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## Natural variability has dominated the movement of High Asia Polar Jet over the past six centuries

**Wenling An**, Kerstin Treydte, Chenxi Xu, Qiuzhen Yin, Flurin Babst, Laibao Liu, Qiong Zhang, Raphael Neukom, Zhenqian Wang, and Zhengtang Guo

Institute of Geology and Geophysics, Chinese Academy of Sciences, China (wlan@mail.iggcas.ac.cn)

Recent northward movement of polar jet has been linked with mid-latitude weather and climate anomalies, but distinguishing the natural variability and anthropogenic activity is hindered by a lack of long-term observations. Here we use tree ring oxygen records from the High Asia to reconstruct variability in the movement of the late spring High Asia Polar Jet (HAPJ) over the past six centuries. We find that the HAPJ has shown a gradually northward trend since 1600s, which have resulted in relatively wet conditions in the High Asia and southern west Asia from 1600s to late 1800s and recent decades. Combined with model results, we find the HAPJ is dominated by the phase changes of North Atlantic Oscillation and volcanic eruption at decadal to multi-decadal scales. At multi-decadal to centurial scales, solar activity is the largest contributor to HAPJ movement, while the contribution of increasing greenhouse gas is relatively small. These results highlight the importance of natural variability in HAPJ movements under the context of global warming.