Solar Wind Helium Abundance Heralds Solar Cycle Onset

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Abstract

We study the solar wind helium-to-hydrogen abundance's (A_{He}) relationship to solar cycle onset. Using OMNI/Lo data, we show that A_{He} increases prior to sunspot number (SSN) minima. We also identify a rapid depletion and recovery in A_{He} that occurs directly prior to cycle onset. This A_{He} Shutoff happens at approximately the same time across solar wind speeds (v_{sw}) and the time between successive A_{He} shutoffs is typically on the order of the corresponding solar cycle length. In contrast to A_{He} 's v_{sw} - dependent phase lag with respect to SSN (Alterman and Kasper, 2019), A_{He} Shutoff's concurrence across v_{sw} likely implies it is independent of solar wind acceleration and driven by a mechanism near or below the photosphere. Using Brightpoint (BP) measurements to provide context, we infer that this shutoff is likely related to the overlap of adjacent solar cycles and the equatorial flux cancelation of the older, extended solar cycle during solar minima.

Full Text

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Figures

Figure 1

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Figure 2

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Figure 3

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Figure 4

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Figure 5

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Figure 6

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