Combining Telescopes to Reveal Growth & Destruction of Interstellar Dust in Nearby Galaxies

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(three-colour images made by Caltech/IPAC)
Missing Dust Emission in Nearby Galaxies

Darker areas show where Herschel missed diffuse dust emission.

Poor resolution of smaller far-infrared telescopes (like IRAS, Planck, COBE) “smears out” emission from dense compact clouds.
Combining Telescopes: Before & After

New data combines observations from Herschel, Planck, IRAS, and COBE satellites.
Our Enhanced View of Dust & Gas in the Large Magellanic Cloud

Warm Dust (160 μm emission)

Cold Dust (350 μm emission)

Hydrogen Gas (from radio telescopes)
Dust & Gas in Other Nearby Galaxies

(Not to scale)

Small Magellanic Cloud

Triangulum (M33)

Andromeda (M31)

Warm Dust
(160 μm emission)

Cold Dust
(350 μm emission)

Hydrogen Gas
(from radio telescopes)

Clark+ (2021), Clark+ (submitted to ApJ)
Huge Variation in Dust vs Gas

New data reveals that dust-to-gas ratio varies dramatically within galaxies, changing by up to a factor of 20! Caused by dust grains growing rapidly in dense clouds, then being destroyed in low-density environments.
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