

## **Description of Additional Supplementary Files**

### **File Name: Supplementary Video 1**

**Description:** AR presence (blue) detected using the TempestExtremes algorithm with IVT (left panel) and IVKE (right panel) from 6-hourly MERRA-2 data from 00 UTC 1 Jan. 2019 to 18 UTC 31 Jan 2019.

### **File Name: Supplementary Video 2**

**Description:** The specific humidity, geopotential height, and winds of the composite AR on pressure levels from 975 to 850 hPa every 25 hPa.

### **File Name: Supplementary Video 3**

**Description:** The evolution of an AR event from 18 to 21 UTC, 3 January 2023 to 18 to 21 UTC, 4 January 2023 from 3-hourly MERRA-2 data.