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Spatio-temporal Characteristics of East Asian Subtropical Jet Perturbationsin Summer

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ABSTRACT

Perturbation of East Asian Subtropical Jet (EASJ) is not only an essential characteristic of the EASJ, but also has significant impacts on seasonal variation of summer rainfall in eastern China. However, few studies have been conducted on detailed characteristics of the EASJ perturbation.Using daily reanalysis data provided by NCEP/NCARand daily precipitation observation data in China during 1960[U+FF5E]2015, the present study first systematically analyzes the temporal and spatial features of the EASJ perturbation and its relationship with the typical rainy season in boreal summer in eastern China. It is found that the perturbation account for 35%∼45% of the total variation in the stationary upper-level westerly jet stream in the Northern Hemisphere and determines the spatial characteristics of the shape and intensity of the jet. Perturbations of the EASJ are mainly comprised of planetary-scale and synoptic-scale waves. The planetary-scale perturbation can be represented by the fourth harmonic, which determines the shape and intensity of the EASJ perturbation. The synoptic-scale perturbation is controlled by the seventh harmonic, which is superimposed on the planetary-scale perturbation and determines the intensity variation of the EASJ perturbation.Following the northward (southward) movement of the total EASJ perturbation and planetary-scale perturbation, the overall intensity of the EASJ perturbation weakens (enhances) while the intensity of perturbation caused by synoptic-scale waves enhances (weakens), and the difference betweentotal perturbation and planetary-scale perturbation increases (decreases).The planetary-scale and synoptic-scale waves and perturbations have substantial impacts on seasonal shift of summer rain belt in eastern China. The combined effect of planetary-scale and synoptic-scale perturbations determines the variation of the EASJ in different stages of the rainy season in summer over eastern China. Duringthe Meiyu season, the EASJ moves northward to around 37-39°N and demonstrates a quasi-biweekly oscillation (13 days) in its spatial position, which is largely attributed to strong planetary-scale perturbationsthat dominate the variation of the primary mode of the EASJ. In the rainy season in summer over North China, both quasi-biweekly oscillation (13 days) and single-week oscillation (6 days) are significant because planetary-scale perturbationsbecome weakened but synoptic-scale perturbations intensify during this period.