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Characterization of the Alfvénic slow solar wind: from turbulent spectra to particle distribution functions

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The solar wind is a turbulent medium in which the energy cascade process is widely considered to result from the nonlinear interaction between the inward and outward propagating Alfvén waves. Fast and slow wind show a different behavior supporting the idea of an older turbulence in the slow wind and an Alfvénic younger turbulence in the fast wind. However, our study suggests that even slow wind can be sometimes highly Alfvénic and this has implications on the spectral features as well. Two kinds of slow solar wind can then be distinguished, characterized by different large-scale properties but also by different micro-scale phenomena. These findings all support a different solar origin of these two kinds of slow wind, a topic long debated in the past years for the typical slow wind. It has been found that the Alfvénic slow wind does not originate from active regions or the cusp of the helmet streamers as the typical slow wind rather from the boundary between streamers and coronal holes. This would determine the similarities with the fast solar wind suggesting a major role played by the super-radial expansion responsible for the lower velocity. We also discuss relevant implications of these new findings for the upcoming Solar Orbiter and Solar Probe Plus missions, and for turbulence measurements close to the Sun.