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NUMERICAL TREATMENT OF HIGHLY FORWARD SCATTERING ON RADIATIVE TRANSFER USING THE DELTA-M APPROXIMATION AND GALERKIN QUADRATURE METHOD

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ABSTRACT. We examined influences of the highly forward scattering on photon transport and numerical treatments of the highly forward-peaked phase function in the scattering integral of the radiative transfer equation (RTE) using the delta-M approximation (dMA) and Galerkin quadrature method with various kinds of quadrature sets. Numerical investigations showed that the first order dMA with the 6-th order level symmetric even quadrature set provided the most accurate and efficient results of the RTE-calculations at a short source-detector distance of $\rho \leq 10/\ \mu'_t$ with the reduced transport coefficient of μ'_t, where the highly forward scattering strongly influences photon transport. At a long distance of $\rho \geq 10/\ \mu'_t$, meanwhile, the zeroth order dMA is sufficient for the accurate and efficient results, meaning that isotropic scattering approximation holds. On the other hand, the Galerkin method provided accurate results for the RTE-calculations in highly forward scattering almost regardless of the quadrature sets.