



#### [Volume XL-7](#)

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-7, 203-208, 2014  
www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XL-7/203/2014/  
doi: 10.5194/isprsarchives-XL-7-203-2014

## Analysis on light quantity and quality based on diverse cloud conditions

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Keywords: Cloud conditions, Global PAR, Diffuse PAR, light quantity, light quality

**Abstract.** Photosynthetic active radiation (PAR) is the source of incident light energy for the photosynthetic activity of plants. PAR additionally characterizes the light environment on the surface of the Earth. The light environment is an important factor for estimating quantities such as carbon exchange and the productivities of forests and agriculture. The incident PAR on the ground surface has the characteristics of light quantity consists of direct and diffuse components, and of light quality consists of spectral components such blue, green and red lights. These light quantity and quality are also important light environmental factors in the photosynthetic activities of plants under the natural environment. However, the light environment including direct and diffuse components and spectral components is easily affected by cloud conditions especially cloud cover and its movements.

In this paper, we focus on the characteristics of the light quantity and quality under diverse cloud conditions, and analyse the observational data, which are the global- and diffuse- spectral irradiances from 400 to 700 nm with quantum and energy units and the cloud conditions derived from whole-sky images taken during summer in Kyoto city.

As for the comparisons with light quality and cloud conditions, we use the Normalized Difference PAR Spectral Index (NDPSI) which shows the difference of red- and blue-light components and we use cloud cover and the Sun appearance ratio derived from the wholesky images to define the cloud conditions.

As the results of these analyses, we confirmed that there are the clear relationships between cloud cover and diffuse ratio, between the Sun appearance ratio and the normalized global PAR as the light quantity, between cloud cover and NDPSI in diffuse component, and between the Sun appearance ratio and NDPSI in direct component as the light quality.

[Conference Paper](#) (PDF, 503 KB)

