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Analysis of Sodium Anysotropies in the Exosphere of Mercury by July 2008 observations at THEMIS

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The exosphere of Mercury is a complex system. The analysis of the sodium component since its discovery in 1985 evidenced a strong variability of the exosphere with time, both in the global emission intensity and in the appearance and disappearance of localized peaks, that may appear at mid latitude in both hemispheres. A correlation with the IMF has been supposed since specific IMF orientation may allow preferential precipitation of solar wind protons under planetary magnetic cusps. Furthermore, the short term variability cannot be easily explained by other external agents.
The solar telescope THEMIS in the Canary Islands is being used since 2007 for a long campaign of observation of the Hermean exospheric sodium. Differently from typical night telescopes, it allows the observation of Mercury during the whole day, and then a long series of images of the exosphere with a time-scale of 1 hour can be obtained, up to 12 hours/day. Moreover, in conditions of very clear and stable sky, high resolution can be used (up to 440000) reaching unprecedented details of the exospheric features.
By using a selected set of high resolution data obtained in July 2008, we analyse the variability in time-scale of 1-hour, investigating the possible mechanisms of sodium release to the exosphere and its dynamics. In particular, during the selected sequence, a double-peak pattern is visible since the beginning of the day (the southern one being stronger), reaching a maximum and then slowly decreasing with time. In our opinion this appears to be related to an injection event of plasma, causing a peak of sodium emission between the first and second scan, and then gradually decreasing and spreading its effects in a wider region toward the equator. Our interpretation links the appearance of sodium asymmetries to combined effects of plasma and photons impact onto the Mercury's surface and sodium ballistic trajectories.
Moreover, we use a MonteCarlo model to simulate the dynamics of the exospheric distribution as a consequence of a plasma injection in the Hermean magnetosphere. The agreement of data with the results of an ad-hoc simulation shows the suitability of our idea.