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CIR-XL recurring for several years

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The heliospheric magnetic flux is determined from the radial component of the magnetic field vector measured onboard interplanetary space probes.
Earlier Ulysses research has shown remarkable independence of the flux from heliographic latitude. Here we are investigating whether any longitudinal variation exist in the 50 year long OMNI magnetic data set. When determining the heliographic longitude of the plasma source, correction was applied for the solar wind travel time. Significant recurrent enhancements of the magnetic flux was observed during the declining phase of the solar cycles. These flux enhancements are associated with co-rotating interaction regions (CIR) lasting several years. The recurrence period is slightly faster than the Carrington Rotation rate.
The same, long lasting recurring features can be observed when plotting the deviation angle of the solar wind velocity vector from the radial direction. However, the deviation angle is small - in order of a few degrees - and cannot account for the observed flux increases. An increase of the magnetic field is clearly caused by the plasma compression associated to CIRs.

Comparing interplanetary data with synoptic maps of the coronal magnetic field (PFSS modell) and coronal temperature data of ACE, we came to the possible explanation that these long-term structures are caused by fast speed solar wind originating from coronal holes. This results supports the idea that magnetic field lines from coronal holes spread out and reach to low latitudes as well.

The recurrent longitudinal variation of the magnetic flux during the declining phase of the solar cycle has impact on the modulation of cosmic rays as well as on the frequency and intensity of space weather events.