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# The surface composition of 21 Lutetia and 2867 Steins, as observed by VIRTIS onboard ROSETTA.

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The Visible and Infrared Thermal Imaging Spectrometer (VIRTIS) aboard Rosetta has successfully returned spatially-resolved 0.4-5.1 micron hyperspectral data of the two main belt asteroids 2867 Steins and 21 Lutetia during the September 2008 and July 2010 fly-bys. In each case, VIRTIS used both its mapping (-M) and high-spectral-resolution (-H) channels.
In both the fly-bys the VIRTIS observations started with the target still unresolved, with the objective of studying the degree of the spectral heterogeneity of the entire asteroid's surface as a function of the rotational phase, allowing one to correlate any brightness variation to either compositional or morphological variegation of the surface itself.
At closer range the instrument operated in pushbroom mode taking advantage of the relative S/C-asteroid motion to build hyperspectral images of the asteroids surfaces.
Closest Approach for Steins occurred at about 803 km, giving a maximum spatial resolution for VIRTIS of 200 m, and at about 3120 km for Lutetia, with a spatial resolution better than 1 km. However, due to the smaller asteroid size, 2867 Steins spanned only 15 pixels at C/A while 21 Lutetia was 10 times larger.
In view of its smaller size, Steins's major topographic features are unresolved, while for Lutetia VIRTIS-M hyperspectral images distinctly show craters, grooves and other surface lineaments.
From a purely spectral point of view the major differences between the two asteroids are in the 490 nm region where Steins is characterized by a clear absorption feature (Keller et al, 2010) lacking in the Lutetia spectrum. Both Steins and Lutetia spectra in the IR from 700 nm up to the thermal emission region (above 3500 nm) are flat and without absorption features (within the calibration accuracy of the instrument). It should be noted that Lutetia shows a clear reddening of the spectrum with increasing phase angle, while Steins does not, within the limited phase coverage available.
There are several commonalities between the spectra of the two asteroids: a) neither of the two show any surface color variegation within a few percent level; this is in contrasts with previous asteroid encounters, all of which found either color or albedo variegation; this uniformity suggest a cover of a compositionally homogeneous regolith; b) On both asteroids the typical signs of space weathering (decrease of the absolute reflectance, spectral reddening from VIS to IR) are absent; c) neither asteroids show any sign of a OH hydration band in the 2700-3000 nm range.
The talk shall deal with the major results obtained by VIRTIS-M and VIRTIS-H, giving possible interpretations in the light of previous ground observations as well as laboratory data on meteorites and analogues materials.