

***Variations in the Properties of Solar Energetic Particle Events over Recent Solar Cycles***

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We have carried out a survey of Solar Energetic Particle (SEP) events over 2 to 4 solar cycles using data from ACE, STEREO, GOES, SOHO, and other near-Earth spacecraft. The peak-intensity, fluence, spectral slope, and compositional signatures were compared for 72 solar proton events during cycle 24, including all those with  $>10$  protons/cm<sup>2</sup>-sr-s at either GOES, STEREO-A, or STEREO-B. Compared to the first 5.7 years of cycles 22 and 23 the number of near-Earth GOES-class SEP events in cycle 24 is reduced by ~40%, and the total fluence of  $>10$  MeV protons is lower by a factor of ~4. At  $>100$  MeV the cycle 23 fluence is lower by a factor of  $>7$  compared to cycles 22 and 23, reflecting a significant decrease in the number of very large SEP events during cycle 23. The fluences of heavy ions from He to Fe show even greater reductions in cycle 23. We discuss factors that may have limited the intensity, spectra, and composition of SEPs during cycle 23, including the interplanetary magnetic field and solar wind properties, CME and shock properties, and seed particle densities and abundances.