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Structure and sources of solar wind in the growing phase of 24^{th} solar cycle

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We present analysis of the solar wind (SW) structure and its association with coronal sources during the minimum and rising phase of 24th solar cycle (2009-2011). The coronal sources prominent in this period - coronal holes, small areas of open magnetic fields near active regions and transient sources associated with small-scale solar activity have been investigated using EUV solar images and soft X-ray fluxes obtained by the CORONAS-Photon/TESIS/Sphinx, PROBA2/SWAP, Hinode/EIS and AIA/SDO instruments as well as the magnetograms obtained by HMI/SDO. It was found that at solar minimum (2009) velocity and magnetic field strength of high speed wind (HSW) and transient SW from small-scale flares did not differ significantly from those of the background slow speed wind (SSW). The major difference between parameters of different SW components was seen in the ion composition represented by the C^6/C^5, O^7/O^6, Fe/O ratios and the mean charge of Fe ions. With growing solar activity, the speed of HSW increased due to transformation of its sources – small-size low-latitude coronal holes into equatorial extensions of large polar holes. At that period, the ion composition of transient SW changed from low-temperature to high-temperature values, which was caused by variation of the source conditions and change of the recombination/ionization rates during passage of the plasma flow through the low corona. However, we conclude that criteria of separation of the SW components based on the ion ratios established earlier by Zhao&Fisk (2009) for higher solar activity are not applicable to the extremely weak beginning of 24^{th} cycle.

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