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Why switchbacks may be related to solar granulation

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Parker Solar Probe data below 0.3 AU have revealed a near-Sun magnetic field dominated by Alfvénic structures that display back and forth reversals of the radial magnetic field. They are called magnetic switchbacks, they display no electron strahl variation consistent with magnetic field foldings within the same magnetic sector, and are associated with velocity spikes during an otherwise calmer background. They are thought to originate either at the photosphere through magnetic reconnection processes, or higher up in the corona and solar wind through turbulent processes.

In this work, we analyze the spatial and temporal characteristic scales of these magnetic switchbacks. We define switchbacks as a deviation from the Parker spiral direction and detect them automatically through perihelia encounters 1 to 6. We analyze the solid angle between the magnetic field and the Parker spiral both over time and space. We perform a fast Fourier transformation to the obtained angle and find a periodical spatial variation with scales consistent with solar granulation. This suggests that switchbacks form near the photosphere and may be caused, or at least modulated, by solar convection.