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Annual and Semi Annual Variations of the Galactic Cosmic Ray Intensity and Seasonal Distribution of the Cloudless Days and Cloudless Nights in Abastumani (41.75oN, 42.82oE; Georgia): (1) experimental study and (2) theoretical modeling

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We study seasonal distributions of the visually observed cloudless days (CD) and cloudless nights (CN) at Abastumani Astrophysical Observatory (41.75N, 42.82E; Georgia) and the galactic cosmic ray (GCR) intensity in 1957-1993. The annual variations of monthly numbers of CD and CN have been observed, with maximum in August for CD and in September for CN. During geomagnetic disturbances it is also observed the growth of number of CD in September and March (equinoctial months), and for CN, together with September, in June, April and February. We assume that this phenomenon indicates an influence of cosmic factors on cloudiness, as well as the existence of semiannual and possibly shorter-periodicity variations. Taking GCR flux as a possible proxy to find some relationships with the annual variations of monthly numbers of CD and CN is our working hypothesis. The influence of GCR flux on ionization of lower atmosphere and variations of density of cloud condensation nuclei, also can be connected to the annual and seasonal changes of temperature at Earth surface of this region. We compose a two dimensional (2-D) time dependent transport equation including all important processes in the heliosphere. An analysis of experimentally observed and theoretically obtained results have been carried out.

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