



## **Interdecadal Weakening of the East Asian Winter Monsoon in the Mid-1980s: The Roles of External Forcings**

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Observations show that the East Asian winter monsoon (EAWM) experienced an interdecadal weakening in the mid-1980s. This is evident for all members of the EAWM system (i.e. East Asian trough, upper-tropospheric jet stream, and lower-tropospheric monsoon circulation). Here, we investigate the relative contributions of natural (volcanic aerosols and solar variability) and anthropogenic [greenhouse gases (GHGs) and anthropogenic aerosols] forcings to this interdecadal weakening using multiple coupled models within the phase 5 of the Coupled Model Intercomparison Program (CMIP5). The results indicate that in the mid-troposphere, the increased GHG concentrations play an important role in weakening the East Asian trough (EAT) by increasing the sea surface temperatures (SSTs) over the North Pacific. In the upper troposphere, natural external forcings contribute to the observed weakening of the meridional shear of the East Asian jet stream (EAJS) by regulating the meridional temperature gradient (MTG) over the East Asian region. In the lower troposphere, both anthropogenic and natural forcings can weaken the Siberian high during this period. Overall, based on the present analysis of the CMIP5 output, GHGs and natural forcings play key roles in shaping the observed interdecadal weakening of the EAWM during the mid-1980s. Additionally, contributions from internal variability cannot be neglected and require further investigation.