

Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Where is the cosmic-ray modulation boundary of the heliosphere?

MING ZHANG, KONSTANTIN GAMAYUNOV, HAMID RASSOUL, Florida Institute of Technology, NIKOLAI POGORELOV, University of Alabama in Huntsville — When cosmic rays (CRs) propagate through the heliosphere, they must overcome the effects of outgoing solar wind (SW), which results in CR modulation. Studies found that the modulation occurs mainly through adiabatic energy loss in the supersonic SW. We had expected it would cease beyond the termination shock, but CR modulation continues in the inner heliosheath. This is because CRs detected there have already spent time in the SW. In a similar argument, CRs seen outside of the heliopause should still be modulated, rendering no precise modulation boundary. However, recent observations from Voyager 1 show that CR flux has reached its interstellar level almost immediately after the heliopause. To understand the difference between the inner and outer heliosheath, we have to consider the huge difference of particle transport in the heliospheric turbulence and interstellar turbulence. Due to the low level of interstellar turbulence inferred from IBEX observations, we expect the parallel diffusion to increase from its typical heliospheric value of 10^{23} cm²/s to the interstellar value of $> 10^{27}$ cm²/s, while the perpendicular diffusion decreases significantly. Here we present model results that show the CR modulation boundary should be slightly beyond the heliopause.

Ming Zhang
Florida Institute of Technology

Date submitted: 11 Jul 2014

Electronic form version 1.4