A study of kinematic relaxation at the Venus bow shock

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A new type of very-low Mach number shock in which the primary method of energy re-distribution is the kinematic relaxation of a non-gyrotropic ion population, was discovered at Venus early in the Venus Express mission. This led to the development of an associated theory and numerical analysis. The recent discovery of such a shock at the Earth using THEMIS data experimentally verified this theory using simultaneous magnetic field and plasma data. It also showed that the most favourable conditions for the formation of such a shock is the magnetic cloud phase of an ICME. Venus Express provides an excellent opportunity to study such shocks further. Here we present results from the duration of the mission, which identifies over thirty shock crossings showing evidence of kinematic relaxation. These shock crossings are investigated to understand how the upstream conditions and heavy ions (including pick-up ions) affect their formation.