UNIVERSITÉ DE STRASBOURG

Observatoire astronomique de Strasbourg

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Dust emission modeling

Multiple approaches to tackle the dust problem

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Investigating the impact of model assumptions in fitting the dust emission in nearby galaxies

→ Application to the Magellanic Clouds

Chastenet et al. (2017) 2017A&A...601A..55C

Investigating the systematics due to dust heating simplifications in common models

→ Draine & Li (2007) and the DIRTYGrid

Chastenet et al., *in prep*

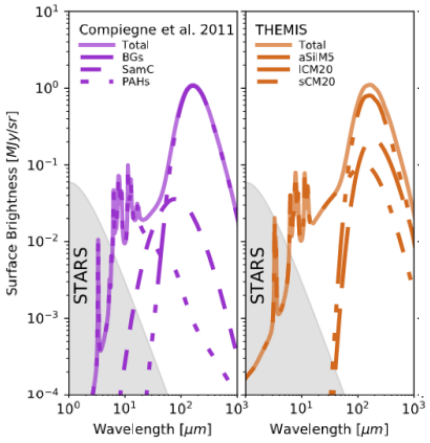
Photo credits: Eric Coles

Chastenet et al. (2017)

Fitting the dust emission in the Magellanic Clouds

We fit the Magellanic Clouds (MCs) dust emission with two dust models: Compiègne et al. (2011) and THEMIS (Jones et al. 2017). We use a strictly identical fitting technique, to get rid of computational discrepancies, and focus on model-based variations.

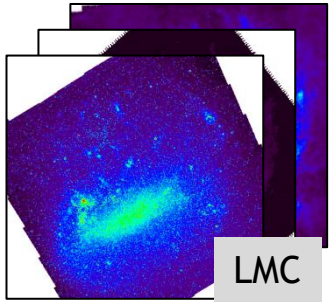
Two dust models

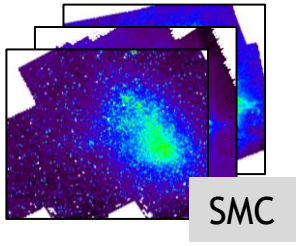


DustBFF (Gordon et al. 2014)

Covariance matrices in a Bayesian approach. Best fit found by χ^2 minimization

Spitzer and *Herschel* observations



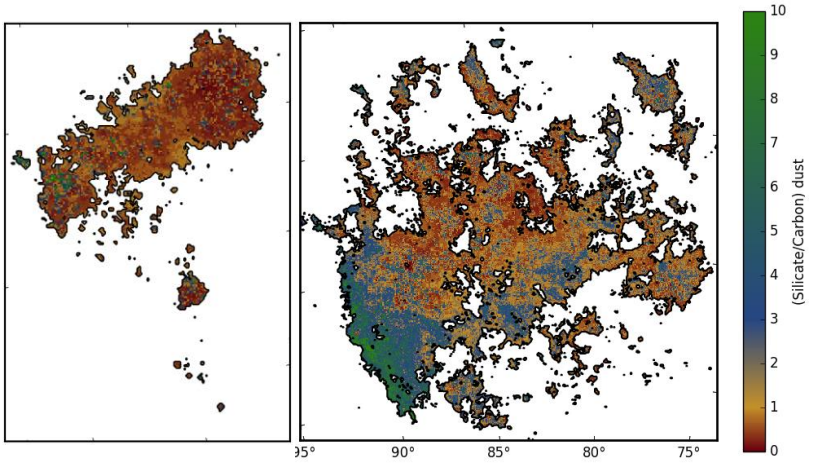


Results

THEMIS shows better fitting residuals, especially in the far-IR, due to a different spectral index • Range of Si/C ratios (≤1) to reproduce the MCs dust emission, implying a different dust composition from that of the MW! (and a significantly low estimation of Si amount in the SMC) • Dust masses agree with literature:

SMC: ~(2.9 — 8.9) x 10^4 $M_\odot$
LMC: ~(3.7 — 4.2) x 10^5 $M_\odot$

Varying Si/C in the MCs



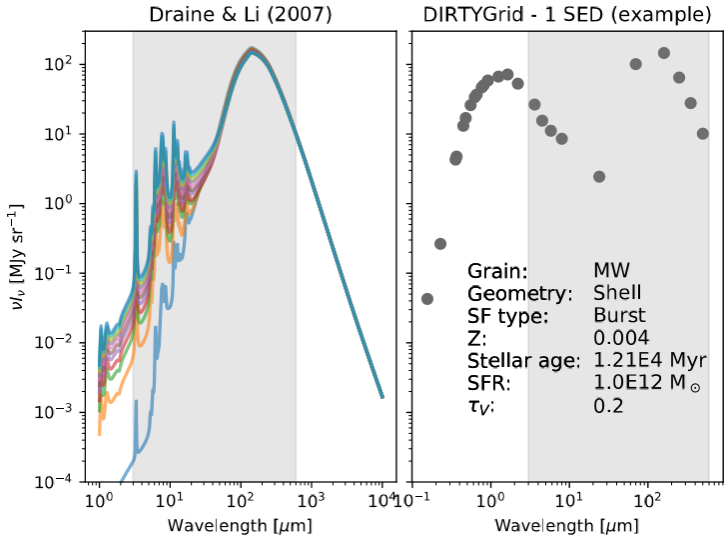
In prep, stay tuned!

Systematics in dust modeling of complex environments

We use radiative transfer to calculate the dust heating environment in a 3D geometry, and create the corresponding emission spectra. We fit these spectra with a common dust model. Our goal is to identify systematics errors in dust emission modeling due to the assumptions for dust heating sources mixing.

Principle

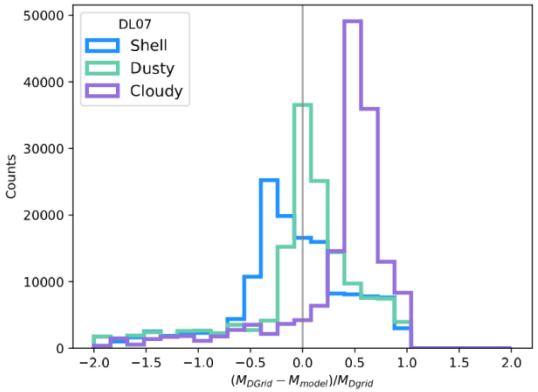
Use the Draine & Li (2007) model to fit each SED created from radiative transfer



Results

Recovering the parameters is geometry dependent: the power-law assumed to take into account multiple dust temperatures does not allow to match the data in each case.

Dust masses can be correctly adjusted in one geometry in particular



The q_{PAH} fraction is never correctly recovered: degeneracies and/or RT effects in dust modeling prevent a good match