



# AMS

American Meteorological Society

## Supplemental Material

*Bulletin of the American Meteorological Society*

Record High Warm 2021 February Temperature over East Asia

<https://doi.org/10.1175/BAMS-D-22-0139.1>

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### *Optimal fingerprinting*

Using the results from the Coupled Model Intercomparison Project Phase 6 (CMIP6), the 36 simulations forced with all-forcings (ALL) and with natural forcing only (NAT) were used in the optimal fingerprinting total least square (TLS) method (Hegerl et al. 1997; Allen and Stott 2003; Ribes et al. 2013) to represent the temperature response to the ALL (1951–2014) and NAT forcings (1951–2014) over the study region (black box in Figure 1a in the main text). The data are area-averaged as times series before input to the TLS. Unforced preindustrial control (piC) simulations from 11 models were divided into a total of 238 non-overlapping chunks, each 64 years long, to estimate internal variability (Table 1). In the TLS method, the non-overlapping anomalous February monthly mean of the daily maximum temperature model-simulated signals are best matched to the observed (Fig. 1c). The TLS are pre-whitened using the operator estimated from the piC trunk and the truncation  $k=62$  is used. The ALL and NAT simulation for the year 1951–2014 are first evaluated separately with 1-single signal test to detect their impact on the local climate, and then combined 2-signal test to attribution their contribution to the historical climate. Uncertainty ranges (5%–95%) for the scaling factors using the fingerprint method were evaluated, and the signal of human-induced warming is considered detected if the scaling factor is significantly greater than zero (Xie et al., 2016; Min et al. 2011).