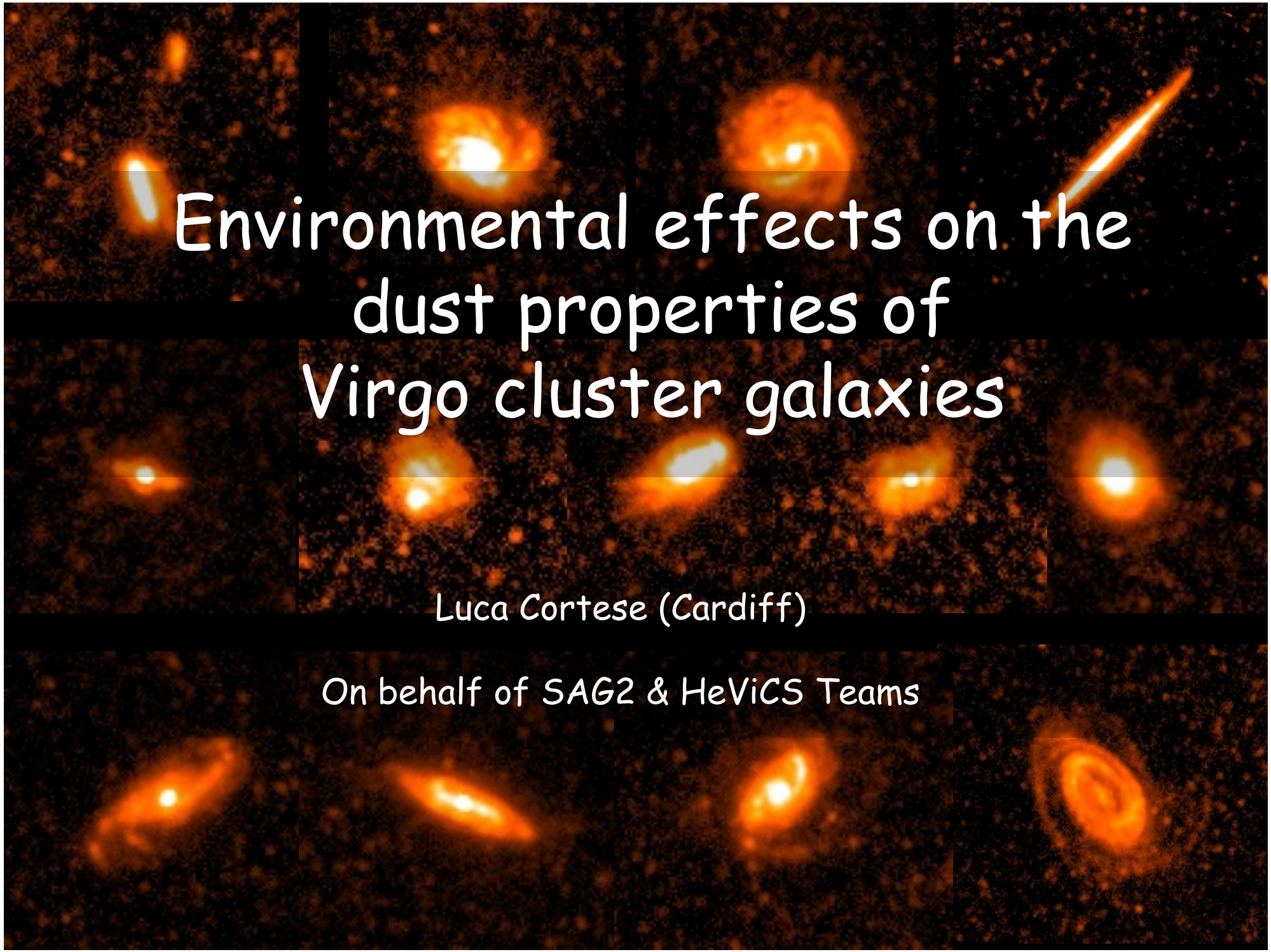


Environmental effects on the dust properties of Virgo cluster galaxies

Luca Cortese (Cardiff)

On behalf of SAG2 & HeViCS Teams

Thanks to

- Goran Pilbratt, ESA, the SPIRE and PACS consortia!

- SAG2 – SPIRE Local Galaxies Group

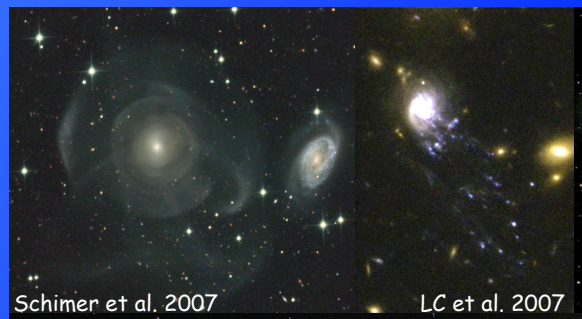
Auld R., Baes M., Barlow M., Bendo G., Bock J., Boselli A., Bradford M., Buat V., Castro-Rodriguez N., Chanial P., Charlot S., Clements D., Cooray A., Cormier D., Cortese L., Davies J., Dwek E., Eales S., Elbaz D., Galametz M., Galliano F., Gear W., Glenn J., Gomez H., Griffin M., Hony S., Isaak K., Lebouteiller V., Levenson L., Lu N., Madden S., O'Halloran B., Okumura K., Oliver S., Page M., Panuzzo P., Papageorgiou A., Parkin T., Perez Fournon I., Pohlen M., Rangwala N., Rigby E., Roussel H., Rykala A., Sacchi N., Sauvage M., Schulz B., Schirm M., Smith M., Spinoglio L., Srinivasan S., Stevens J., Trichas M., Symeonidis M., Vaccari M., Vigroux L., Wilson C., Wozniak H., Wright G., Zeilinger W.

- The Herschel Virgo Cluster Survey (HeViCS) Team

Davies J. (P.I.), M. Baes, G. J. Bendo, S. Bianchi, H. Boehringer, D. Bomans, A. Boselli, P. Chanial, M. Clemens, E. Corbelli, L. Cortese, A. Dariush, I. De Looze, S. Dye, S. Eales, D. Fadda, J. Fritz, D. Garcia-Appadoo, G. Gavazzi, C. Giovanardi, M. Grossi, T. Hughes, L. Hunt, A. Jones, S. Madden, D. Pierini, M. Pohlen, M. Putman, S. Sabatini, M. Smith, S. di Serego Alighieri, J. Verstappen, C. Vlahakis, E. Xilouris, S. Zibetti

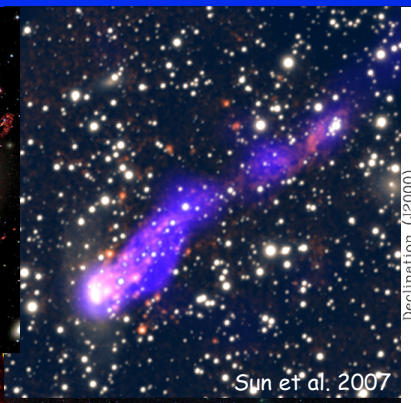
Environmental effects on galaxy evolution

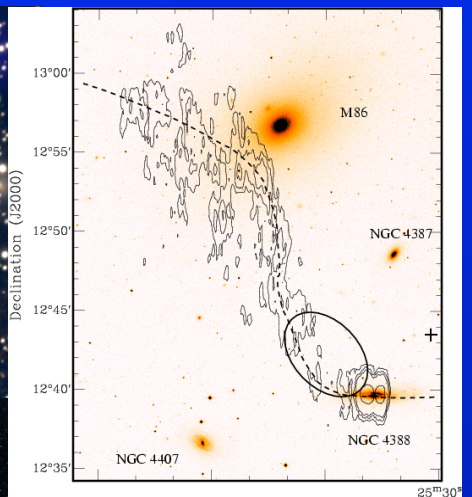
So far a plethora of info about stars and gas (atomic, molecular, ionized)…


Schimer et al. 2007

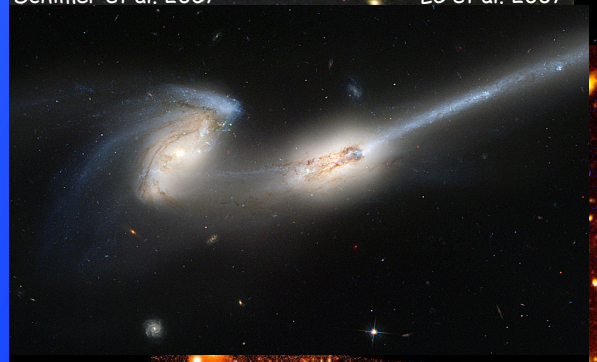
LC et al. 2007

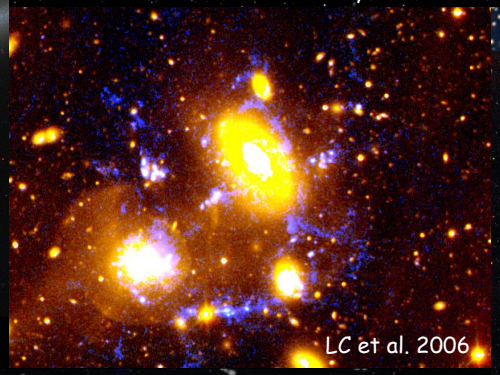

Kenney et al. 2008


Sun et al. 2007

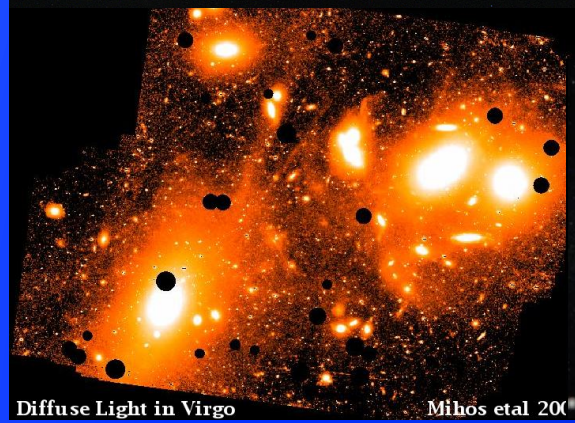


Oosterloo & van Gorkom 2005

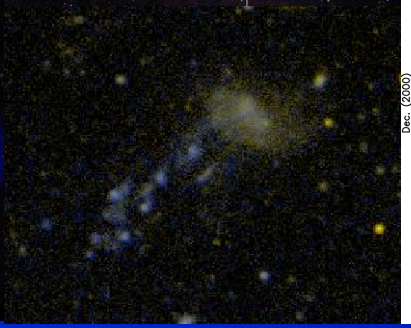


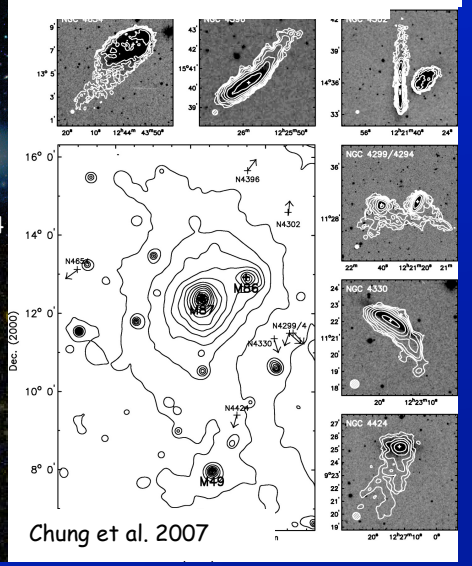

LC et al. 2006


Yoshida et al. 2004


Diffuse Light in Virgo Mihos etal 20(


Duc et al. 2007





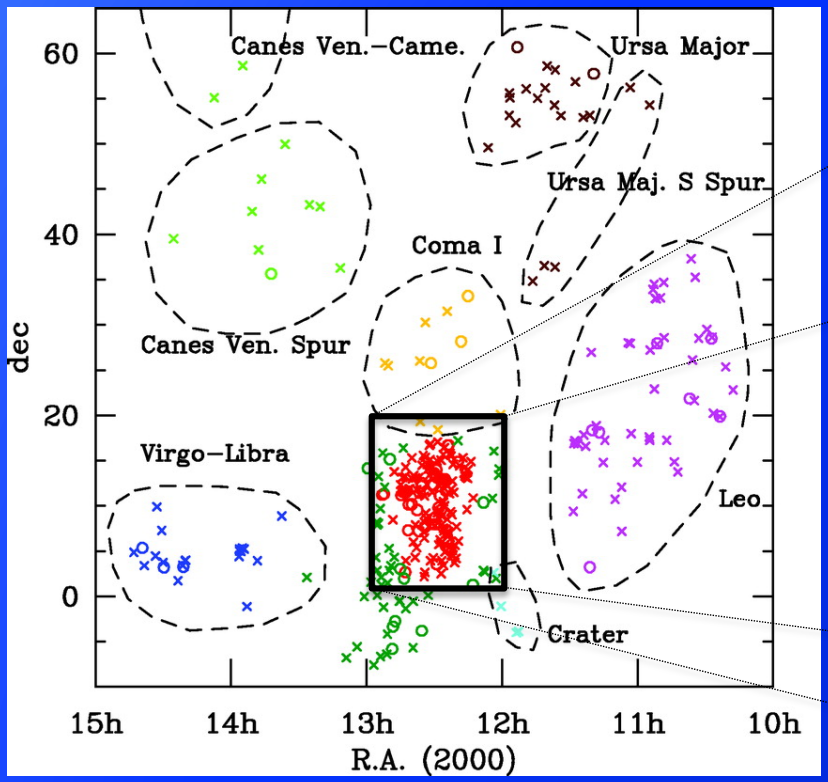
Chung et al. 2007

What about dust?

HRS

Herschel Reference Survey

Boselli et al. 2010, PASP, 122, 261



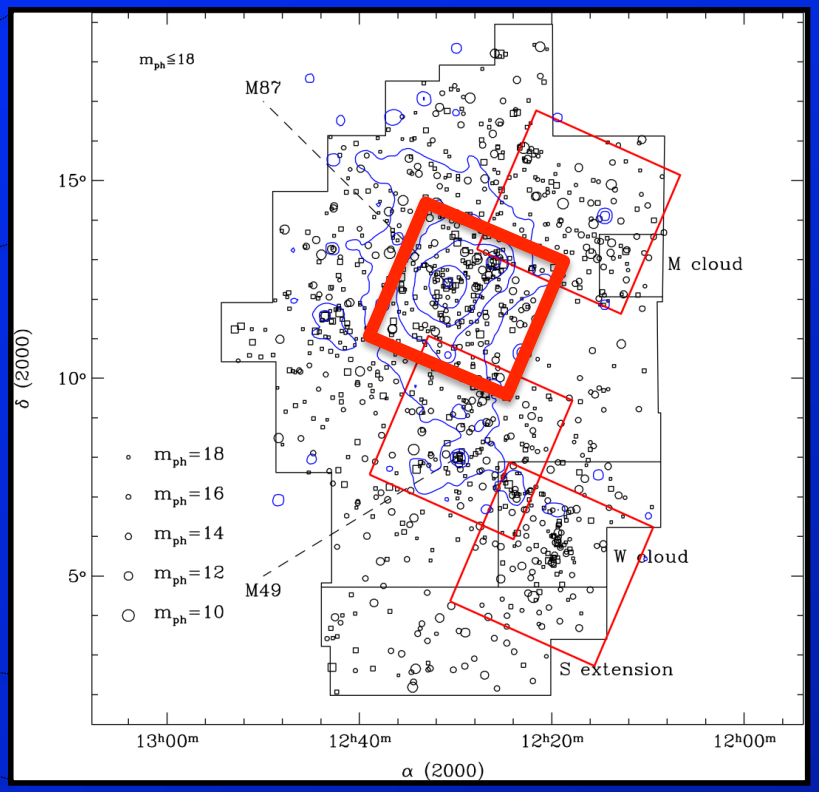
- SPIRE 250, 350, 500μm maps
- 15<D<25 Mpc
- K<12 for Sp. -- K<8.7 for E/S0
- Gal. lat. > +55 deg & A(B) < 0.2 mag
- 323 obj. (65 E/S0, 258 Sp./Irr)

See talk by Eales (tomorrow)

HeViCS

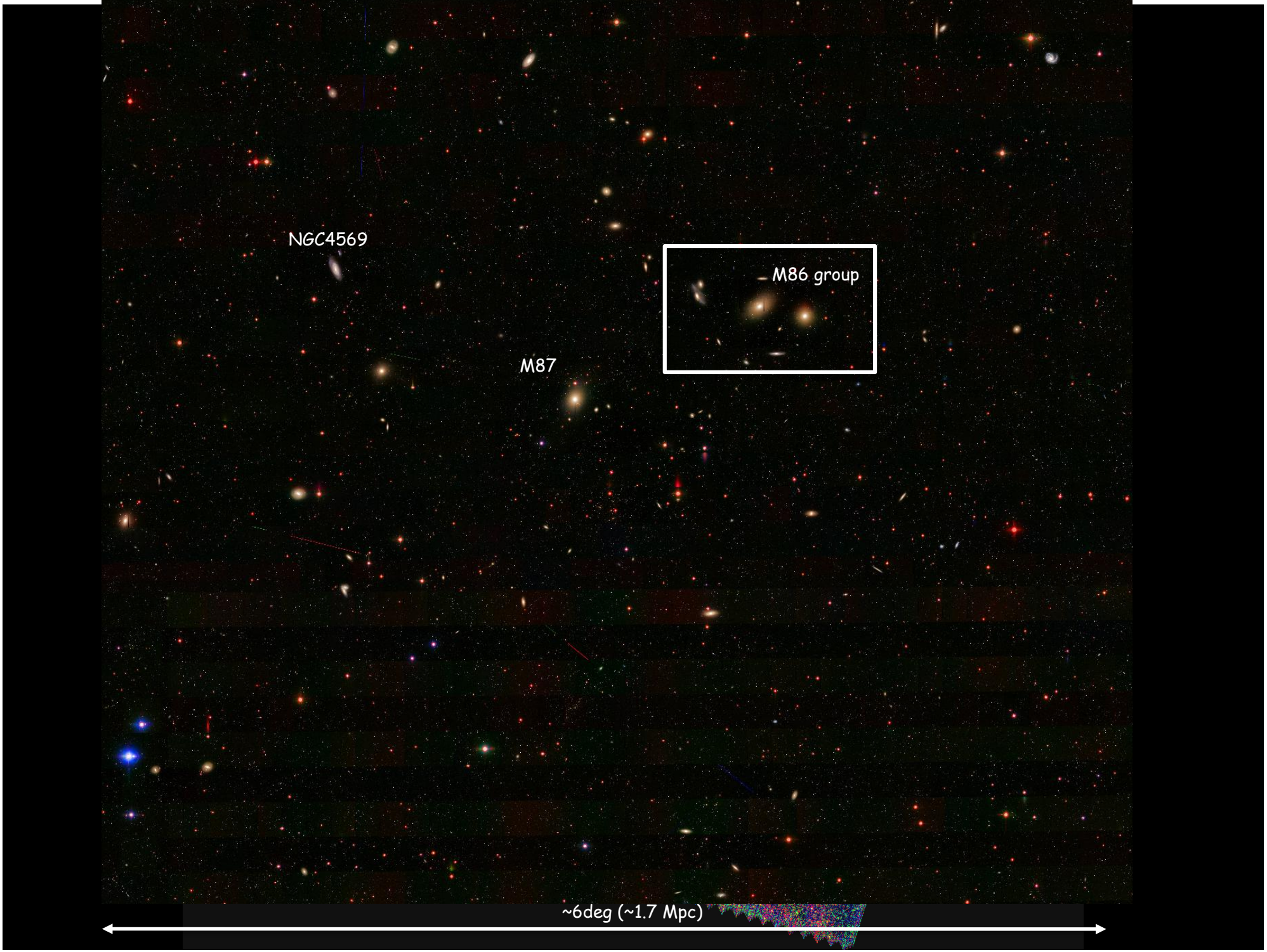
Herschel Virgo Cluster Survey

Davies et al. 2010, A&A in press

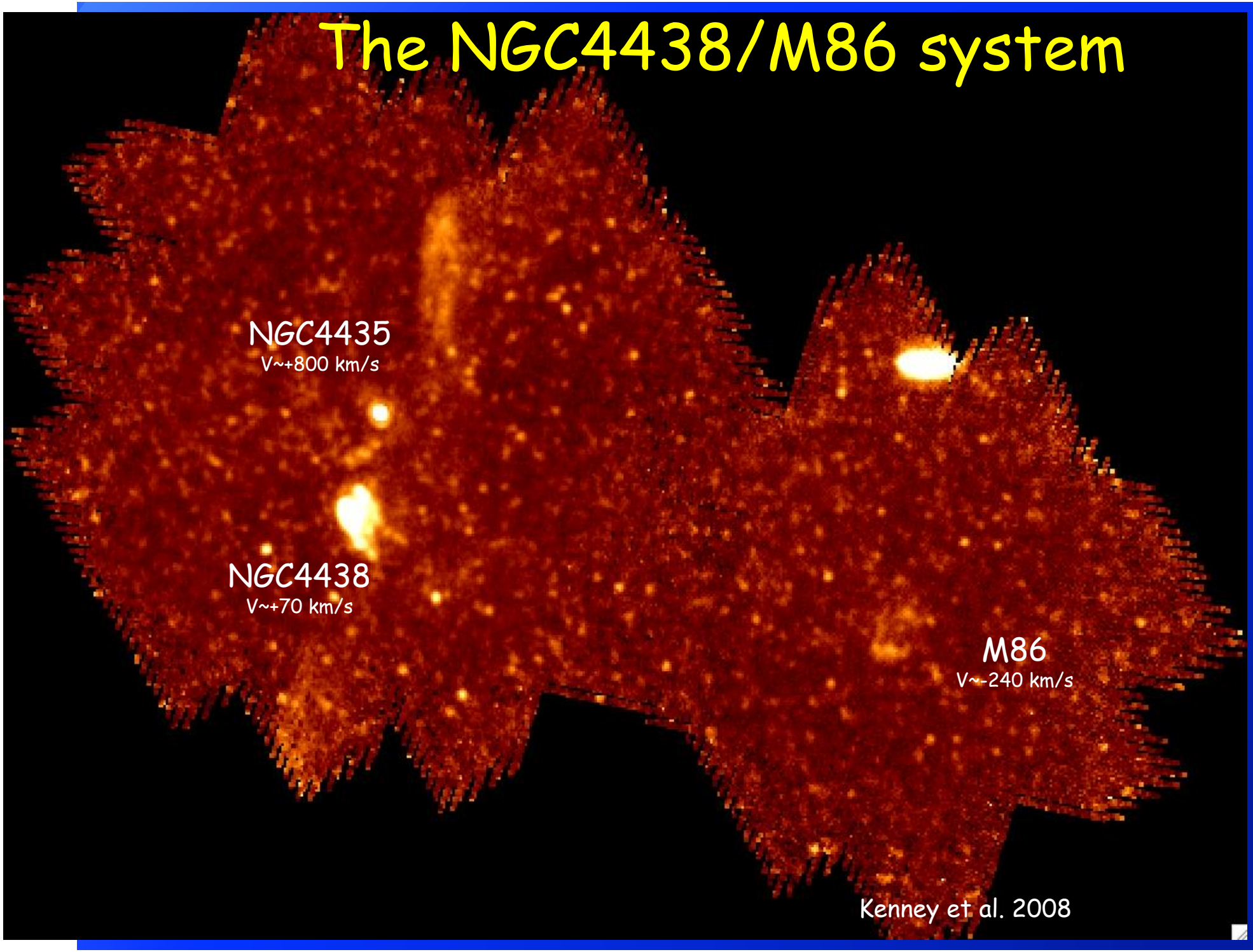


- SPIRE+PACS maps
- 100, 160, 250, 350, 500μm
- ~64 deg²

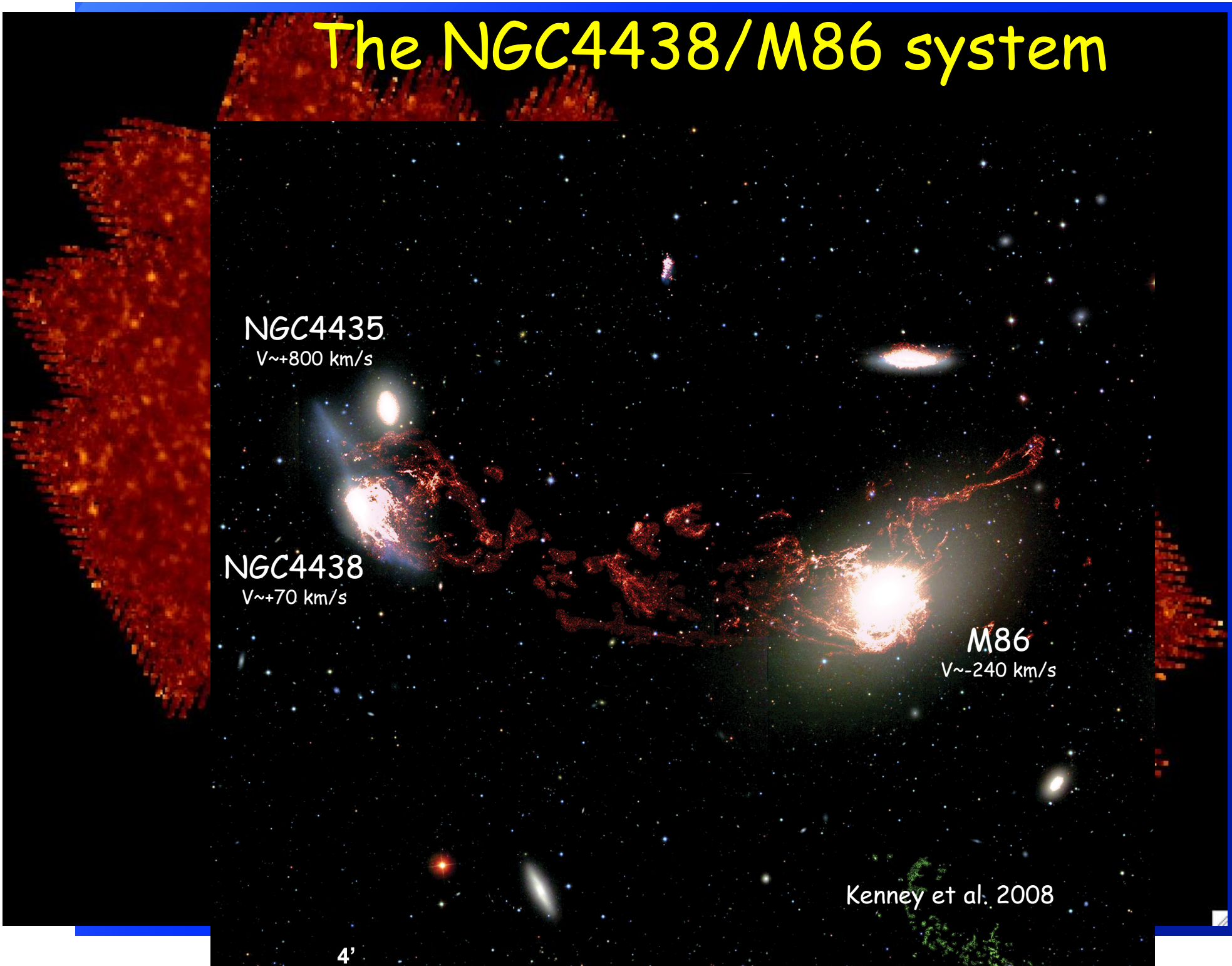
See talks by
Bianchi, Baes, De Looze


NGC4569
M86 group
M87
~6deg (~1.7 Mpc)

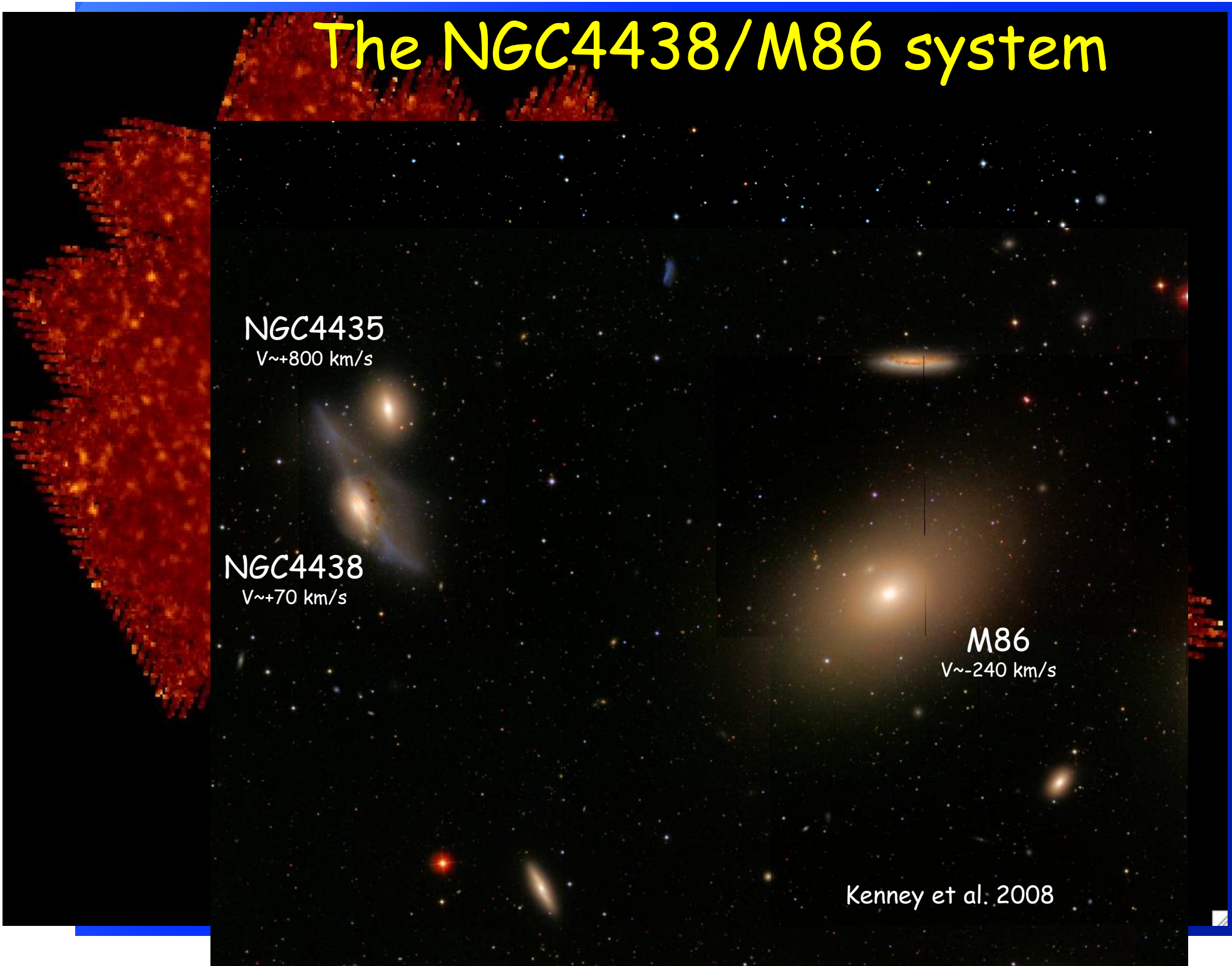
The NGC4438/M86 system



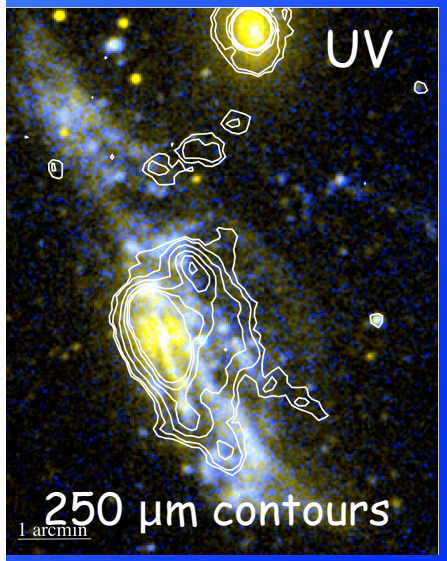
The NGC4438/M86 system

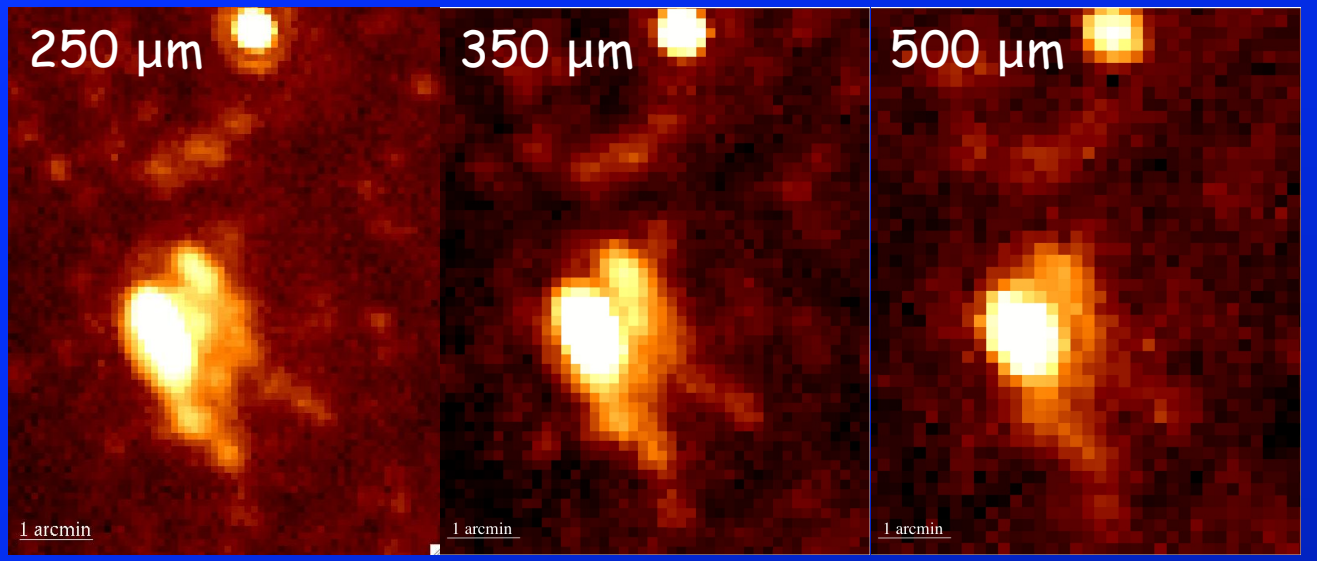


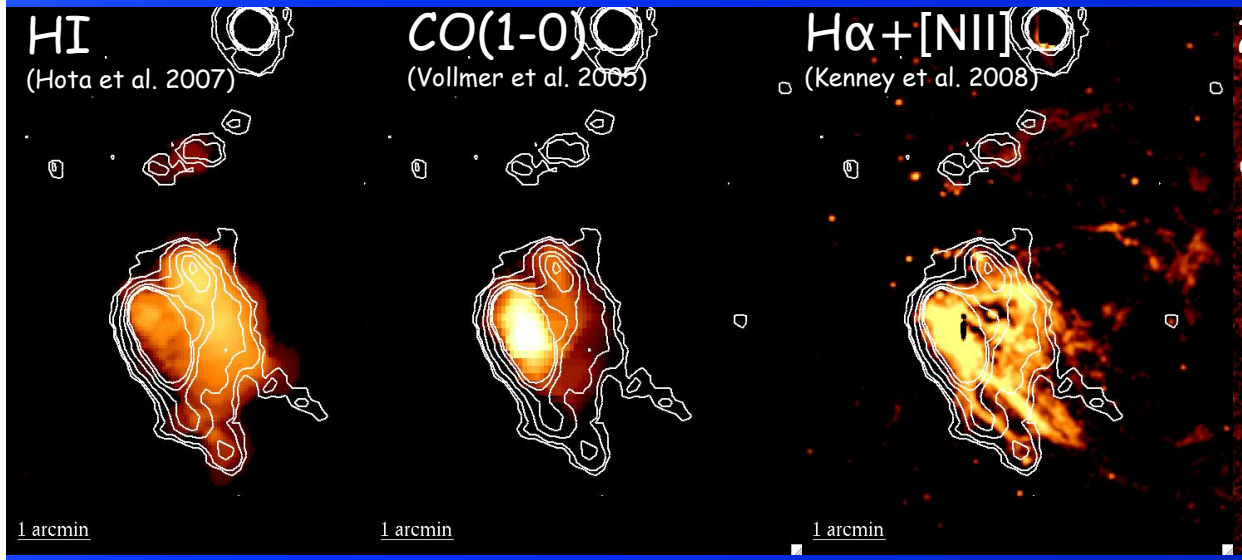
The NGC4438/M86 system

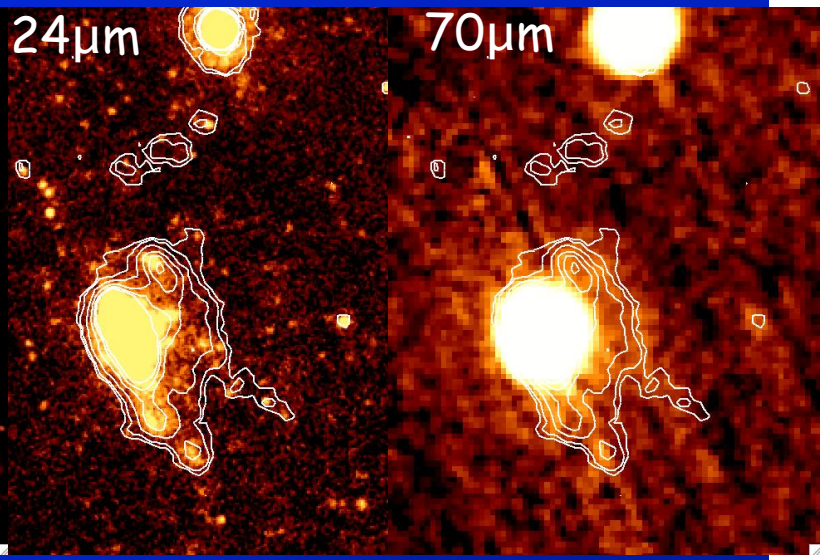


NGC4438





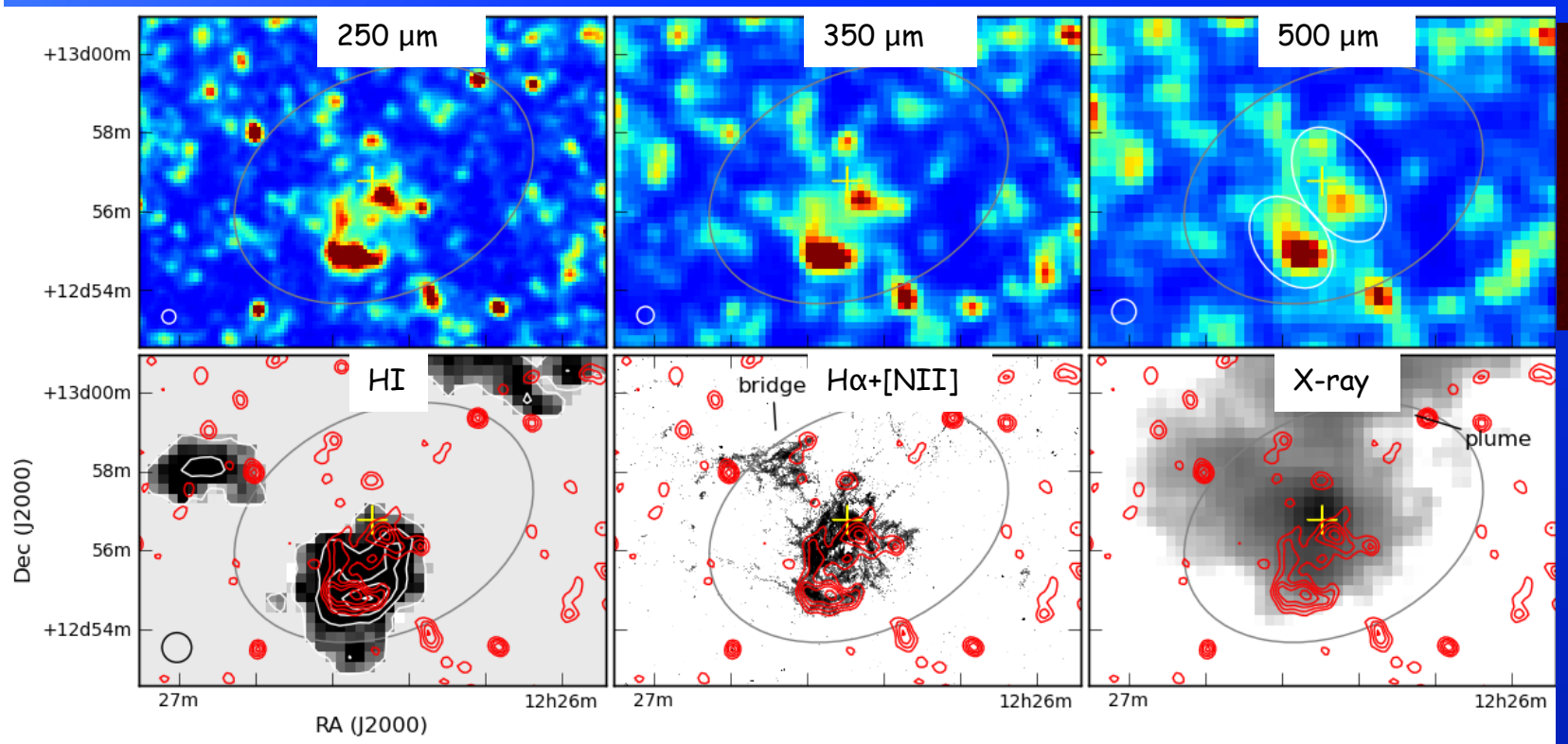




Extra-planar cold dust associated with stripped gas

LC et al. 2010a A&A, in press

M86

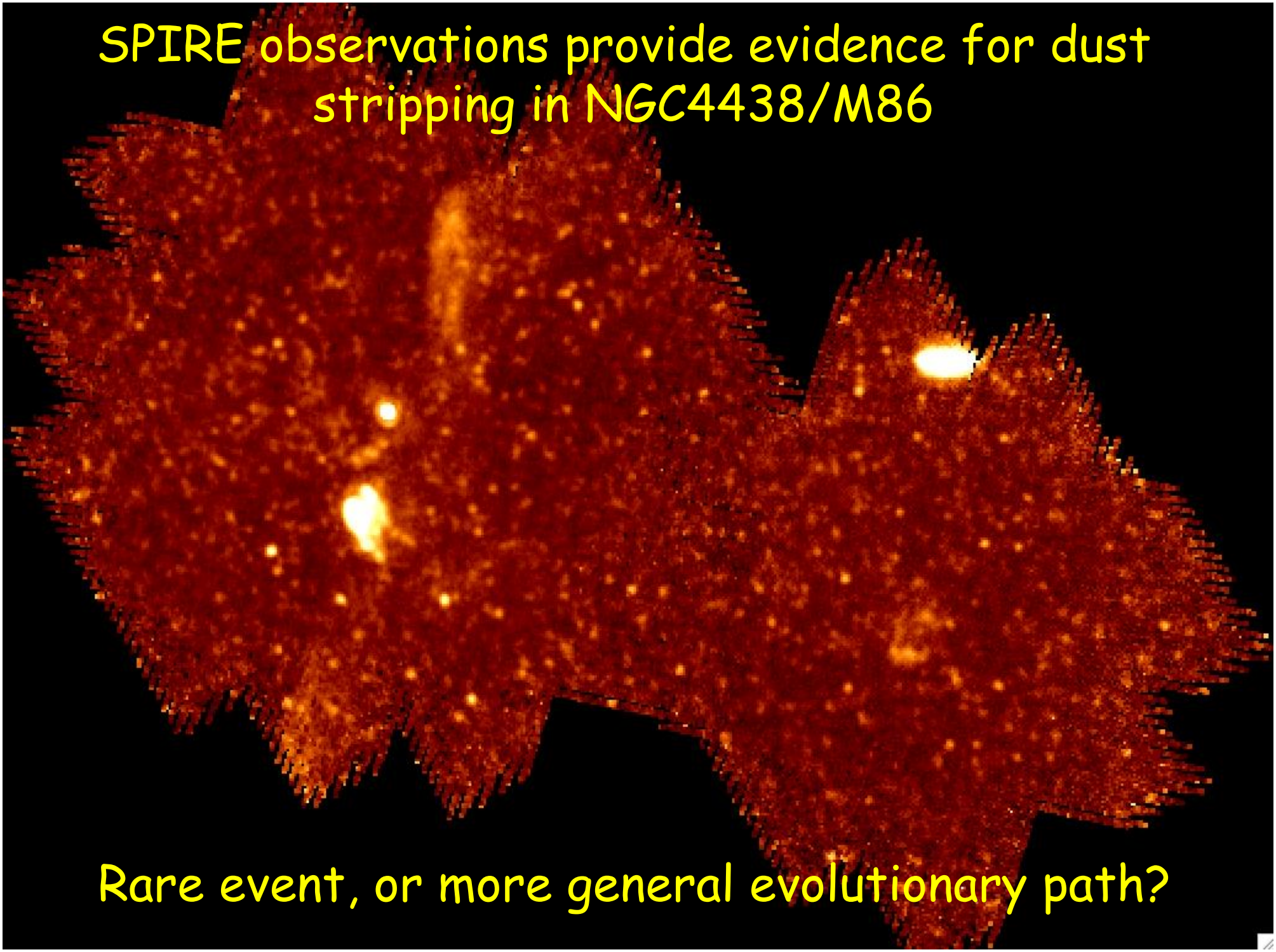


Cold dust follows closely ionized (Hα+[NII]) gas
Likely material stripped from NGC4438

Heating mechanism not clear, likely the same responsible for Hα+[NII] emission: e.g., tidal heating

See poster by Haley Gomez (P1.39) for more details!

Gomez et al. 2010 A&A, in press


SPIRE observations provide evidence for dust stripping in NGC4438/M86
Rare event, or more general evolutionary path?

Ideally, we want to estimate a "dust-deficiency" parameter…

HI deficiency

$$def(HI) = \log(\langle M(HI, D_{opt}, Type)\rangle) - \log(M(HI)_{obs})$$

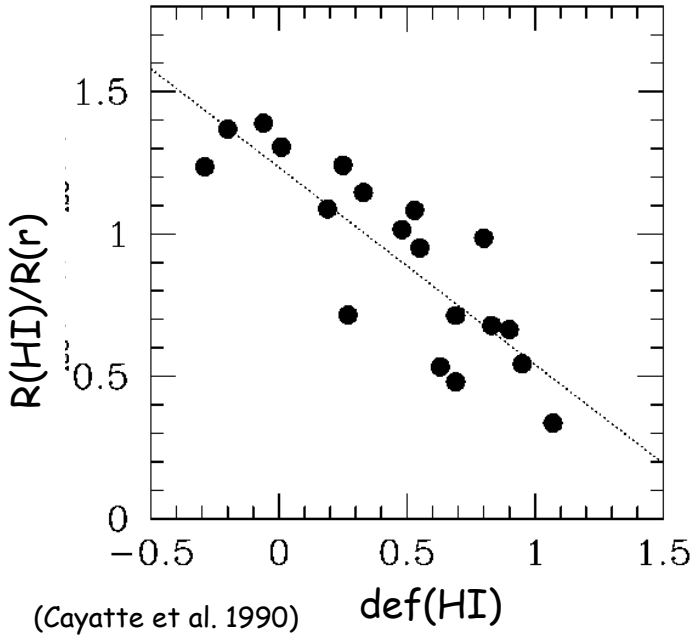
(Haynes & Giovanelli 1984)

def(HI) = 0 ==> Normal HI content

def(HI) = 1 ==> Lost 90% of HI

HI deficiency associated
with "truncation" in the HI disk

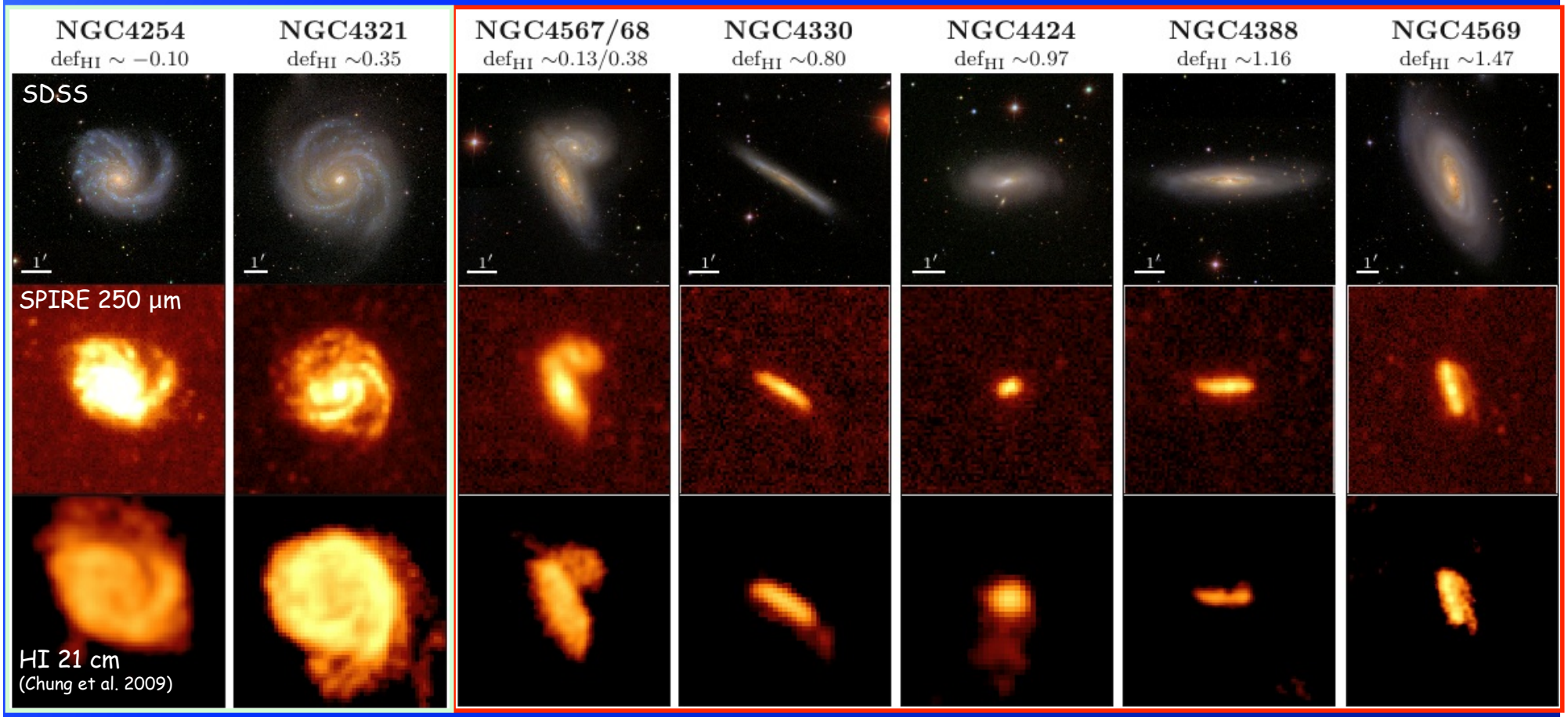
Dust is stripped ==>
"truncation" in the dust disk ?



(Cayatte et al. 1990)

"Truncated" dust disk in HI-deficient Virgo spirals

HI-rich → HI-poor

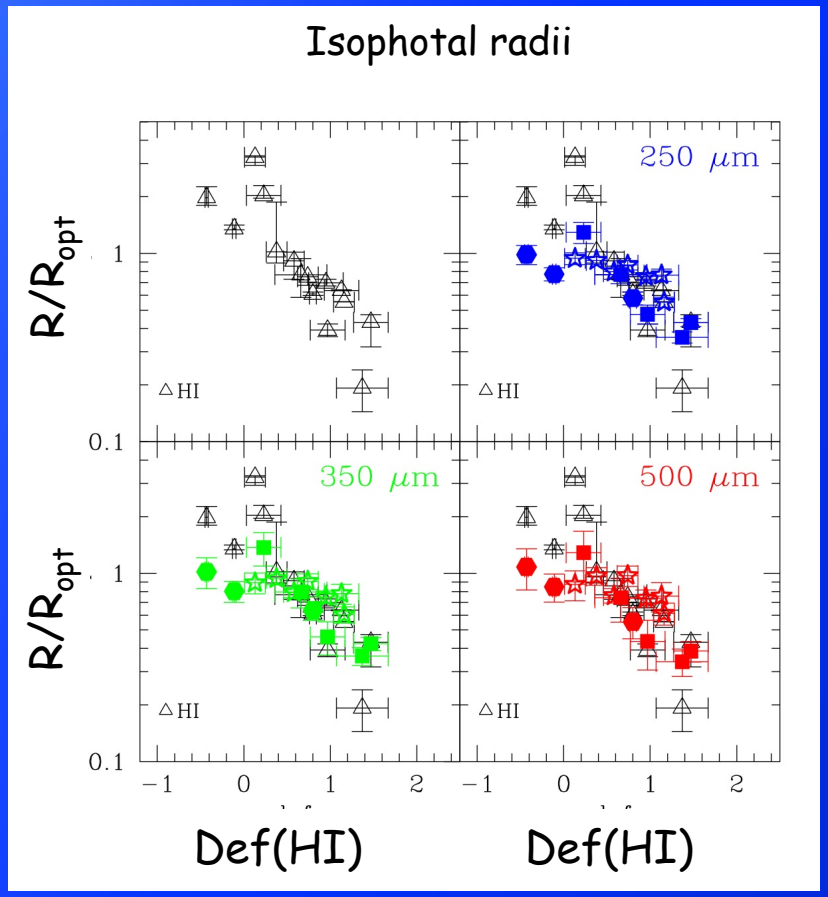


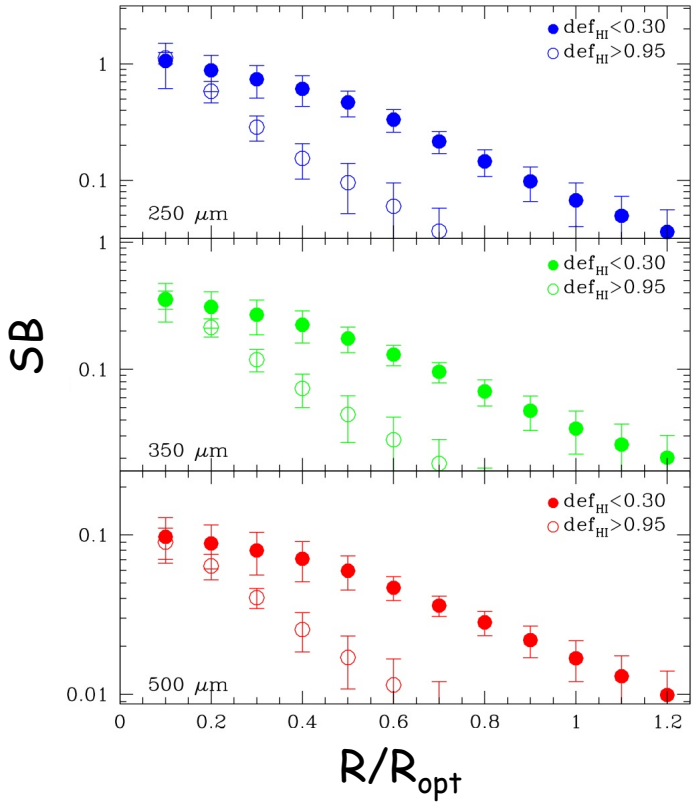
Pohlen et al. 2010 A&A, in press

LC et al. 2010b A&A, subm.

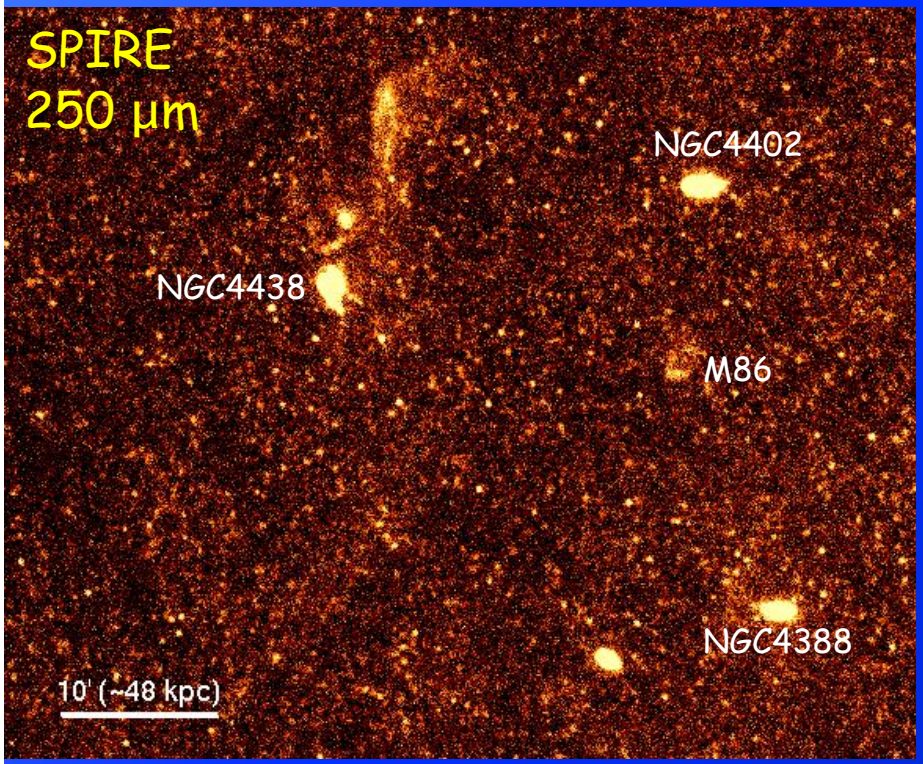
See Poster by Matt Smith (P2.44)

"Truncated" dust disk in HI-deficient Virgo spirals





Looking for stripped dust - Beware of cirrus!

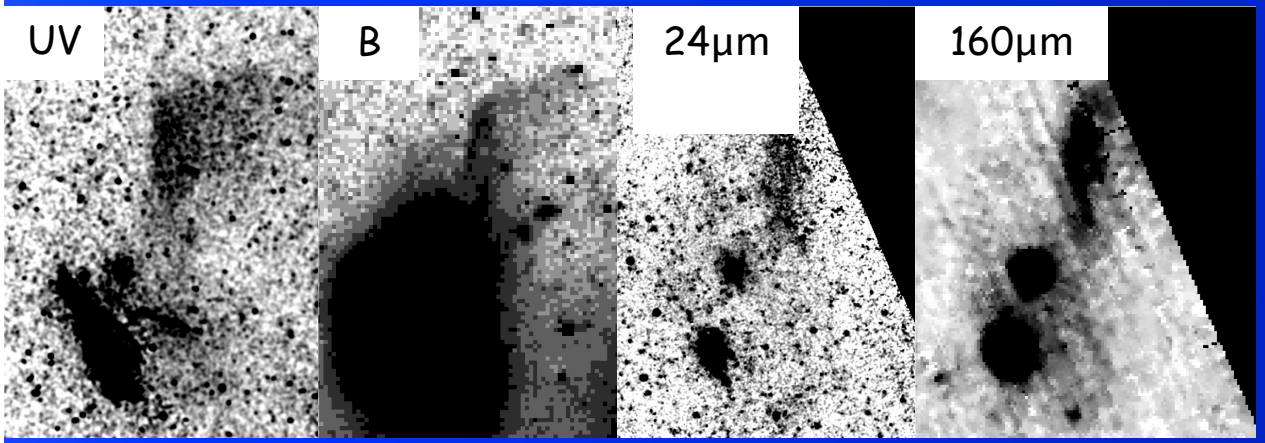


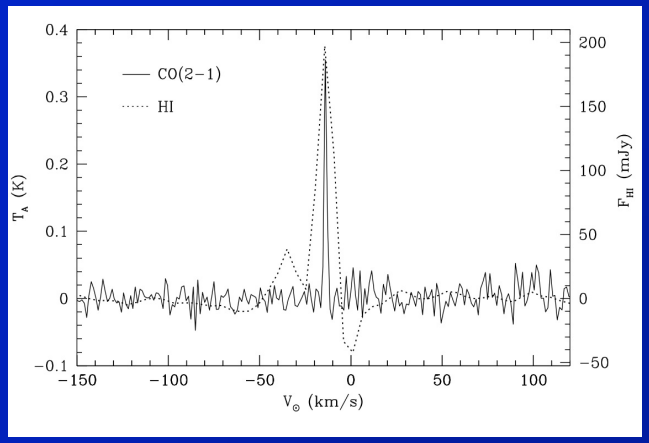
Diffuse Plume near NGC4438

FUV/opt/24µm/160µm/HI/CO counterpart

Previously interpreted as a tidal stream

Properties and kinematics more consistent with cirrus than tidal debris





LC et al. 2010c MNRAS, 403, L26

Summary

- HeViCS+HRS observations of the Virgo cluster: first glimpse of the effects of the environment on the dust properties of cluster spirals.

Very promising data to:

- Look for "clear" examples of dust stripping
- Quantify the amount of dust-deficiency in cluster spirals
- Look for any diffuse intra-cluster dust stripped from infalling spirals