## The interaction of Mars's ionosphere with the solar wind and crustal magnetic fields

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Mars' interaction with the solar wind is unique in the solar system, in that it is mediated both by the planet's ionosphere in combination with its intense and spatially varied crustal magnetic fields. Over a significant fraction of the surface, these crustal fields generally dominate over the induced magnetic fields produced by the solar wind interaction. At high ionospheric altitudes, crustal fields are able to directly shape the plasma distribution around the planet, modulating plasma structure, composition and transport processes. Densities are typically elevated in regions of strong crustal fields at altitudes above ~250 km, with compositions more reminiscent of the lower ionosphere, and lower electron temperatures. On smaller scales, and at lower altitudes, signatures of ionospheric upwellings and plasma instabilities are routinely detected in regions of radial crustal fields, in both in-situ and remote sensing measurements. Recent studies using data from Mars Express and MAVEN have characterised these couplings in detail, in terms of their occurrence statistics, and dependence on upstream and insolation conditions, and will be briefly summarised in this presentation. Synergies with other (exo-)planetary ionospheres will be discussed, in the context of improved ionospheric measurements that could be made with the next generation of Mars exploration missions, such as M-MATISSE currently proposed for M7.