Evolutionary changes of solar wind, coronal holes and photospheric magnetic structures during 1996 - 1999 years.

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One of the most important and interesting problems of solar physics is the origin and acceleration of the solar wind. It is known now that the solar wind consists of "fast" and "slow" streams. The "fast", high-speed, solar wind is usually associated with coronal holes regions of open magnetic field structure (Krieger et al., 1973, Nolte et al., 1976). "Slow", low-speed, streams originate above closed magnetic field regions such as coronal streamers (Gosling et al., 1981). Wang (1994) indicates two types of slow solar wind associated with rapidly diverging magnetic field occurring at the boundaries of the large polar coronal holes and above small, isolated, coronal holes. Solar rotation causes to interact high-speed and low-speed flows and produce large-scale complicated structure that corotate with the Sun (Gosling, 1996). Axford and McKenzie were the first who suggested that the high-speed wind originates directly from the chromospheric network at the bottom of a coronal hole, and that high-frequency waves at 10^4 Hz are possibly created there by small scale reconnections.

The aim of this work is to analyze evolutionary changes of solar wind parameters, coronal holes distribution and photospheric magnetic field structure over the rising phase of the solar cycle during 1996 - 1999 years.

In this study the daily full-disk high resolution ($1''.1483$) magnetograms in the line $FeI\lambda = 8688\dot{A}$ and Dopplergrams obtained with the Vacuum Telescope of the National Solar Observatory Kitt Peak, the coronal hole maps in the line $\lambda = 10830\dot{A}$ for every day from the same observatory and Wind satellite data for the period of 1996 - 1999 years were used.

To detail study the daily magnetograms and coronal hole maps were combined. The total number of non-polar coronal holes for every day were calculated taking into account their polarity. There are also coronal holes connected with active regions and those which are not. All of them show significant changes in their numbers, areas with the solar cycle growth.

The peculiarities of photospheric magnetic field fine structure and its velocity fields at the regions corresponding to the coronal holes locations were analyzed for the whole period.

The solar wind parameters: speed, density, etc., were averaged for every day and their changes over the period of 1996 - 1999 were analyzed jointly with coronal holes distribution and associated photospheric magnetic field changes.

Figure 1 shows distributions of daily total number of non-polar coronal holes on the solar disk and average daily solar wind speed during 1996 - 1999 years.

The possible mechanism of solar wind formation is discussed.

Acknowledgements

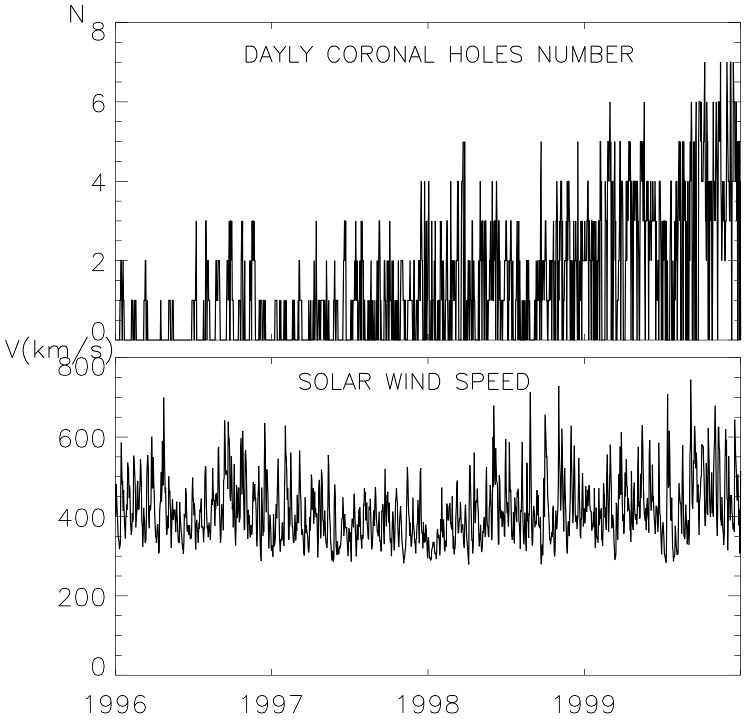

Fig.1.Distributions of daily total number of non-polar coronal holes on the solar disk and average daily solar wind speed during 1996 - 1999 years.

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References

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