Atmospheric visibility variation over the Chinese continent from 1957 to 2005

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A variation of atmospheric visibility over the Chinese continent was investigated statistically. The analyzed data were for 117 sites over the Chinese continent from 1957 to 2005. The data were also compiled in discrete classes and continuous values for the former and latter terms, respectively. Accordingly, we investigated the atmospheric visibility in terms of the phase of variation rather than the magnitude of variation. We analyzed the data on a one-year statistical basis and found that the atmospheric visibility increased till 1965 (maximum phase) and then it decreased till 1980 or 1990 (minimum phases), and after that, it increased again. There were two modes in the minimum phases around 1980 and 1990 in terms of the site numbers. We also compared the variation of the atmospheric visibility to that of the solar radiation such as direct, diffuse, and their summation (global) radiation at surface. As a whole, the variation of atmospheric visibility was well in phase with solar radiation variations. But we also found that the first mode of the minimum phases around 1980 corresponded to the minimum phase of the direct solar radiation, while the second mode of the minimum phases around 1990 corresponded to the minimum phase of the global and diffuse radiation. The observation sites of the second minimum phase around 1990 have tendency that they locate at the central area in the Chinese continent and larger amount of population compared to the first minimum phase around 1980. Because the atmospheric visibility is generally a good indicator of aerosol loading near the surface, the variation of it suggested that aerosol near the surface is one of the most influential agents for the variation of solar radiation at surface over the Chinese continent.

Key words: Visibility, Solar radiation, aerosol, Global dimming and brightening