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Asteroid exosphere: Simulation for 2867 Steins and 21 Lutetia, targets of the Rosetta mission.

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Due to their relative small size, asteroids are not able to retain an atmosphere where collisions or complex chemistry play an important role. Since the outgassing is small, probably only a thin exosphere surrounds the small bodies.

We adapt a Monte Carlo model, initially developed to simulate Mercury's tenuous exosphere, to the two Rosetta flyby targets 2867 Steins and 21 Lutetia.

The Exobase of an asteroid lies, in analogy to Mercury, on it's surface and the exosphere sources may be similar to those of the terrestrial planet: Modelled processes are ion sputtering, micrometeorite impact vaporization, photon-stimulated desorption and thermal release. The adaptation of the code is therefore straight forward, although the relative contributions of each release process may vary substantially relative to the exosphere of Mercury.

The results from the simulation are density profiles of the vertical structure of the exosphere, which may be useful to select interesting species to investigate by mass spectrometry during the flybys. As input for the model, results from ground based observations are used. Because not much is known about an individual asteroid before a close encounter, possible released species and other important properties are derived from meteorite analogue compositions.