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THE CLOUD COVER FRACTION OBTAINED FROM A GROUND CCD CAMERA AND ITS EFFECT ON A RADIATIVE TRANSFER MODEL

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Clouds are the major factor that rules the solar irradiance over Earth's surface. They interact with solar radiation in the shortwave spectra and with terrestrial radiation emitted by Earth's surface in the longwave range. Information about cloud cover is a very important input data for radiative transfer models and great effort is being made to improve methods to get this information. This paper reports the effects on a radiative transfer model by using the simple cloud fraction obtained by a ground set CCD camera instead of the satellite derived cloud index.
The BRASIL-SR model is a radiative transfer model that calculates surface solar irradiance, using a normalized cloud index determined by statistical analyses of satellites images and from climatological values of temperature and albedo. Cloud fraction was obtained from digital images collected by a ground set CCD (Charge Coupled Device) camera, in the visible range (0.4mm - 0.7mm) as RGB (Red - Green - Blue) compositions. The method initially transforms the image attributes from the RGB space to the IHS (Intensity - Hue - Saturation) space. The algorithm defines threshold values for the saturation component of the IHS system to classify a pixel as cloudy or clear sky. Clear skies are identified by high values of saturation in the visible range while cloudy condition presents a mixture of several wavelengths and consequently lower saturation values.
Results from the CCD camera and from the satellite were compared with the Kt and Kd from pyranometer data obtained from a local BSRN radiation station at Florianópolis (27ž 28'S, 48ž 29'W) and show that cloud fraction is only a poor information about the cloud sky status since it does not bear any information on the cloud optical depth which is needed in most radiative transfer models such as the one used in this paper (the BRASIL-SR).