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A Lattice Boltzmann Method for Electromagnetic Wave Scattering by Water Droplets JAMAL HUSSAIN, MOHD MERAJ KHAN, Department of Applied Mechanics, Indian Institute of Technology Madras, RATUL DASGUPTA, Department of Chemical Engineering, Indian Institute of Technology Bombay, HARISH N DIXIT, Department of Mechanical Aerospace Engineering, Indian Institute of Technology Hyderabad, SUMESH P. THAMPI, Department of Chemical Engineering, Indian Institute of Technology Madras, ANUBHAB ROY, Department of Applied Mechanics, Indian Institute of Technology Madras — Understanding scattering of electromagnetic waves from water droplets in the sky is crucial for accurate estimation of rainfall. Scattering analysis and its signature depends on the shape, size and the distance of droplets as well as polarization of the wave. In this study, we solve Maxwell's equations of electromagnetism using the lattice Boltzmann method following the work of Hauser and Verhey (2017). Standard validations of electromagnetic waves by a dielectric interface and fluid mechanics problem have been performed. Scattered intensity is directly related to the droplets size and shape distribution. Therefore, this project is aimed at solving Maxwells equations of electromagnetism using the lattice Boltzmann method with the intention of accurately relating the shape and size distribution of the water droplets to calculate the scattered intensity. Error in the solutions was found to be minimal on comparing with analytical solutions. The applicability of the proposed numerical method towards analyzing scattering of electromagnetic waves by a three-dimensional scatterer, modelled on realistic water droplets, will be discussed.

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