Life Cycle of Dust in the Magellanic Clouds and the Milky Way

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Our understanding of the life cycle of dust to great extent is based on the observational and theoretical studies of the Milky Way and the Magellanic Clouds, which will be in focus of this contribution. Over past years, a large volume of observations with unprecedented resolution has accumulated for the Milky Way. It permits investigations of different stages of the life cycle of dust, from its formation in stellar sources to destruction in star forming regions and supernovae shocks. Observations of dust emission, extinction, polarisation of light, and interstellar element depletions in the solar neighbourhood provide the most accurate constraints for the reference dust models applied to study extragalactic systems. However, global spatial studies of the circumstellar and interstellar dust are complicated in the Milky Way disk because of high extinction, confusion along the line of sight and large uncertainties in distances. In contrast, favourable position on sky and proximity of the Magellanic Clouds permit detailed multi-wavelength studies of the dust-forming stellar populations and variations of the interstellar grain properties for the entire galaxies. They enabled the first comparison between the global stardust production rates from theoretical calculations and those from observations, which confirm discrepancy between accumulated stardust mass and observed interstellar dust mass, “missing dust-source” problem. Modelling of the life cycle of dust in the Large Magellanic Cloud showed that dust growth by mantle accretion in the ISM, a major dust source in the Milky Way, can be responsible for the existing dust mass in the LMC. I will present comparison of the dust input from different sources to the dust budgets of the Milky Way and of the Magellanic Clouds, which reveals how the role of these dust sources depends on metallicity.