# The Monte Carlo Methods in Atmospheric Optics (Springer Series in Optical Sciences) (Volume 12)

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This monograph is devoted to urgent questions of the theory and applications of the Monte Carlo method for solving problems of atmospheric optics and hydrooptics. The importance of these problems has grown because of the increas ing need to interpret optical observations, and to estimate radiative balance precisely for weather forecasting. Inhomogeneity and sphericity of the atmos phere, absorption in atmospheric layers, multiple scattering and polarization of light, all create difficulties in solving these problems by traditional methods of computational mathematics. Particular difficulty arises when one must solve nonstationary problems of the theory of transfer of narrow beams that are connected with the estimation of spatial location and time characteristics of the radiation field. The most universal method for solving those problems is the Monte Carlo method, which is a numerical simulation of the radiative-transfer process. This process can be regarded as a Markov chain of photon collisions in a medium, which result in scattering or absorption. The Monte Carlo tech nique consists in computational simulation of that chain and in constructing statistical estimates of the desired functionals. The authors of this book have contributed to the development of mathemati cal methods of simulation and to the interpretation of optical observations. A series of general method using Monte Carlo techniques has been developed. The present book includes theories and algorithms of simulation. Numerical results corroborate the possibilities and give an impressive prospect of the applications of Monte Carlo methods.

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