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Similarity and difference of Alfvén waves' propagation and evolution in the slow and fast solar wind of inner heliosphere

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Parker Solar Probe detected the Alfvénic slow solar wind in the inner heliosphere. Before that, although different spacecraft had measured that slow solar wind sometimes has Alfvénic characteristics, they did not attract extensive and strong attention and discussion. The critical question is, how does the propagation and evolution of Alfvénic waves perform through the same or different processes in the fast and slow solar wind? To study this problem, we simulate the formation of high and low-speed solar wind and the propagation of evolving Alfvén waves therein from a global perspective. Compared with one-dimensional or multi-dimensional simulations with a limited range of latitude and longitude, the advantage of global simulation is that it provides a self-consistent model of fast and slow solar wind coexisting in different flow tubes. Based on this model, we study and evaluate the effects of the expansion, bending, and non-uniformity across the flux tube on the propagation of evolving Alfvén wave. The varying characteristics during the propagation consist of wave amplitude, wave-vector anisotropy, wave mode conversion, etc. As the critical interface to distinguish the sub-Alfvénic and super-Alfvénic solar wind, which is also the vital interface to distinguish the corona and interplanetary space, Alfvén surface is another important aspect of our research. We study the propagation characteristics of Alfvén waves inside and outside the non-spherical interface. In addition, we also discuss the possible relationship between the propagation and evolution of the Alfvén wave and the formation and development of switchback.