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A multi-timescale view on the slow solar wind with MTOF

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The solar wind is known to be composed of several different types of wind. Their respective differences in speed gives rise to the somewhat crude categories *slow* and *fast* wind. However, slow and fast winds also differ in their composition and plasma properties. While coronal holes are accepted as the origin of the fast wind (e.g. [Tu2005]), slow wind is hypothesized to emanate from different regions and to be caused by different mechanisms, although the average properties of slow wind are remarkably uniform. Models for the origin of the slow solar wind fall in three categories. In the first category, slow wind originates from the edges of coronal holes and is driven by reconnection of open field lines from the coronal hole with closed loops [Schwadron2005]. The second category relies on reconnection as well but places the source regions of the slow solar wind at the boundaries of active regions [Sakao2007]. A topological argument underlies the third group which requires that all coronal holes are connected by the so-called “S-web” as the driver of the slow solar wind [Antiochos2011].

Solar wind composition has been continuously measured by for example SOHO/CELIAS and ACE/SWICS. In this work we focus on the mass time-of-flight instrument of SOHO/CELIAS/MTOF [Hovestadt1995], which has been collecting data from 1996 to the present day. Whereas much attention in previous years has been focused on spectacular features of the solar wind like (interplanetary) coronal mass ejections (ICMEs) our main interest lies in understanding the slow solar wind. Although it is remarkably homogeneous in its average properties (e.g. [vonSteiger2000]) it contains many short term variations. This motivates us to investigate the slow solar wind on multiple timescales with a special focus on identifying individual stream with unusual compositions. A first step in this is to identify individual streams. A useful tool to do this reliably is specific entropy [Pagel2004]. Consequently, this leads to an extensive picture of individual streams from MTOF, which can be combined with observations from other spacecraft in the future. In particular, identifying and understanding short-term variations of the slow solar wind has the potential to help distinguishing between different possible source regions and mechanisms.

Further, with the long term goal of identifying possible different source mechanisms or regions, we analyze and compare the properties of individual streams on short time scales to focus on significant deviations from the average properties of slow solar wind.

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