# Recent decadal weakening of the Eurasian westerly jet attributable to anthropogenic aerosol emissions

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**Abstract**

**The Eurasian subtropical westerly jet stream (ESWJS) is a major feature of the summertime atmospheric circulation in the Northern Hemisphere. Here, we demonstrate that three reanalysis datasets show robust and substantial weakening trends of the summer ESWJS over the last four decades. Furthermore, we use climate model simulations from the Coupled Model Intercomparison Project Phase 6 (CMIP6) and the Detection and Attribution Model Intercomparison Project (DAMIP) to identify the causes of these weakening trends. Our results strongly suggest that anthropogenic aerosols were likely the primary driver of the observed weakening trends. In particular, warming over mid-high latitudes due to aerosol reductions in Europe, and cooling in the tropics and subtropics due to aerosol increases over South and East Asia acted to reduce the meridional temperature gradient at the surface and in the lower and mid troposphere, leading to reduced vertical shear of the zonal wind and a weaker westerly jet in the upper troposphere. Our results suggest that if, as expected, Asian anthropogenic aerosol precursor emissions decline in future, we should anticipate a renewed strengthening of the summer ESWJS.**

**Keywords:** Westerly jet stream, trends, Eurasia, anthropogenic aerosols.

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