Supplementary Information
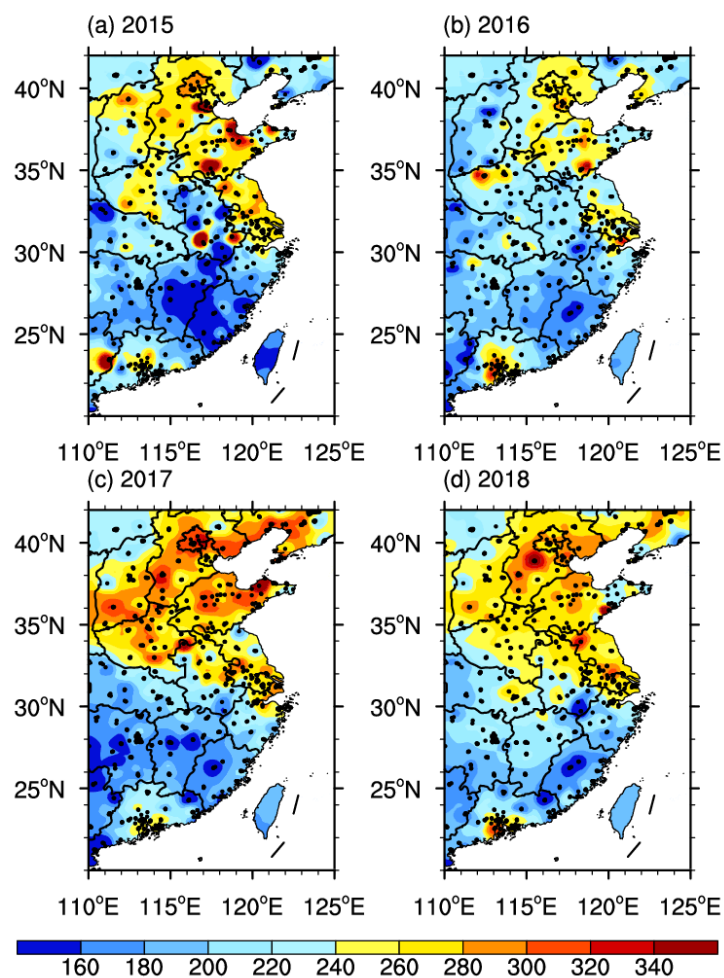
Figure S1. The distribution of the maximum values of MDA8 in summer of (a) 2015, (b) 2016, (c) 2017 and (d) 2018. The black dots indicate the locations of the observation sites.
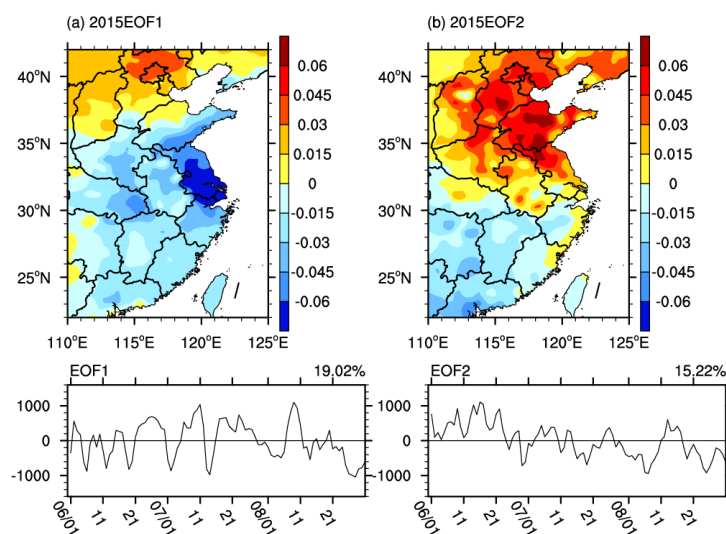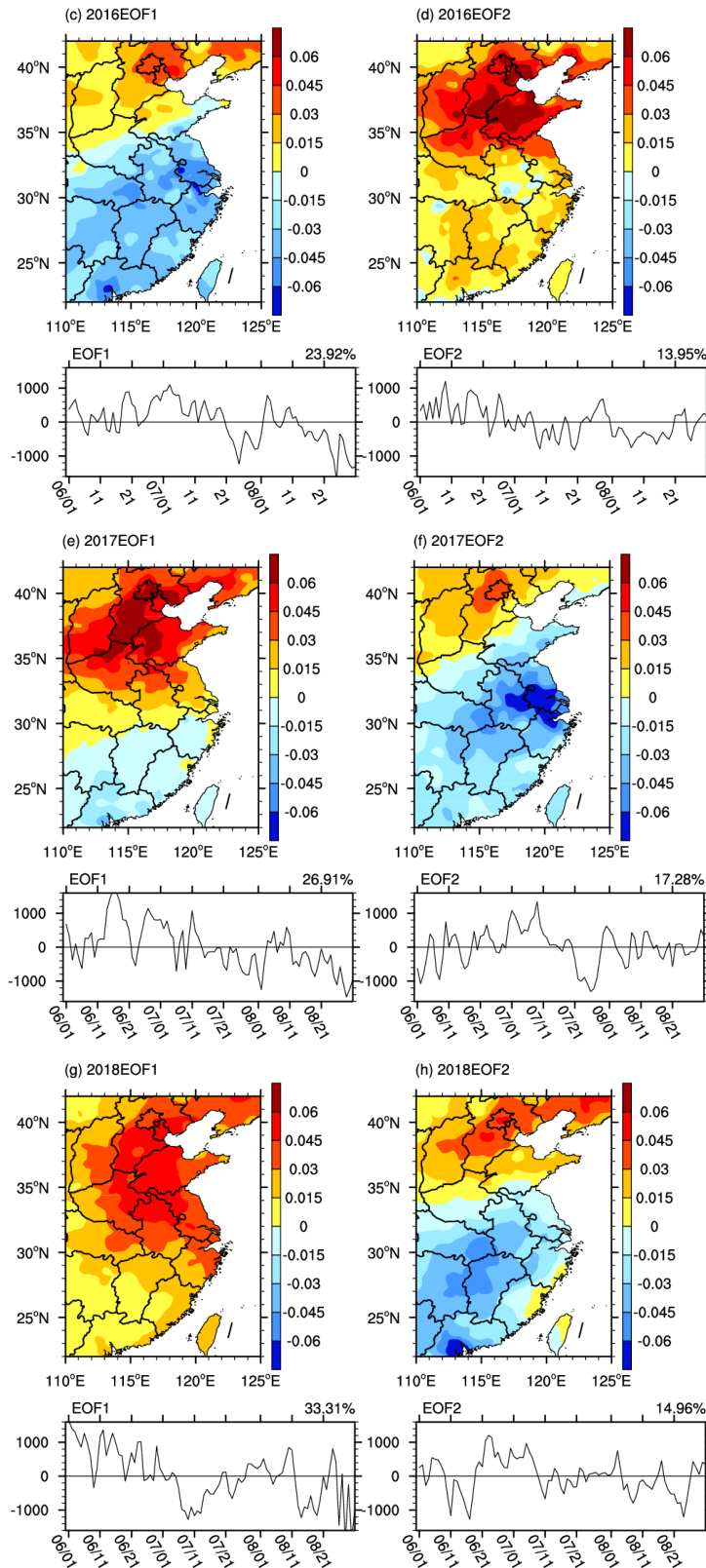
Figure S2. The first (a, c, e, g) and second (b, d, f, h) EOF patterns of MDA8 in summer in 2015 (a, b), 2016 (c, d), 2017, (e, f) and 2018(g, h). The EOF pattern includes the spatial pattern and the time coefficient.
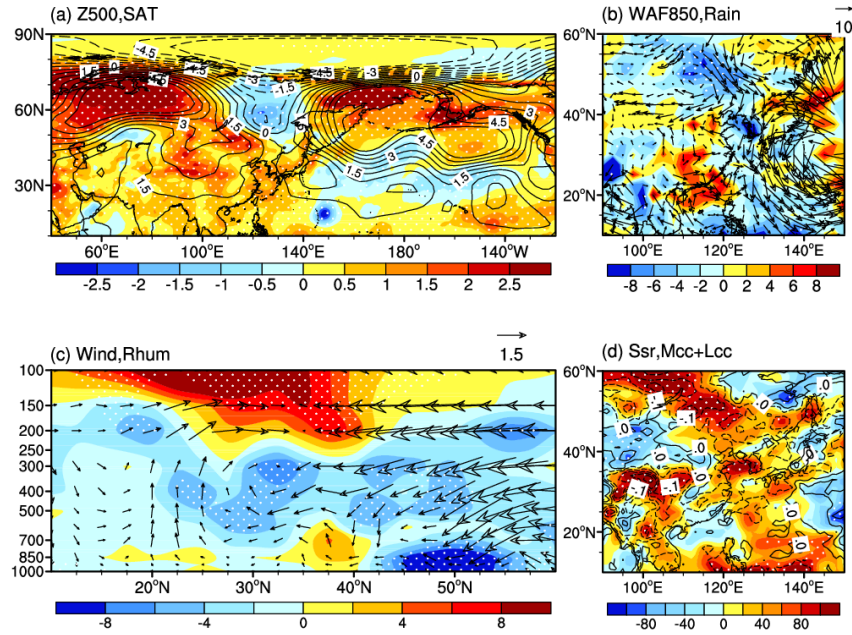
Figure S3. Anomalies of summer mean atmospheric circulations in 2016, with respect to the mean during 1979–2018. (a) geopotential height at 500 hPa (contours) and surface air temperature (shading), (b) water vapor flux at 850 hPa (arrow) and precipitation (shading), (c) 100°E–120°E mean wind (arrows) and relative humidity (shading), (d) downward solar radiation at the surface (shading) and the sum of low and medium cloud cover (contours). The white dots indicate that the shading was above the 95% confidence level.
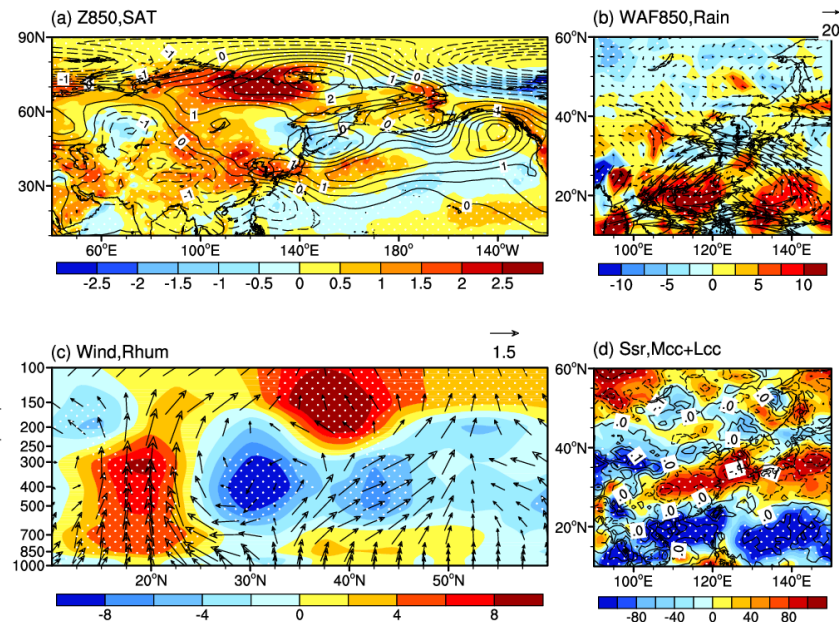
Figure S4. Anomalies of summer mean atmospheric circulations in 2018 with respect to the mean during 1979–2018. (a) geopotential height at 850 hPa (contours) and surface air temperature (shading), (b) water vapor flux at 850 hPa (arrows) and precipitation (shading), (c) 100°E–120°E mean wind (arrows) and relative humidity (shading), (d) downward solar radiation at the surface (shading) and the sum of low and medium cloud cover (contours). The white dots indicate that the shading was above the 95% confidence level.
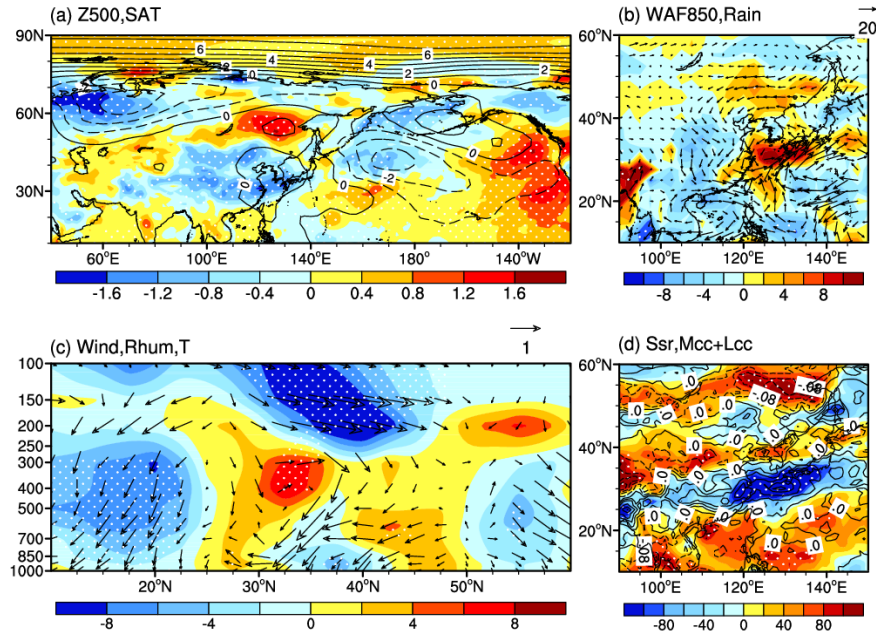
Figure S5. Anomalies of summer mean atmospheric circulations in 2015 with respective to the mean during 2015–2018. (a) geopotential height at 500 hPa (contours) and surface air temperature (shading), (b) water vapor flux at 850 hPa (arrows) and precipitation (shading), (c) 100°E–120°E mean wind (arrows) and relative humidity (shading), (d) downward solar radiation at the surface (shading), the sum of low and medium cloud cover (contours). The white dots indicate that the shading was above the 95% confidence level.
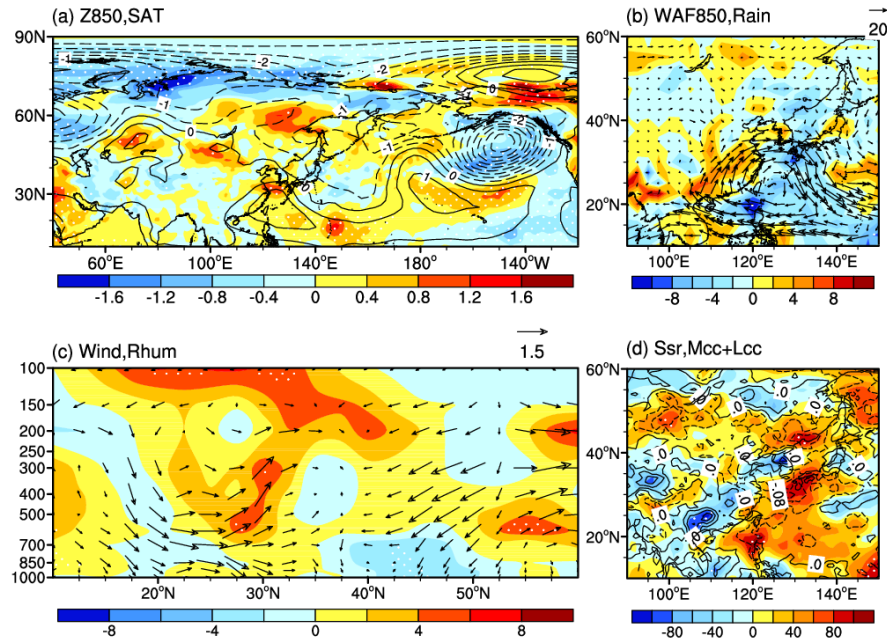
Figure S6. Anomalies of summer mean atmospheric circulations in 2017 with respective to the mean during 2015–2018. (a) geopotential height at 850 hPa (contours) and surface air temperature (shading), (b) water vapor flux at 850 hPa (arrows) and precipitation (shading), (c) 100°E–120°E mean wind (arrows) and relative humidity (shading), (d) downward solar radiation at the surface (shading), the sum of low and medium cloud cover (contours). The white dots indicate that the shading was above the 95% confidence level.