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Correct atmosphere optics modeling: Theory and experiment

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Rapid evolution of computers in last decades provides complicating atmospheric models with detailing vertical profiles, accounting for irregular clouds in wide spectral ranges. Numerical algorithms for calculating radiative characteristics with maximal exactness and minimization of uncertainty are usually applied. There are many different computer codes including look-up tables with aerosols characteristics, water vapor, atmosphere conditions in different latitudes, continental and sea conditions, and seasons. Sophisticated approaches for calculating optical parameters are based on scattering and radiative transfer theories. It is very useful for applied problems. However the analysis of separate factors influence on atmospheric radiative characteristics without of considering all possible variations of the whole totality is often necessary for many research problems. For that case the simple models of homogeneous (for the clear atmosphere) and two or three layer atmosphere (for cloudy cases) allow operative varying considered atmospheric optical parameters and provide result that hardly contributes to complicate models and clearly elucidateaninteractions between of key atmospheric parameters and radiative characteristics. Two-stream methods of radiative transfer theory ensure an acceptable exactness for calculating integral (over viewing directions) radiative characteristics (irradiance and radiative divergences). Asymptotic formulas are also effective for fast and transparent calculation in case of the cloud atmosphere. A simplest optical model is accepted of the homogeneous clear atmosphere including ozone absorption in UV ranges, molecular scattering, and four variants of the aerosol content at selected shortwave wavelength. In cloud case three variants of extended cloud layer are added. Radiative characteristics together with heating rate are calculated and presented in this study. Results of optical parameters retrieved from observation of solar radiation in the atmosphere and radiative characteristics are compared with simple modelling.

Biography

Irina N Melnikova is Leading specialist in the St. Petersburg State University, Russia. She completed Doctor of Sciences in Physics & Mathematics, Main Geophysical Observatory, St.Petersburg in 2001. She is an Editorial board member of The Open Journal of Modern Physics, Scientific Online Publishing, Co., Ltd. and of Frontiers in Environmental Informatics, which is a section of Frontiers in Environmental Science and Member of the Organizing Committee of the Biennale Conference “Natural and Anthropogenic Aerosols”.

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