MERCURY

A planet-sized space weather detector

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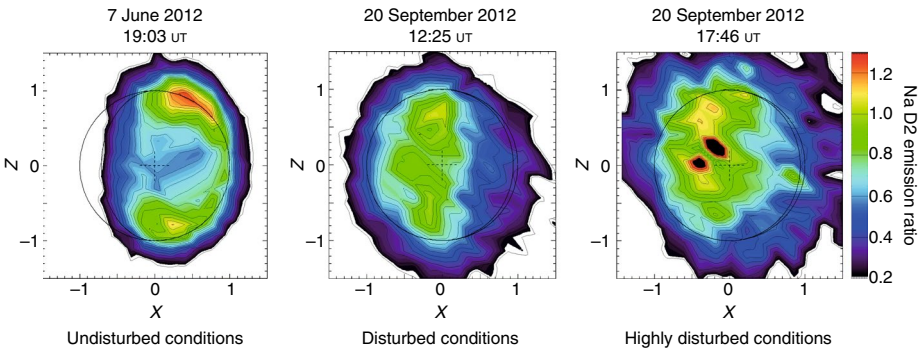

The innermost planet of the Solar System does not have a proper atmosphere but it possesses an exosphere — an atmospheric layer too tenuous for its molecules to be in the collisional regime. Mercury's exosphere is affected by multiple exogenous and endogenous effects that can act as sources or sinks of molecules, which are difficult to characterize with precision. Stefano Orsini and collaborators find a clear connection between exospheric dynamics and the passing of coronal mass ejections (CMEs) from the Sun that could help to both monitor solar CME activity and constrain the origins of Mercury's exosphere.

Orsini et al. use a combination of ground-based maps of Mercury's exosphere in the sodium (Na) line and in situ plasma data from the MESSENGER spacecraft obtained between 2012 and 2013. They show, through several examples, how the shape of the Na exosphere changes according to the plasma environment. They could follow, in particular, the hourly evolution of the Na exosphere during the passage of two closely timed CMEs, detecting significant variations (pictured). These results demonstrate that the Na exosphere can be used as a sort of giant detector for solar wind status at the Sun–Mercury distance and its continuous monitoring can help detect and model CMEs and their effects in the inner heliosphere.

Future Mercury missions like ESA–JAXA's BepiColombo will give more in situ information on the plasma's behaviour and will shed more light on the source and evolution of Mercury's Na exosphere.

Luca Maltagliati

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