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Poster
The heavy ion composition is a crucial diagnostic to determine the coronal source region properties and acceleration processes of coronal mass ejection events and fast solar wind. The charge states of these ions are frozen-in at the corona, therefore recording the thermal properties of electron temperature and density of the plasma in the coronal origins. The sun produces large expulsions of plasma and energy from the solar corona called interplanetary coronal mass ejections (ICMEs) that carry a unique distribution of heavy ions in comparison to regular solar wind signatures. Suprathermal heavy ions are the heavy ions with a higher kinetic energy than their thermal counterparts that become more abundant during ICMEs and fast solar wind. A comprehensive study of suprathermal heavy ion composition can improve our understanding of solar wind events as they are likely the seed population of harmful solar energetic particles (SEPs) and can be used as ICME and space weather predictors. In this study, we characterize the suprathermal heavy ions throughout the mission lifetime of the Wind spacecraft. We analyze the species densities (e.g. O7+, O6+, C6+, and C5+) and charge state ratios (e.g. O7+/O6+ and C6+/C5+) in the thermal and suprathermal ranges during ICME events, shocks, and fast solar wind time periods. We find that the suprathermal particle composition has unique characteristics compared to their thermal counterparts, a key finding in the question of acceleration processes. This research provides the fundamental understanding of suprathermal density characteristics that will inform studies on shock acceleration to suprathermal speeds and source analysis of suprathermal populations. Through studying the suprathermal heavy ion composition, we evaluate the acceleration process of those ions and what factors impact their abundances.
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12
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