Dust, Gas and Stars in Early-Type Galaxies

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Early-Type Galaxies: important link to galaxy formation & evolution

NGC5128; Peng et al 2002
Early-Type Galaxies in HI and CO

HI morphology varies with environment; 40% out of 166 ETGs (Serra et al.12)

CO centrally concentrated; 22% out of 266 ETGs (Young et al.11)

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Warm ionized gas: e.g. 89% of 59 ETGs (Annibali et al. 10)

Ionized gas and dust emission

FIR/submm emission: e.g. ~50% of 62 ETGs (Smith et al. 12)
Interstellar medium and star formation

- How does star formation and gas mass relate to each other?
- Can we infer physical properties such as the gas-to-dust mass ratio

Combes et al. 07
Early-Type Galaxies with FIR/submm detection

- FIR/submm from Herschel Reference Survey (48% of ETGs; Boselli et al. 10; Ciesla et al. 12)
- Ancillary UV-to-MIR imaging data set
- HI and CO (Boselli et al. 14)
- 20/28 detected in HI; 18/28 detected in CO
Global SED modeling to get SFR, $M_D$, $M_\ast$.

- Image processing with imagecube (Lianou, Barmby & Taylor 15)
- Modeling with magphys (da Cunha et al. 08) & cigale (Noll et al. 09)
$M_{DUST}/SFR$ vs specific SFR

- $M_{DUST}/SFR$ indirectly related to dust-to-gas mass ratio, assuming a Schmidt-Kennicutt law (da Cunha et al. 10)

- For the same $M_{DUST}/SFR$ big range of $sSFR$
$M_{\text{DUST}}/SFR$ vs $M_{\text{GAS}}$ directly (not-cor)related to $M_{\text{GAS}}$

> Similar when considering the surface density of $M_{\text{GAS}}$
Surface densities of SFR vs $M_{\text{GAS}}$

\[ \log_{10}\left( \sum \text{SFR} \right) \left( M_0 \, \text{yr}^{-1} \, \text{kpc}^{-2} \right) \]

\[ \log_{10}\left( \sum M_{\text{GAS}} \right) \left( M_0 \, \text{pc}^{-2} \right) \]

Lianou et al., in prep
Surface densities of SFR vs $M_{\text{GAS}}$ follows Milky Way trend

Misiriotis et al. 2006
Summary

- SFR vs gas mass extends to lower values as compared to Milky Way regions

- Gas-to-dust mass ratio not easy to predict, based on the gas and dust histories of these types of galaxies

- Local studies of NGC5128 (Cen A) provide best local test bed to understanding ISM and star formation in ETGs
Future prospects

- Star formation and ISM in local star forming galaxies (Lianou et al., in prep.)

- Contribution of AGB stars to the ISM in local early-type galaxies (Cassara et al., in prep.)