

Light pollution in Beijing and effects on Xinglong Station of National Astronomical Observatory

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Abstract. A night-sky luminance survey was carried on in Beijing to assess the level of light pollution. The luminance of the zenith night sky and skies in four directions at six sites with different distances from the city center was measured by using a photometric luminance meter. The Xinglong Station of National Astronomical Observatory was included to study the impacts of city lights on an astronomical observatory. The survey shows that the night-sky luminance decreases with increasing distance from the city center. Measurement results indicate that outdoor lighting in the Xinglong county town which is close to the observatory has non-negligible influence on the night sky at Xinglong Station.

Keywords. night-sky luminance, astronomical observatory, outdoor lighting, light pollution

Measurements were made to estimate the quality of the Xinglong Station, a major optical/IR site for astronomical observations in China. A small and easy-to-use device called the Night Sky Luminance Meter was used in the survey, which gives the luminance in linear (cd/m^2) units. The zenith night sky and skies at 45 degrees altitude in four directions of north, south, east and west are all brighter before midnight though the luminance decreases with time. After midnight, the night-sky luminance reduces to a low value and remains generally stable until twilight appears. Measurement results show that night skies of urban, suburban and even rural sites in Xinglong have been brightened by artificial outdoor lighting of Beijing. The zenith luminance of the night sky decreases with increasing distance from the city center. At the Xinglong station the quality of the zenith night sky is about 21.4 mag/arcsec². Compared with luminance data taken at Lingshan, Xinglong Station proves to be suffering from light pollution from the Xinglong county town which is close to the observatory. Diffusely distributed suburban towns in the northeast of Beijing also contribute to the problem.

Measurements provide evidence to support for the development of regulations on the usage of outdoor lighting. Moreover, much more education outreach is needed as lack of awareness and apathy are the main problems.

Future plans to continue our work include extending the survey by constructing a network of observing stations in which the night-sky luminance will be simultaneously and automatically monitored at multiple astronomical sites in China at a high frequency for a long period of time. Data from this project is expected to provide a more comprehensive historical record of the light pollution situation at observatories.