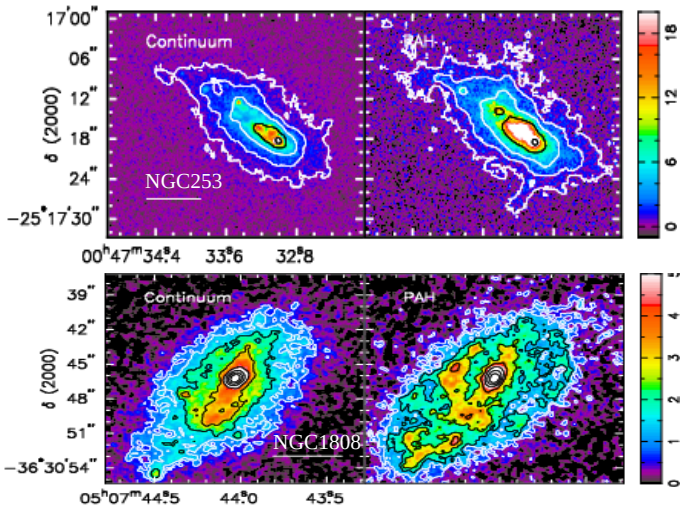
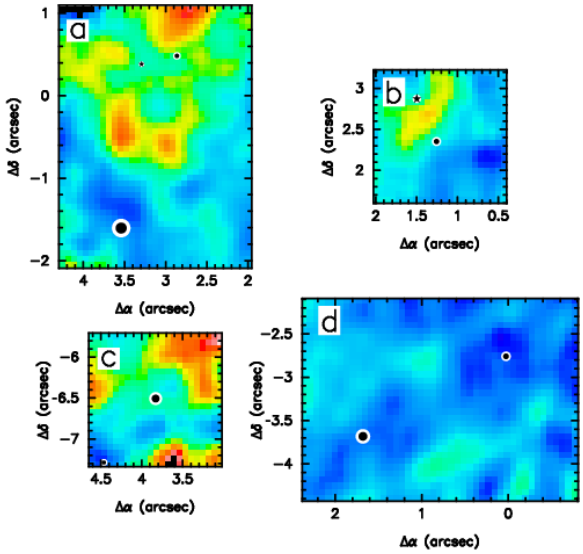
PAHs in energetic extragalactic environments

The mid-infrared dust emission features at 3.3, 6.2, 7.7, 8.6, 11.3 and 12.7 µm, commonly ascribed to PAHs (polycyclic aromatic hydrocarbons), are a powerful diagnostic of the conditions in dusty external galaxies. In order to better characterise the usefulness of PAH emission as a tracer of star formation, we are undertaking a programme of 3 µm narrow band imaging of a sample of nearby template galaxies covering a wide range of metallicity, star formation activity, and nuclear activity. Here we show high spatial resolution images of PAH feature emission from the central regions of the nearby starburst galaxies NGC253 and NGC1808, taken with ISAAC at the VLT-UT1. Globally, the feature emission is seen to peak on the central starburst regions of both sources. On smaller scales, however, we see no general spatial correlation or anti-correlation between the PAH feature emission and the location of sites of recent star formation, suggesting that the degree to which PAH feature emission traces starburst activity is more complicated than previously hypothesized based on results from data with lower spatial resolution. We do find spatial correlations, though, when we consider the feature-to-continuum *ratio*, which is low at the positions of known super star clusters in NGC1808 as well as at the position of the IR peak in NGC253. We take this to imply a decrease in the efficiency of PAH emission induced by the star formation, caused either by mechanical energy input into the ISM, or photoionisation or photodissociation of the PAH molecules.



3.21 µm continuum emission (left) and 3.28 µm continuum-subtracted PAH feature emission (right) from NGC253 (top) and NGC1808 (bottom). The bars in the left panels indicate 100 pc. The images have not been scaled to a common peak level. PAH emission can be traced on the scales of the central star formation regions and super star clusters (see also the figure to the right). On larger scales the NGC253 image shows tails to the south and north, tracing the well known superwind, and providing strong support that winds can be heavily mass-loaded. This observation has important implications for enriching galaxy halos and possibly the intergalactic medium with small dust grains.



Blow-ups of regions in NGC1808. Shown as circles are the positions of young super star clusters, as observed in the K-band by Tacconi-Garman et al. (1996). In each case the K-band knot lies at a position of low feature-to-continuum ratio.

References:
• Tacconi-Garman, L. et al. 1996: AJ, 112, 918

E. Sturm, L. Tacconi-Garman, M. Lehnert, D. Lutz, R. Davies, A. Moorwood