ELS-XV-2015 Abstracts
ELS-XV-2015-129
Electromagnetic & Light Scattering XV 2015, Leipzig

Analysis of vertical profiles of visible radiation measured from a balloon

P. Stammes, P. Wang, M. Allaart, and W. Knap
Royal Netherlands Meteorological Institute (KNMI), De Bilt, the Netherlands (stammes@knmi.nl)

Vertical profiles of visible radiation integrated over all directions (actinic flux) have been measured in clear and cloudy atmospheres, from the surface up to 30 km altitude. A green light sensor, developed at KNMI, was used to measure these actinic flux profiles from an ozone sonde balloon. In total, 63 launches with ascending and descending profiles were performed between 2006 and 2010. The measured uncalibrated actinic flux profiles have been analyzed using the Doubling Adding KNMI (DAK) radiative transfer model. Values of the cloud optical thickness (COT) along the flight track were taken from the Spinning Enhanced Visible and Infrared Imager (SEVIRI) Cloud Physical Properties (CPP) product. The impact of clouds on the actinic flux profile has been evaluated on the basis of the cloud modification factor (CMF) at the cloud top and cloud base, which is the ratio between the actinic fluxes for cloudy and clear-sky scenes. The impact of clouds on the actinic flux is clearly detected: the largest enhancement occurs at the cloud top due to multiple scattering. The actinic flux decreases almost linearly from cloud top to cloud base. Above the cloud top the actinic flux also increases compared to clear-sky scenes. We find that clouds can increase the actinic flux up to 2.3 times of the clear-sky value at cloud top and decrease it to about 0.05 at cloud base. The relationship between CMF and COT agrees well with DAK simulations, except for a few outliers. Good agreement is found between the DAK simulated actinic flux profiles and the observations for single layer clouds in fully overcast scenes.