The impact factor of surface spectral albedo in an arid area

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Climate is very sensitive to surface albedo. Subtle changes in surface albedo can affect the energy balance of land atmosphere system and cause climate change. Therefore, accurate acquisition of surface albedo parameters and the study of their distribution characteristics are of great significance to regional climate change and to the improvement and validation of land surface process models. As the past studies on the surface albedo are mostly focus on the full-spetrum radiation. And in the third generation of land-surface process models, such as the CLM, LSM, and the later-released CLM4.0 and CLM4.5, the solar radiation is divided into visible and near-infrared radiation, with a wavelength of 0.7 μm as a divide, as well as being divided into direct radiation and scattered radiation in the parameterization process of the surface albedo. However, the absorption and reflection of different wavelengths of sunlight would change by the change of underlying surface. In order to understand the impact factors of surface spectral albedo and provide theory basis for the parameterization of surface albedo, the observational data on the spectral radiation and 2cm soil moisture in Dunhuang, China from July 2017 to December 2018 were analyzed. The reason of choosing Gobi area instead of other areas is it can minimize the impact of cloud cover and other weather conditions on the solar radiation. During the observation period, the surface albedo increased with the wavelength in each season except winter. The surface albedo was affected by the solar altitude and soil moisture, and they exhibited obvious anti-correlations. The annual mean surface albedo of GR, UV, VIS and NIR was 0.25, 0.13, 0.25 and 0.43, while the correlation coefficient with solar altitude was -0.41, -0.08, -0.29 and -0.30, and the correlation coefficient with 2cm soil moisture was -0.60, -0.60, -0.59 and -0.46, respectively. Longer wavelengths correspond to stronger relationship between the surface albedo and solar altitude. In contrast, shorter wavelengths correspond to stronger relationship between the surface albedo and 2cm soil moisture.

Keywords: surface spectral albedo, solar altitude, soil moisture, arid area

