Impact of East Asian anthropogenic aerosols on clouds and precipitation over the north Pacific Ocean

*romgwu wang[1,2]

1. IEECAS, 2. UCAS

Aerosols act as cloud condensation nuclei or ice nuclei and have complex effects on cloud physical properties and precipitation. The North Pacific Ocean (NPO) is rich in heat and water vapour, providing favourable conditions for aerosol-cloud interactions. Under the effect of prevailing westerly winds in winter, a large amount of air pollutants from East Asia are transported over the NPO, affecting weather and climate. The effects of increased anthropogenic aerosols in East Asia on cloud properties and precipitation in the NPO region were investigated based on the WRF-Chem model. The results showed that: under the pollution scenario, the concentration of cloud droplet number increased significantly, the effective radius decreased, the warm rain process was suppressed, the concentration of raindrops decreased, and the concentration of ice crystals and snow crystals increased; the formation of high clouds was promoted and the development of low clouds was suppressed. Total precipitation was insensitive to aerosol concentration, increasing by only 2%. The increase in aerosol concentration changes the precipitation intensity and its frequency distribution, increases the probability and intensity of heavy precipitation, and raises the risk of extreme precipitation. This study provides an important reference for the in-depth discussion of the impact of aerosols on weather and climate.

Keywords: WRF-Chem, ACI, precipitation, microscopic characteristics of clouds, the North Pacific

