

垂直无碰撞激波的离子加速机制

杨忠炜^{1,2}, 陆全明^{1,2}, 郭俊³, 王水¹

1 中国科学技术大学地球和空间科学学院 中国科学院基础等离子体物理重点实验室, 合肥 230026; 2 中国科学院空间天气学国家重点实验室, 北京 100080; 3 青岛科技大学数理学院, 青岛 266041

收稿日期 2007-12-7 修回日期 2008-3-10 网络版发布日期 2008-7-17 接受日期

摘要 利用一维全粒子模拟得到的垂直无碰撞激波的位形, 通过试验粒子方法研究了不同初始能量粒子的激波加速机制. 将与激波相互作用的离子分成反射和直接穿过两类, 发现只有被激波反射的离子可被激波明显加速, 其中初始能量较小的反射离子通过激波冲浪机制加速, 而初始能量较大的离子通过激波漂移加速机制加速. 同时激波厚度还对离子被加速过程有重要影响.

关键词 [无碰撞激波](#) [高能粒子](#) [冲浪加速](#) [漂移加速](#)

分类号 [P354](#)

DOI:

Mechanism of ion acceleration at perpendicular collisionless shocks

YANG Zhong-Wei^{1,2}, LU Quan-Ming^{1,2}, GUO Jun³, WANG Shui¹

1 Key Laboratory of Basic Plasma Physics, University of Science and Technology of China, Chinese Academy of Sciences, Hefei 230026, China; 2 Key Laboratory for Space Weather, Chinese Academy of Sciences, Beijing 100080, China; 3 School of Mathematics and Physics, Qingdao University of Science and Technology, Qingdao 266041, China

Received 2007-12-7 Revised 2008-3-10 Online 2008-7-17 Accepted

Abstract With one-dimensional (1D) perpendicular collisionless shocks obtained by full particle simulation, the mechanisms of shock acceleration of various initial energetic particles are investigated by using test particle method. The results show that the ions can be separated into two groups at the shock front: the reflected ions and the directly transmitted ions. Only the reflected ions can be accelerated significantly. Moreover, the lower initial energy ions are accelerated by shock surfing mechanism, and the higher initial energy ions gain energy by shock drift acceleration. Meanwhile, the thickness of the shock can significantly affect the acceleration process of ions.

Key words [Collisionless shock](#); [Energetic ions](#); [Surfing acceleration](#); [Drift acceleration](#)

通讯作者:

杨忠炜 qmlu@ustc.edu.cn

作者个人主页: 杨忠炜^{1,2}; 陆全明^{1,2}; 郭俊³; 王水¹

扩展功能

本文信息

▶ [Supporting info](#)

▶ [PDF \(2267KB\)](#)

▶ [\[HTML全文\] \(0KB\)](#)

▶ [参考文献](#)

服务与反馈

▶ [把本文推荐给朋友](#)

▶ [加入我的书架](#)

▶ [加入引用管理器](#)

▶ [引用本文](#)

▶ [Email Alert](#)

▶ [文章反馈](#)

▶ [浏览反馈信息](#)

相关信息

▶ [本刊中包含“无碰撞激波”的相关文章](#)

▶ 本文作者相关文章

• [杨忠炜](#)

•

• [陆全明](#)

•

• [郭俊](#)

• [王水](#)