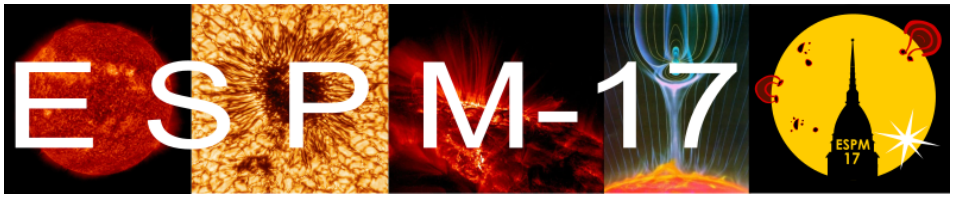

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Clustering of the Solar Wind at 1 AU: Reconnection and the Ambient Solar Wind

Investigating the solar wind is important for our understanding of the dynamics of plasma in the solar system environment. At 1 AU, where the solar wind interacts with the Earth's magnetosphere, we can also identify different transient processes, such as Interplanetary Coronal Mass Ejections (ICMEs) and Corotating Interaction Regions (CIRs), which may result in the occurrence of magnetic reconnection.
In this work we use Self Organizing Maps (SOMs) [1], an unsupervised learning method which achieves dimensionality reduction via neural networks, to transform the observed time series of WIND spacecraft (proton density, proton temperature, solar wind speed and magnetic field strength) into visual maps. We apply clustering techniques to the resulting maps to obtain a classification of the solar wind. Then, by using a reconnection exhausts catalogue from Eriksson et al. 2022 [2] the occurrence of magnetic reconnection in the different clusters is examined.

[1] T. Kohonen, 'Self-organized formation of topologically correct feature maps', Biol. Cybern., vol. 43, no. 1, pp. 59–69, Jan. 1982, doi: 10.1007/BF00337288.

[2] S. Eriksson et al., 'Characteristics of Multi-scale Current Sheets in the Solar Wind at 1 au Associated with Magnetic Reconnection and the Case for a Heliospheric Current Sheet Avalanche', ApJ, vol. 933, no. 2, p. 181, Jul. 2022, doi: 10.3847/1538-4357/ac73f6.

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Session Classification: Coffee break and poster session 2

Track Classification: Diagnostic tools and numerical methods in solar physics