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Recent Cosmic Ray Observations from Voyagers 1 and 2

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Voyagers 1 and 2 are now both in the interstellar medium. Voyager 1 crossed the heliopause on 25 August 2012 and Voyager 2 recently crossed on 5 November 2018. We find that the energy spectra of H, He, and electrons, which for the first time are being measured unaffected by the effects of solar modulation, are essentially identical at the two spacecraft. This implies that there are no significant gradients of these particles over a distance of ~ 167 AU in the local interstellar medium. We review some of the results contained in Cummings et al., *ApJ*, 2016, including the estimates of the energy density of cosmic rays and of the ionization rates of atomic H in the interstellar medium by cosmic rays. We also present preliminary spectra of a significant number of isotopes. With respect to the crossings of the heliopause by the two spacecraft, we compare observations at Voyager 2 with those at Voyager 1 and report on several differences. Finally, we report on the anisotropy of a few hundred MeV protons, which is observed by Voyager 1 much of the time in the local interstellar medium. This work was supported by NASA under contract NNN12AA01C.

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