dark-green lines indicate the corresponding moisture contribution during the “21.7” event.