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Title	A nearby galaxy perspective on dust evolution. Scaling relations and constraints on the dust build-up in galaxies with the DustPedia and DGS samples
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Several of the limitations of our study could be addressed by spatially resolving star forming regions. Performing a similar analysis on ≈ 100 pc scales within galaxies would allow us to access another important parameter: the density of the ISM. This quantity drives mantle growth and coagulation. Local variations of the dust-to-metal mass ratio are good indications of grain growth and can help us break the degeneracy with SNII destruction (Sect. 5.2.2). In addition, spatial resolution would be a way to address the origin of the trend of q_{AF} with metallicity (Sect. 4.2), as well as resolving ETGs to quantify the grain sputtering timescale (Sect. 4.1.2). Numerous spatially resolved dust studies have already been published (e.g., Galliano et al. 2011; Mattsson & Andersen 2012; Draine & Hensley 2013; Hunt et al. 2015; Roman-Duval et al. 2017; Aniano et al. 2020). We are currently preparing several papers of a resolved subsample, with the same consistent approach as employed in the present manuscript (Roychowdhury et al., in prep.). The main observational challenge in order to address these degeneracies is however to obtain spatial resolution in ELMGs, at far-IR wavelengths. The data are currently very limited, because the sensitivity of *Herschel* was not high enough. SPICA (van der Tak et al. 2018) was the only observatory on the horizon to have the sensitivity to produce resolved far-IR maps of ELMGs. Its sudden cancelation by ESA might leave the important open questions raised in this paper unanswered for several decades.

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References

- Akylas, A., & Georgantopoulos, I. 2009, *A&A*, **500**, 999
 Aloisi, A., Clementini, G., Tosi, M., et al. 2007, *ApJ*, **667**, L151
 Andersson, B.-G., Lazarian, A., & Vaillancourt, J. E. 2015, *ARA&A*, **53**, 501
 Aniano, G., Draine, B., Hunt, L., et al. 2020, *AJ*, **889**, 150
 Aoyama, S., Hou, K.-C., Shimizu, I., et al. 2017, *MNRAS*, **466**, 105
 Aoyama, S., Hirashita, H., & Nagamine, K. 2020, *MNRAS*, **491**, 3844
 Arendt, R. G., Dwek, E., Kober, G., Rho, J., & Hwang, U. 2014, *ApJ*, **786**, 55
 Asano, R. S., Takeuchi, T. T., Hirashita, H., & Inoue, A. K. 2013, *Earth Planets Space*, **65**, 213
 Asplund, M., Grevesse, N., Sauval, A. J., & Scott, P. 2009, *ARA&A*, **47**, 481
 Assef, R. J., Stern, D., Noirot, G., et al. 2018, *ApJS*, **234**, 23
 Astropy Collaboration (Robitaille, T. P., et al.) 2013, *A&A*, **558**, A33
 Astropy Collaboration (Price-Whelan, A. M., et al.) 2018, *AJ*, **156**, 123
 Audouze, J., & Tinsley, B. M. 1976, *ARA&A*, **14**, 43
 Baes, M., & Dejonghe, H. 2001, *MNRAS*, **326**, 733
 Balog, Z., Müller, T., Nielbock, M., et al. 2014, *Exp. Astron.*, **37**, 129
 Barlow, M. J., Krause, O., Swinyard, B. M., et al. 2010, *A&A*, **518**, L138
 Barnard, J., McCulloch, R., & Meng, X.-L. 2000, *Stat. Sin.*, **10**, 1281
 Beers, T. C., Flynn, K., & Gebhardt, K. 1990, *AJ*, **100**, 32
 Begum, A., Chengalur, J. N., Karachentsev, I. D., Sharina, M. E., & Kaisin, S. S. 2008, *MNRAS*, **386**, 1667
 Bell, A. C., Onaka, T., Galliano, F., et al. 2019, *PASJ*, **71**, 123
 Bendo, G. J., Buckalew, B. A., Dale, D. A., et al. 2006, *ApJ*, **645**, 134
 Bevan, A., Barlow, M. J., & Milisavljevic, D. 2017, *MNRAS*, **465**, 4044
 Bianchi, S., & Schneider, R. 2007, *MNRAS*, **378**, 973
 Bianchi, S., De Vis, P., Viaene, S., et al. 2018, *A&A*, **620**, A112
 Bianchi, S., Casasola, V., Baes, M., et al. 2019, *A&A*, **631**, A102
 Bocchio, M., Micelotta, E. R., Gautier, A.-L., & Jones, A. P. 2012, *A&A*, **545**, A124
 Bocchio, M., Marassi, S., Schneider, R., et al. 2016, *A&A*, **587**, A157
 Bolatto, A. D., Wolfire, M., & Leroy, A. K. 2013, *ARA&A*, **51**, 207
 Boquien, M., Burgarella, D., Roehlly, Y., et al. 2019, *A&A*, **622**, A103
 Bot, C., Ysard, N., Paradis, D., et al. 2010, *A&A*, **523**, A20
 Boulanger, F., Boissel, P., Cesarsky, D., & Rytter, C. 1998, *A&A*, **339**, 194
 Brauhar, J. R., Dale, D. A., & Helou, G. 2008, *ApJS*, **178**, 280
 Brightman, M., & Nandra, K. 2011, *MNRAS*, **413**, 1206
 Brinkmann, W., Siebert, J., & Boller, T. 1994, *A&A*, **281**, 355
 Bron, E., Le Bourlot, J., & Le Petit, F. 2014, *A&A*, **569**, A100
 Brown, M. J. I., Jarrett, T. H., & Cluver, M. E. 2014, *PASA*, **31**
 Buat, V., Heinis, S., Boquien, M., et al. 2014, *A&A*, **561**, A39
 Burgarella, D., Nanni, A., Hirashita, H., et al. 2020, *A&A*, **637**, A32
 Calura, F., Pipino, A., & Matteucci, F. 2008, *A&A*, **479**, 669
 Camps, P., Misselt, K., Bianchi, S., et al. 2015, *A&A*, **580**, A87
 Camps, P., Trayford, J. W., Baes, M., et al. 2016, *MNRAS*, **462**, 1057
 Camps, P., Trčka, A., Trayford, J., et al. 2018, *ApJS*, **234**, 20
 Cappi, M., Panessa, F., Bassani, L., et al. 2006, *A&A*, **446**, 459
 Cardelli, J. A., Clayton, G. C., & Mathis, J. S. 1989, *ApJ*, **345**, 245
 Cartledge, S. I. B., Clayton, G. C., Gordon, K. D., et al. 2005, *ApJ*, **630**, 355
 Casasola, V., Bianchi, S., De Vis, P., et al. 2020, *A&A*, **633**, A100
 Chabrier, G. 2003, *PASP*, **115**, 763
 Chasteney, J., Sandstrom, K., Chiang, I. D., et al. 2019, *ApJ*, **876**, 62
 Clark, C. J. R., Dunne, L., Gomez, H. L., et al. 2015, *MNRAS*, **452**, 397
 Clark, C. J. R., Verstocken, S., Bianchi, S., et al. 2018, *A&A*, **609**, A37 (C18)
 Clark, C. J. R., De Vis, P., Baes, M., et al. 2019, *MNRAS*, **489**, 5256
 Clayton, G. C., Gordon, K. D., Salama, F., et al. 2003, *ApJ*, **592**, 947
 Cohen, M., Megeath, S. T., Hammersley, P. L., Martín-Luis, F., & Stauffer, J. 2003, *AJ*, **125**, 2645
 Compiègne, M., Verstraete, L., Jones, A., et al. 2011, *A&A*, **525**, A103
 Cormier, D., Madden, S. C., Lebouteiller, V., et al. 2015, *A&A*, **578**, A53
 Cormier, D., Abel, N. P., Hony, S., et al. 2019, *A&A*, **626**, A23
 Cortese, L., Ciesla, L., Boselli, A., et al. 2012, *A&A*, **540**, A52
 Crinklaw, G., Federman, S. R., & Joseph, C. L. 1994, *ApJ*, **424**, 748
 Dale, D. A., Helou, G., Contursi, A., Silbermann, N. A., & Kolhatkar, S. 2001, *ApJ*, **549**, 215
 Dale, D. A., Cook, D. O., Roussel, H., et al. 2017, *ApJ*, **837**, 90
 David, L. P., Jones, C., Forman, W., Vargas, I. M., & Nulsen, P. 2006, *ApJ*, **653**, 207
 Davies, J. I., Baes, M., Bianchi, S., et al. 2017, *PASP*, **129**, 044102
 Davies, J. I., Nersesian, A., Baes, M., et al. 2019, *A&A*, **626**, A63
 De Cia, A., Ledoux, C., Mattsson, L., et al. 2016, *A&A*, **596**, A97
 De Looze, I., Barlow, M. J., Swinyard, B. M., et al. 2017, *MNRAS*, **465**, 3309
 De Looze, I., Barlow, M. J., Bandiera, R., et al. 2019, *MNRAS*, **488**, 164
 De Looze, I., Lamperti, I., Saintonge, A., et al. 2020, *MNRAS*, **496**, 3668 (DL20)
 Demyk, K., Meny, C., Lu, X. H., et al. 2017a, *A&A*, **600**, A123
 Demyk, K., Meny, C., Leroux, H., et al. 2017b, *A&A*, **606**, A50
 De Vis, P., Gomez, H. L., Schofield, S. P., et al. 2017a, *MNRAS*, **471**, 1743
 De Vis, P., Dunne, L., Maddox, S., et al. 2017b, *MNRAS*, **464**, 4680
 De Vis, P., Jones, A., Viaene, S., et al. 2019, *A&A*, **623**, A5
 Diehl, S., & Statler, T. S. 2007, *ApJ*, **668**, 150
 Draine, B. T. 1978, *ApJS*, **36**, 595
 Draine, B. T. 2009, in *Astronomical Society of the Pacific Conference Series*, eds. T. Henning, E. Grün, & J. Steinacker, 414, 453
 Draine, B. T. 2011, in *EAS Publications Series*, eds. C. Joblin, & A. G. G. M. Tielens, 46, 21
 Draine, B. T., & Hensley, B. 2012, *ApJ*, **757**, 103
 Draine, B. T., & Hensley, B. 2013, *ApJ*, **765**, 159
 Draine, B. T., & Li, A. 2007, *ApJ*, **657**, 810 (DL07)
 Draine, B. T., & Salpeter, E. E. 1979, *ApJ*, **231**, 438