Deceleration and deflection of solar wind ions by periodic shocks

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Interacting with a supersonic solar wind, the escaping ions result in a series of phenomena in the Martian space environment. Observations from MAVEN magnetometer and plasma detector revealed a serial of small-amplitude quasi-monochromatic waves upstream of the Martian bow shock. Those waves have a dominant frequency at the local proton gyrofrequency. The waves evolve into periodic shock structures as they are convected downstream by the high-speed solar wind flow. We found those structures deflected and decelerated solar wind ions through magnetic mirror topology. A consequence of the effect is a significant loss of solar wind ion energy, accompanying with pitch angle scattering.