

论文

动态中子输运方程迭代初值的选取方法

洪振英,袁光伟,傅学东

北京应用物理与计算数学研究所, 北京100088

摘要:

研究离散纵标动态中子输运方程迭代求解时, 迭代初值的不同选取方法, 设计合理的迭代初值可以适当放宽对时间步长的限制, 缩短计算时间. 设计四种迭代初值并应用于数值求解中的等比格式和菱形格式, 其中等比格式形成非线性离散方程, 菱形格式形成线性离散方程. 考察不同迭代初值的计算效率, 分别对物理量变化平缓以及变化剧烈的问题进行考察. 数值算例表明构造的基于物理量随时间走势的预估值作为迭代初值优势明显, 这在保证计算精度的前提下提高了数值计算效率.

关键词: 离散纵标, 中子输运方程, 迭代初值, 等比格式, 菱形格式

METHODS OF DETERMINING ITERATIVE INITIAL VALUE FOR TIME-DEPENDENT NEUTRON TRANSPORT EQUATION

Hong Zhenying, Yuan Guangwei, Fu Xuedong

Institute of Applied Physics and Computational Mathematics, Beijing 100088, China

Abstract:

In this paper the methods of determining iterative initial value about iterative procedure for discrete ordinate time-dependent neutron transport equation are studied. Proper iterative initial value can extend time step limit, thereby save computing time. Four kinds of methods which are applied to exponential method and diamond method are studied and the different numerical results are compared. The discrete equation of exponential method is nonlinear and the discrete equation of diamond method is linear. The numerical results by using different initial value on problems of different physical process show that the method of choosing iterative initial value based on the physical process has higher computational efficiency than others. Thus one can select more rational method to solve time-dependent transport equation such that the corresponding method can improve the computational efficiency on the condition of keeping numerical precision.

Keywords: discrete ordinate, neutron transport equation, iterative initial value, exponential method, diamond difference

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通讯作者:

作者简介:

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