



The 22-Year Hale Cycle in Cosmic Ray Flux - Evidence for Direct Heliospheric Modulation

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The ability to predict times of greater fluxes of galactic cosmic rays is important for reducing the hazards caused by these energetic particles on satellite communications, aviation and astronauts. During the 22-year Hale cycle, we see a difference in shape from a 'flat topped' to a 'spiked topped' peak in cosmic ray flux time series. It is thought that differing drift patterns for when the northern solar pole is predominantly positive ($qA>0$) to when the northern pole is negative ($qA<0$) cause this difference in cosmic ray modulation. Here, we demonstrate a link between cosmic ray modulation and properties of the large-scale heliospheric magnetic field during the declining phase of the solar cycle, when the difference between $qA>0$ and $qA<0$ cycles is most apparent. The results suggest that drift affects may not be the sole mechanism responsible for the Hale Cycle in cosmic ray flux at Earth. Further to this it is suggested that the Hale cycle in cosmic ray flux may be primarily limited to the grand solar maximum of the space-age.