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耀斑引发的激波初始速度对激波到达时间预测的影响

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Influence of the initial shock speed excited by solar flares on shock arrival time prediction

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摘要 利用Hakamada-Akasofu-Fry运动学太阳风模型模拟了1981到1985卡林顿周的48个太阳耀斑事件激发的激波到达地球的时间.结果表明,对模式输入参数之一的激波初始速度进行调整,可以使模拟结果和实际观测基本一致.通过对发生在该时期多个事件的统计分析,分别得到日球表面东、西两半球耀斑爆发对应的激波初始速度调整因子和初始速度的统计关系.该关系应用到1986到1990卡林顿周期间发生的耀斑对应的激波到达地球时间的模拟时,对于位于西(东)半球的耀斑,预测行星际激波到达地球所需时间的平均绝对误差从未使用该关系的16(15) h降低到12(11) h.

关键词: HAF模型 初始太阳风激波速度 激波到时 II型射电爆发

Abstract: By using Hakamada-Akasofu-Fry (HAF) solar wind model, we simulated 48 solar flare events during Carrington Rotation 1981 to 1985 and compared the simulated shock arrival time with observations by satellites at 1 AU. It is found that the initial solar wind shock speed deduced from the metric Type II radio burst observations plays an important role in the shock arrival time prediction. The match between predicted and observed shock arrival times (SATs) was considerably improved by iteratively adjusting the initial shock speed. We obtained the adjustment factors as a function of the initial shock speed for different hemispheres by statistical analysis and applied them to adjust the initial shock speed driven by the solar flares which occurred in the following five Carrington rotations (1986~1990), the mean absolute error of the shock arrival time was reduced from 16 (15) hours to 12 (11) hours for the flare occurred on the western (eastern) hemisphere. This indicates that there can be significant improvements for the shock arrival time prediction by adjusting the initial shock speed using the statistical functions.

Keywords: HAF model Initial shock speed Shock arrival time Type II radio burst

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