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The geological units of asteroid 21 Lutetia

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The OSIRIS images acquired during the recent Rosetta fly-by of Lutetia (10th of July 2010), enabled us to unravel the long geological history of the asteroid. This is recorded on its highly varied surface which displays geological units of disparate ages. In particular, seven main regions (in turn subdivided into minor units) can be discriminated on the basis of the crater density, surface orientation, presence of linear features (i.e. fractures, faults and grooves) and deposits. The regions are separated by clear morphological border and/or cross-cutting and embayment relationships. The oldest ones, pervasively affected by fractures and grooves, display surfaces so heavily cratered to be dated back to a period not far from the Late Heavy Bombardment (one of them yielding a crater retention age of 3.5 Ga). A crater of 60 km of diameter, probably representing the most prominent event of Lutetia history, cut two of the oldest regions, but it is still quite old as testified by the high crater density on its floor and walls, the absence of discernable deposits related to the impact event, and the intense deformation of its floor. What appears really young is the North Poles crater cluster associated to smooth ejecta broadly mantling the surrounding units and displaying few craters and no linear features . The North Pole cluster is the product of superimposed impacts; the last one of 21 km of diameter excavated the preexisting ejecta up to the bedrock which locally outcrops at the crater rim. During the modification stage the ejecta of this last impact were involved in several gravitational phenomena. The complex evolution of the North Pole region is testified by the great variety of deposits made up of mega-boulders diamictons, fine materials, gravitational taluses and landslide accumulations.
In this work the geological evolution of Lutetia surface will be tentatively reconstructed through the description of its main units and related contacts.