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A climate classification: Mediterranean, monsoon and westerlies climates

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This study aims to develop a large-scale climate classification for investigating the mechanisms of global climate formation in the surface. There are three types of large-scale climates, i.e., monsoon, Mediterranean and westerlies, corresponding respectively to collocation of temperature and precipitation at in-phase, anti-phase and out of phase, during seasonal cycle. The first one is called proper collocation, and the latter two are named as improper collocation, hereafter. The collocations are coupled with different seasonal moisture transport pattern with moisture divergence. Northward/southward moisture transport accompanies a moisture convergence/divergence with more/less precipitation in the season leading to different climate type. As an example, the climate around Tibetan Plateau can be attributed to four regimes, i.e., East Asia monsoon, South Asia monsoon, Central Asia and westerlies regimes, despite of the Köppen climate classification. The Central Asia regime refers to the dry climate in middle and southern part of the area, while the dry land belt with the westerlies regime extends from northern Central Asia throughout the northwestern China. The proper collocation between temperature and precipitation leads to a warm-wet climate over monsoon zones in warm season (May-October), whereas the improper one leads a hot-dry climate in Mediterranean climate areas and the dry land with the westerlies climate regime. By contrast, a mild-wet climate is in Mediterranean or quasi-Mediterranean climate areas in comparison with cold-dry climate in Asian monsoon zone during cold season (November to April). The improper collocation results in land degradation or even desertification in Mediterranean climate areas and the dry land with the westerlies regime with insufficient precipitation and over-evenly distribution of the precipitation during seasonal cycle. The improper collocation is actually made by improper dynamical and thermal dynamical collocation in regional moisture circulation associated with seasonal change of mid-latitude stationary waves in wave number and phase, which is virtually forced by large mountains and land-sea thermal contrast in the surface. Besides, analysis manifests that there exists mutually engagement between the seasonal changes in some properties of the mean moisture flows over monsoon and non-monsoon areas across Tibetan Plateau in Eurasian continent. It implies a dynamical coupling existed in large-scale moisture patterns over the earth surface.

Keywords: Large-scale climate classification, monsoon, westerlies, Mediterranean climate, Tibetan

Plateau