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CR-SA hysteresis phenomenon on the basis of NM data, 4. Comparison of time-lags for odd and even solar cycles, relative role of drifts

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Abstract. Estimations of cosmic ray time -lags in long-term variations for solar cycles 19 and 21 (Dorman et al., 2001a), as well as for cycles 20 and 22 (Dorman et al., 2001b), show that there are large differences between odd and even solar cycles. We assume that this odd-even effect in the hysteresis phenomenon is caused mainly by cosmic ray drift effects. The odd-even effect in time-lags we use for rough estimates of the relative role of drifts in establishing long-term modulation. We found that with changing of assuming relative role of drift effects (amplitude Adr in %), the time lag (Xmax in average months) also changed, but in different directions for odd and even solar cycles: for odd cycles 19, 21 Xmax decreases with increasing of Adr, and for even cycles 20, 22 Xmax increases with increasing of Adr. We try to use odd-even effect in time-lags for a rough estimation of the relative role of CR drift effects in formation of long-term modulation as well as for estimation of real time lag and dimension of the modulation region. To determine Xmax and Adr separately, we assume that for a first approximation Xmax and Adr are about the same in odd and even solar cycles. In this case the crossing of dependences of Xmax from Adr for odd and even cycles determines the expected values of Xmax and Adr. On the basis of estimated value of Xmax we determine the dimension of modulation region (with taking into account the influence of nonlinear processes on the solar wind speed in the outer Heliosphere according to Le Roux and Fichtner, 1997), the radial diffusion coefficient and transport path as well as expected CR intensity out of the modulation region and absolute CR modulation (relative to the CR intensity level in the interstellar space. We determine also the relative role of drifts and convection-diffusion in formation of observed CR modulation in the Heliosphere in dependence of particle rigidity.

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