THE ANTIPROTON TO PROTON RATIO OVER A 22-YEAR CYCLE: A TIME DEPENDENT APPROACH

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The prediction from a steady-state two-dimensional numerical modulation model is that the antiproton to proton ratio should exhibit a "w" shape during $A > 0$ solar polarity cycles, and an "M" shape during $A < 0$ cycles. Moreover, the ratio should show smaller variations during an $A > 0$ cycle than during an $A < 0$ cycle and a sharp increase going through solar maximum from one cycle to the other. In this paper we present results from a two-dimensional time-dependent numerical modulation model using the latest interstellar antiproton and proton spectra. The variations in the magnitude of the heliospheric magnetic field and the tilt angle of the heliospheric current sheet are based on smoothed data, but are constructed to give an idealized 22-year cycle with identical variations during each polarity cycle. This was done in order to correlate changes in the antiproton to proton ratio with medium- to long-term changes in the magnetic field magnitude and current sheet tilt angle. Qualitative conclusions based on the steady-state model's results remain valid, but the ratio now behaves differently during periods of increasing and decreasing solar activity. We find better qualitative agreement with data with this more realistic approach.