

An iterative method for transport equations in radiotherapy

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Treatment with high energy ionizing radiation is one of the main methods in modern cancer therapy that is in clinical use. During the last decades two main approaches to dose calculation were used, Monte Carlo simulations and pencil-beam models. A third way to dose calculation has not attracted much attention in the medical physics community. This approach is based on deterministic transport equations of radiative transfer. In this work, we study a full discretization of the transport equation which yields a large linear system of equations. The computational challenge is that scattering is strongly forward-peaked, which means that traditional solution methods like source iteration fail in this case. Therefore we propose a new method, which combines an incomplete factorization of the scattering matrix and several iterative steps to obtain a fast and accurate solution. Numerical examples are given.