Geophysical Research Abstracts
Vol. 14, EGU2012-2878, 2012
EGU General Assembly 2012

'TNOs are Cool: A survey of the trans-Neptunian region'. Results from the PACS and SPIRE observations with the Herschel Space Observatory

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The TNOs are the frozen leftovers from the formation period of the outer solar system. The TNO population comprises (i) the main Kuiper belt beyond the orbit of Neptune consisting of objects in resonant and non-resonant orbits, (ii) the halo outskirts of "scattered" and "detached" bodies, and (iii) the Centaurs, the objects located between Jupiter and Neptune which have origin from the Kuiper belt. Up to date, more than 1500 TNOs and Centaurs have been discovered. Their study reveal a richness of orbital and physical properties. TNOs cover a wide range of intrinsic colours from slightly bluish slopes to the reddest gradients known in the solar system [1]. Spectroscopy confirms the presence of water-ice on the surface of about 30 objects, but also of volatile-ice like methane and perhaps nitrogen on bright objects such as Pluto, Eris, Makemake and Sedna [2].

An Open Time Key Program entitled "TNOs are Cool: A survey of the Transneptunian Region" (PI T. Mueller) was submitted to the Herschel space telescope in order to investigate the albedo, size distribution and thermal properties of these distant and primitive bodies. This proposal has been awarded 372.7 hours to perform radiometric measurements of around 140 TNOs/Centaurs [3]. All the targets are observed with the PACS photometer instrument (3 bands centered at 70, 100 and 160 micron), and only the brightest ones with the SPIRE instrument (with channels centered at 250, 350, and 500 microns).
In this work we present the results of the combined SPIRE and PACS instruments observations for the 2 Centaurs Chiron and Chariklo, the dwarf planet Haumea, 2 plutinos (Huya and Orcus), 3 classical TNOs (Quaoar, Salacia and 2002 UX25), and 2002 TC302 (a 2:5 resonant object).
The spectral energy distribution of these targets have been modeled with a NEATM thermal model and in cases where rotational properties are known also with a thermophysical model.
We will present our results on the size, the albedo, and the thermal properties, including thermal inertia and surface emissivity of these large TNOs and Centaurs.

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