The GTC mid-infrared spectroscopic program of primitive outer-belt asteroids

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Asteroids in the outer edge of the asteroid belt (Cybeles, Hildas, and Jupiter Trojans) may provide a number of clues to the origin and evolution of the asteroid belt and the formation of our planetary system. They have a pristine composition, experienced little heating and may contain a significant fraction of ice in their interiors. The origin of these populations is still under debate. Levison et al. (2009) suggested that a large fraction of these bodies are transneptunian objects (TNOs) moved to these resonances in an early epoch of the Solar System called the "Late Heavy Bombardment" (LHB). To compare the physical properties of these asteroid populations with TNOs and comets is thus a strong test of dynamical models.

In mid 2013, we started a mid-infrared photometric and spectroscopic program in the N-band using the CANARICAM camera-spectrograph at the 10.4-m GTC telescope at the "Roque de los Muchachos" Observatory (Canary Islands, Spain). We aim to study the surface composition and key properties such as radius, albedo, and thermal inertia based on their low-resolution 8–13-micron spectra and N-band photometry. We already obtained the spectra of 5 objects, that of (225) Henrieta is shown as an example in the Figure. The three published spectra of Trojan asteroids (Emery et al. 2006) and of (65) Cybele (Licandro et al. 2011) exhibit clear emissivity features from which the compositional and physical properties can be inferred. The spectra of these objects strongly resemble one another, presenting an emission plateau due to silicates at about 9.1-11.5 microns (the Si-O stretch fundamental). Fine-grained silicates in a very porous (fairly castle) structure, and no other mineral group (Emery et al. 2006, Vernazza et al. 2012), reproduce the major features of the Trojans and Cybele asteroid spectra.

In this work, we present the preliminary results of our observational program including the N-band spectra, size, and albedo of the already observed 5 asteroids, and discuss the potential of such observations.

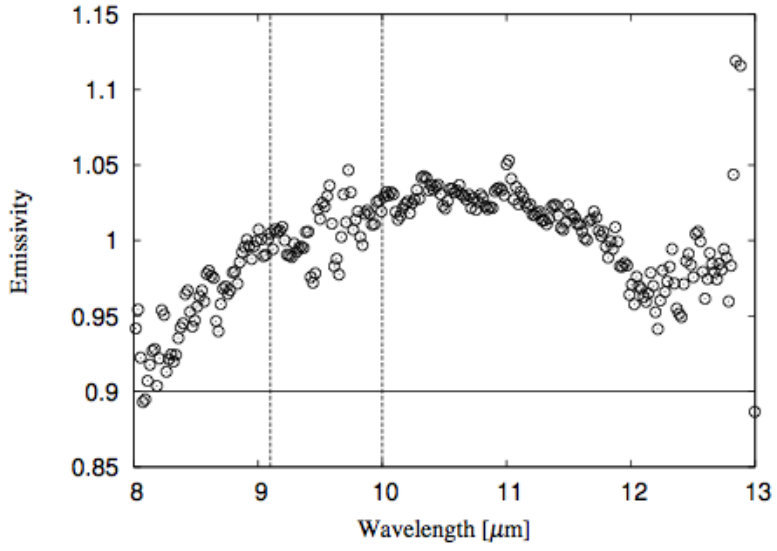

Figure: Emissivity spectrum of asteroid (225) Henrietta in the 8–13-micron spectral region obtained with Canaricam on June, 2013.

References: Emery, J. P. et al., 2006, Icarus, 182, 496; Levison, H. et al. 2009, Nature,460,364; Licandro, J. et al., 2011, A&A, 525, 34; Vernazza, P. et al., 2012, Icarus, 221, 1162.