Dust collisional heating and small grain destruction in NGC 4438

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During the collision between NGC 4438 and M86 a large mass of interstellar medium (ISM), in addition to displaced stars, was ejected from the galaxy giving rise to an interaction and mixing of the interstellar medium of the two galaxies with the intergalactic medium (IGM, Kenney et al. 2008).

The IGM, a hot coronal-type gas, represents an extreme environment for dust. In such a hot gas the collision of fast ions and electrons with dust will lead to both destruction and heating (Micelotta et al. 2010a; Bocchio et al. 2012, 2013). It is therefore expected that the emission from the small grains embedded within a hot gas will be significantly reduced by erosion on rather short timescales, making these grains difficult to observe in these extreme environments.

NGC 4438 is therefore an ideal test-case to study dust heating and destruction in the hot and tenuous gas of the IGM close to interacting galaxies. With the Herschel Space Observatory we have the sensitivity and the spatial resolution to determine the dust spectral energy distribution (SED) and to measure the temperature of dust embedded within a hot gas.

We performed a multi-wavelength study of the dust and gas around NGC 4438 and combining Herschel and Spitzer data we present the full dust SED for two different regions. For the first time we show that large grains embedded within a hot coronal gas are heated by electron collisions and that the smallest grains are rather rapidly destroyed by collisions with electrons.