



The annual and semi-annual variations in the distributions of cloudless days and nights in Abastumani

Maya Todua, Goderdzi G. Didebulidze, and Nikoloz Gudadze

Abastumani Astrophysical Observatory at Ilia State University, Tbilisi, Georgia (mayatodua@iliauni.edu.ge)

To reveal the influence of cosmic factors on cloud covering, we study the inter-annual distributions of cloudless days (CD) and cloudless nights (CN) in Abastumani Astrophysical Observatory (AAO - 41.75N, 42.82E), using the continuous data of CD and CN, covering three 11-year solar cycles. It was revealed that the greatest number of CD was in August, while the greatest number of CN was in September. This picture changed when geomagnetically disturbed conditions had been considered. For weak and moderate geomagnetic disturbances, the greatest number of CD moves to September, where the frequency of magnetically disturbed day-nights is the highest during a year. On the other hand, at geomagnetically quiet conditions the maximum number of CN appears in August. These observed properties in the inter-annual distributions of cloud cover may indicate the impact of cosmic factors on cloud formation process. It is demonstrated for the considered dataset that the inter-annual variations of relative number of CD are well described by the sum of harmonic functions with annual and semi-annual periods. By this description the maximum of the annual relative number of CD is in Augusts and the amplitude of its variations does not depend on the planetary geomagnetic Ap index. For the semi-annual variations of these CD the maxima are in March and April, the amplitude depending on Ap index values, which also may indicate possible impact of cosmic factors on cloud cover. These maxima in March and April are significant at $Ap \geq 8$ and increase at $Ap \geq 12$ and $Ap \geq 20$. Cloud covering processes differ during day-time and night-time which can influence the radiative balance at the Earth's surface. This influence is different in various seasons resulting in different variability of day- and night-time cloud covering which can affect the regional climate.