



Air Stagnations for China (1985–2014): Climatological Mean Features and Trends

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Air stagnation is an important meteorological measurement for unfavourable air pollution conditions, but little is known about it in China. We conducted a comprehensive investigation of air stagnation in China, based on sounding and surface observations of 81 stations, from January 1985 to December 2014. The stagnation criteria were revised to be topographically dependent for the great physical diversity in this country.

It is found that the annual mean air stagnation occurrences are closely related to general topography and climate features. Two basins in the northwest and southwest of China—Tarim and Sichuan Basins—exhibit the most frequent stagnation occurrence (50% days per year), whereas two plateaus (Tibet-Qinghai and Inner Mongolia Plateau) and the east coastal areas experience the least (20% days per year). Over the whole country, air stagnations achieve maxima in summer and minima in winter, except for Urumqi, a major city in the northwest of China, where stagnations keep a rather constant value yearly around with a minimum in spring. There is a nationwide positive trend in stagnation occurrence during 1985–2014, with the strongest increasing centres over Shandong Peninsula in eastern China and the south of Shaanxi in central China. Dependence degrees of air stagnations on three components (upper- and lower-air winds, precipitation-free days) are examined. It shows that the spatial distribution and trend of air stagnations are mainly driven by the behaviours of upper-air wind speeds.

Air stagnation climatology presents a specific view to the natural background of atmosphere features being responsible to air pollution levels. The results presented in this paper may have significant implication to air pollution research, and may be used in atmospheric environment management or air pollution control.