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Solar filament fine structures and their counter-streaming flows

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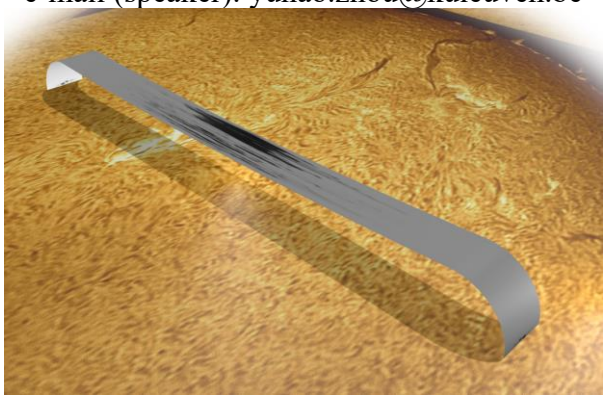

Solar filaments are elongated dark structures observed against the solar disk. They are composed of numerous long fibril-like structures called filament threads, which are considered to be the building blocks of solar filaments, and thus the key to disclosing the physics of solar filaments. There have been some explanations on the formation of these filament structures, but this problem remains unresolved. Besides their mysterious formation, filament threads are observed to move with alternating directions, which is called counter-streaming flows. The origin of these flows has not been clarified yet. In our recent work [1], based on the widely used 1D model [2], we present a 2D numerical model, basically based on the randomized heating at the footpoints of the filament channel, to explain the formation of filament threads and their counter-streaming flows. Simulation is done with the open-source MHD code MPI-AMRVAC[3]. It is found that our numerical model can naturally reproduce the formation of the threads. We further calculated the synthetic Hα and EUV images based on some approximate methods [4, 5]. The results suggest that while the cold Hα counter-streaming flow is mainly due to the longitudinal oscillation of the filament threads, there exists million-degree counter-streaming flows in the interthread corona, which are alternating unidirectional flows.

References

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