Variations in the dust destruction efficiency and dust sticking coefficient

O. Osman [1,2], K. Bekki [1] and L. Cortese [1]

[1] *ICRAR M468 The University of Western Australia, Australia*

[2] *University of Khartoum - Department of Physics, Sudan*

Dust destruction efficiency (f_{des}) and dust sticking coefficient (C_s) are essential parameters that control dust evolution. They are commonly fixed to specific values in the literature although they vary according to the dust properties. Here we use chemodynamical simulations with a new treatment for dust destruction and growth timescales to investigate the influence of variations in f_{des} and C_s on dust temporal evolution and spatial correlations with the cold gas. We find that there is a specific range of f_{des} and C_s in which dust evolution on average ($D/G \propto Z^n$) is consistent with the average driven from galaxy samples. This range is between 0.01 and 0.02 for f_{des} in a single cloud near an SN, and between 0.5 and 1 for C_s. We also find that f_{des} and C_s values influence the abundance of the different ISM components as well as the dust abundance. Accordingly, simulations that produce more dust (low f_{des} and/or high C_s) result in a steeper correlation between dust surface density and H_2 surface density, and between D/G ratio and Z. In these simulations, the correlation between dust surface density and total gas surface density is shallower. We compare predictions of several simulations (with different star formation recipes, gas fractions, metallicities, and metallicity gradients) to the spatially resolved M101 galaxy and conclude that metallicity and dust–to–gas ratio are the primary drivers of the dust and gas spatial variations.