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# Analysis of energy spectra measured by New Horizons: PIC simulation results versus observations in the environment of Pluto

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Shell velocity distribution pickup ions (PUIs) are created in the solar wind (SW) by UV effect or charge-exchange between SW ions and neutral atoms in the very local interstellar median (VLISM)[1]. The New Horizons Solar Wind Around Pluto (SWAP) instrument has provided the first direct observations of interstellar H+ and He+ pickup ions in the solar wind condition near Pluto. Interplanetary (IP) shocks are considered as a possible mechanism on the ion energy spectra modulation[2]. In this talk, we will focus on the particle kinetic properties at IP shocks near Pluto and use PIC simulations to analyze the observed energy spectra in low, middle, and relatively high energy range (from 100 eV/q to about 8 KeV/q). We extended our automatic separation method (ASM)[3,4], which has successfully applied to IP shocks in the heliosphere and heliospheric termination shock, to quasi-parallel shocks. The incident ions can be divided into 4 subpopulations: directly transmitted ions, gyro-reflected ions, back-streaming ions with single-bounce and back-streaming ions with multi-bounce. Their contributions to the total envelop of ion energy spectra will be discussed in detail and compare with the SWAP experimental data. In summary, the low energy part is mainly contributed by the pickup protons, the two peaks I the middle energy range is contributed by solar wind protons and helium ions, the highest energy tail is contributed by pickup $He^+$.

References

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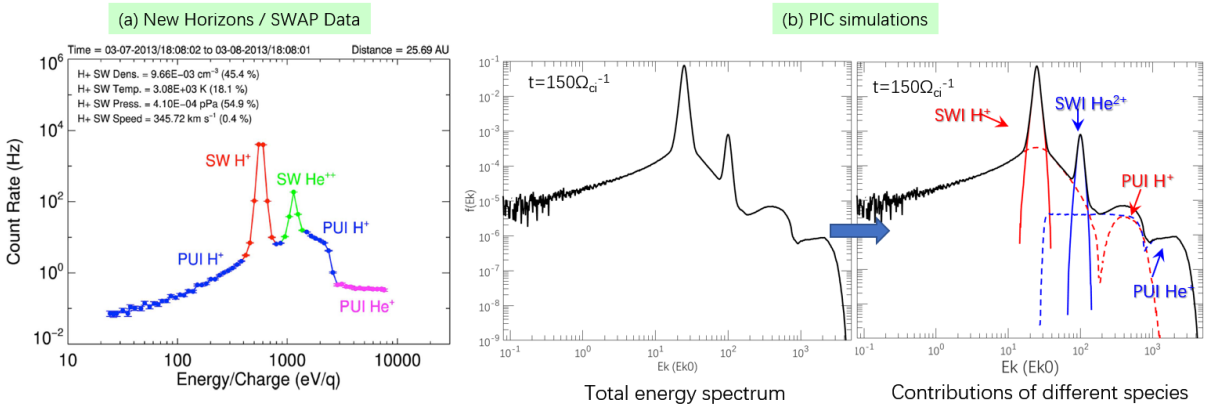


Figure 1 (a) Ion energy spectra observed by New Horizons / SWAP in the environment of Pluto, (b) Ion energy spectra obtained by PIC simulations. The middle panel shows the total envelop of the spectrum, and the right panel shows the contributions of different ion species.