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## Ionic Charge States of Heavy Ions Associated with Interplanetary Shocks at 1AU

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### Abstract content

Measurements with advanced instrumentation on the SAMPEX, SOHO and ACE spacecraft show a large variability of the ionic charge of heavy ions in solar energetic particle (SEP) events with energy, in particular for Fe. In this paper we present a survey of ionic charge observations in interplanetary shock related SEP events obtained in the energy range  $\sim 0.18$ - $0.43$  MeV/nuc with the SEPICA instrument onboard ACE during the time period 1997 - 2000. We analyzed all interplanetary shock related events where SEPICA data are available ( $\sim 40$ ). For most of the events (34) we find mean ionic charge states for iron of  $\sim 9$  - 11 in the energy range 0.18 - 0.25 MeV/nuc that remain approximately constant between 0.18 and 0.43 MeV/nuc, but in a few cases a significant increase of  $Q(\text{Fe})$  with energy by 1 - 2 charge units is seen in this energy range. Two events show high charge states for Fe ( $\sim 16$ ) at 0.18 - 0.25 MeV/nuc with a strong increase by 3 - 4 charge units between 0.18 and 0.43 MeV/nuc, similar to the observations in all Fe-rich and  $^3\text{He}$ -rich events. The interplanetary shock related ionic charge states will be compared with solar wind charge states and with ionic charge states during the onset phase of the SEP events. The implications of the energy dependence of the ionic charge states for possible sources contributing to the accelerated population, e.g. solar wind, suprathermal particles, and contributions from Fe-rich impulsive events, will be discussed.

**If this papers is presented for a collaboration, please specify the collaboration**

### Summary

### Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 83-86

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