Longterm variations of solar wind flow

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In the previous paper, we studied long-term variations of three-dimensional structure of the open and closed coronal field lines starting at the photosphere and the source surface. In this paper, we study three-dimensional structure of coronal magnetic field lines calculated by the potential field model devised by Hakamada with synoptic maps of the photospheric magnetic field publisehd by the NSO at the Kitt Peak, during four hundred and thirty Carrington rotations (CRs) from CR 1645, the 17th of August 1976, through CR 2074, the 30th of August 2008. The data for about 33 years cover the almost three solar activity cycles, from around the minimum phase of the 21st cycle through the minimum phase of the 24th cycle. It is found that, by the visual check of the synoptic maps of the photospheric magnetic field, many strong magnetic regions appear in the photosphere during the maximum phases and they disappear during the minimum phases. The polar photospheric fields change their polarity in the declining phase just after the maximum phase of the solar activity. The coronal magnetic field also shows the similar features as those of the photospheric field. The polar coronal magnetic fields on the source surface change their polarity in the declining phase. The polarity change of the coronal magnetic field is shown clearly, as the first time, by the motion picture of open field line structure. In this analysis, we calculated open field lines from the sub-eath points on the source surface at every three hours. The coronal plasmas move along these field lines up to the source surface and escape into interplanetary space as the solar winds. From these field lines, we infer emanating points of the solar winds from both the photosphere and the source surface, as well as the magnitude those magnetic field. We constructed a motion picture by compilation of 430 synoptic maps. The long-term variation of these flow of the solar wind in the corona can be seen by this motion picture.