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The configuration of the induced Martian magnetosphere and ionosphere during quiet solar wind conditions

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We report on the configuration of the induced Martian magnetosphere and ionosphere during unusually quiet solar wind conditions encountered during the Mars-Earth heliospheric conjunction of March-April 2010. The unique characteristics of the induced Martian magnetosphere, most notably the remnant magnetic field embedded within the planet's crust, introduce significant complexity to the determination of the state of the system at any instant from single-spacecraft observations. It is therefore of central importance to accurately characterise the 'baseline' or 'ground-state' of the interaction between the solar-wind and the induced magnetosphere. Fortunately, such an opportunity arose during March-April 2010, when Earth and Mars were in approximate alignment along the Parker spiral, allowing measurements of the solar wind bulk properties measured by the Advanced Composition Explorer spacecraft at Earth's orbit to be reliably extrapolated to the orbit of Mars. We report observations from three instruments on board Mars Express (the MARSIS topside-sounder, the ASPERA ion and electron plasma instrument, and the MaRS radio sounder) obtained during several days throughout this interval when the solar wind dynamic pressure remained approximately one order of magnitude below its nominal value, and the embedded magnetic field remained approximately constant.