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Dust-Obscured Star-Formation in Intermediate Redshift Galaxy Clusters

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We present Spitzer MIPS 24-micron observations of 16 0.4<z<0.8 galaxy clusters drawn from the ESO Distant Cluster Survey (EDisCS). This is the first large 24-micron survey of clusters at intermediate redshift. The depth of our imaging corresponds to a total IR luminosity of 8x10^10 Lsun, just below the luminosity of luminous infrared galaxies (LIRGs), and 6^{+1}_{-1}% of M_V < -19 cluster members show 24-micron emission at or above this level. We compare with a large sample of coeval field galaxies and find that while the fraction of cluster LIRGs lies significantly below that of the field, the IR luminosities of the field and cluster galaxies are consistent. However, the stellar masses of the EDisCS LIRGs are systematically higher than those of the field LIRGs. A comparison with optical data reveals that ~80% of cluster LIRGs are blue and the remaining 20% lie on the red sequence. Of LIRGs with optical spectra, 88^{+4}_{-5}% show [O II] emission with EW([O II])>5A, and ~75% exhibit optical signatures of dusty starbursts. On average, the fraction of cluster LIRGs increases with projected cluster-centric radius but remains systematically lower than the field fraction over the area probed (< 1.5xR200). The amount of obscured star formation declines significantly over the 2.4 Gyr interval spanned by the EDisCS sample, and the rate of decline is the same for the cluster and field populations. Our results are consistent with an exponentially declining LIRG fraction, with the decline in the field delayed by ~1 Gyr relative to the clusters.

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