RECONNECTION AND TURBULENCE ASSOCIATED HEATING IN THE SOLAR WIND

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It has been suggested recently that heating of the solar wind plasma can be associated with the occurrence of spatially overlapped discontinuities, current sheets, magnetic coherent structures, turbulent intermittency and pressure anisotropy instabilities. Small-scale reconnection and magnetic structures can be generated and controlled by turbulence itself. However, correlations found in statistical analyses do not necessarily imply direct causation. There is no consensus in statistical studies regarding the local heating of plasma at current sheets in terms of proton/electron temperatures or specific entropy. We report results on plasma heating associated with discontinuities and structures within reconnection outflow layers in the solar wind. Instead of statistical analysis of events we present case studies of reconnection outflows, emphasizing the crucial importance of the proper identification of underlying structures in the plasma heating problem. We investigate the Riemannian decay of currents sheets involving magnetic reconnection with skewed magnetic fields in the solar wind and show that, the observed plasma heating strongly depends on the actual crossing and geometry of reconnection exhaust boundaries and their instability. Kelvin-Helmholtz instability associated fluctuations within reconnection boundary layers show anisotropy features typical for critically-balanced turbulence.