

# Karhunen-Loeve for 'PSF' removal

Mark Chun

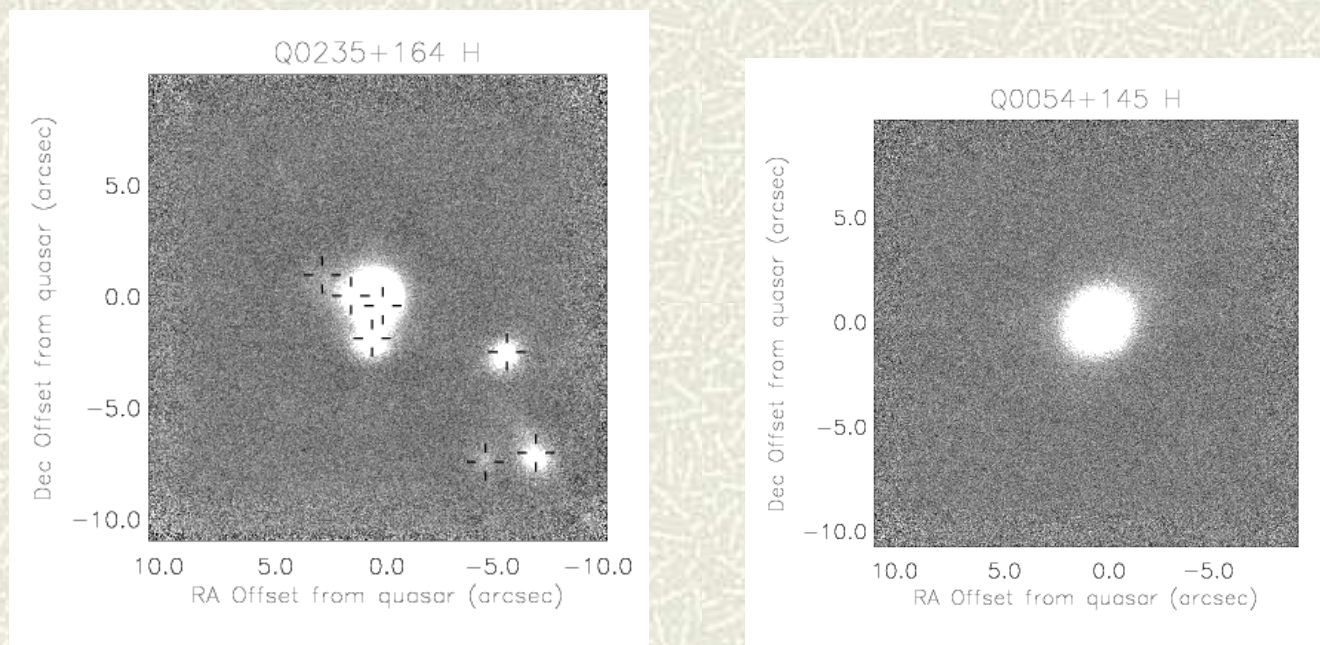
CfAO-Extragalactic AO workshop

August 7, 2005



# QSOALS imaging w/AO

- # Basic problem: searching for faint diffuse things near bright 'point' source
- # Need an estimate of quasar contribution

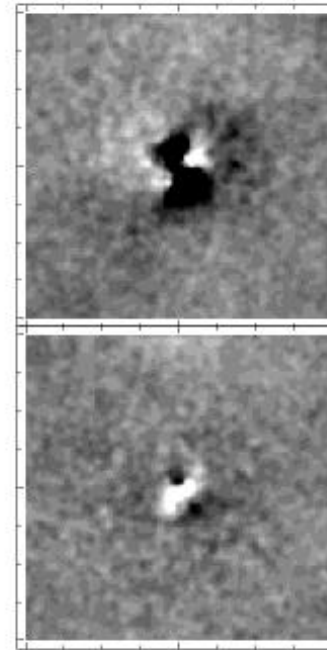
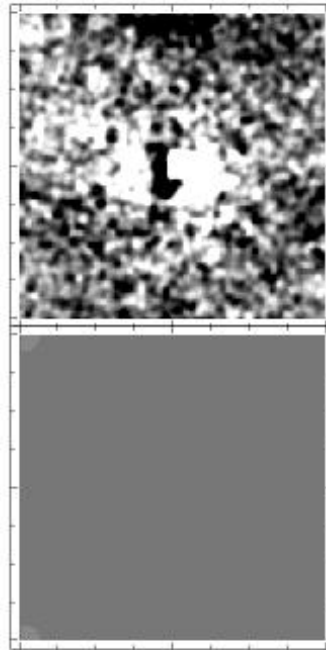
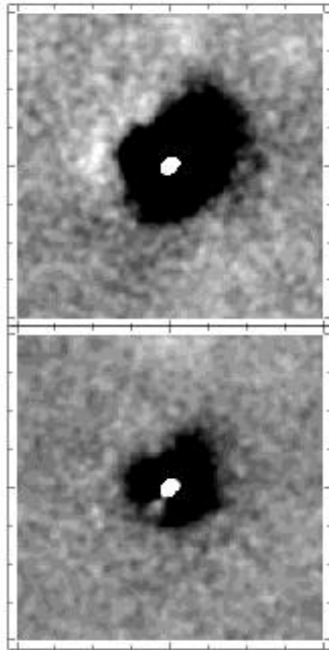


# Approaches...

- # PSF Cal observations
- # PSF extracted from final image
- # Azimuthal-average+sigclip/median

QSO Residual

Star Residual

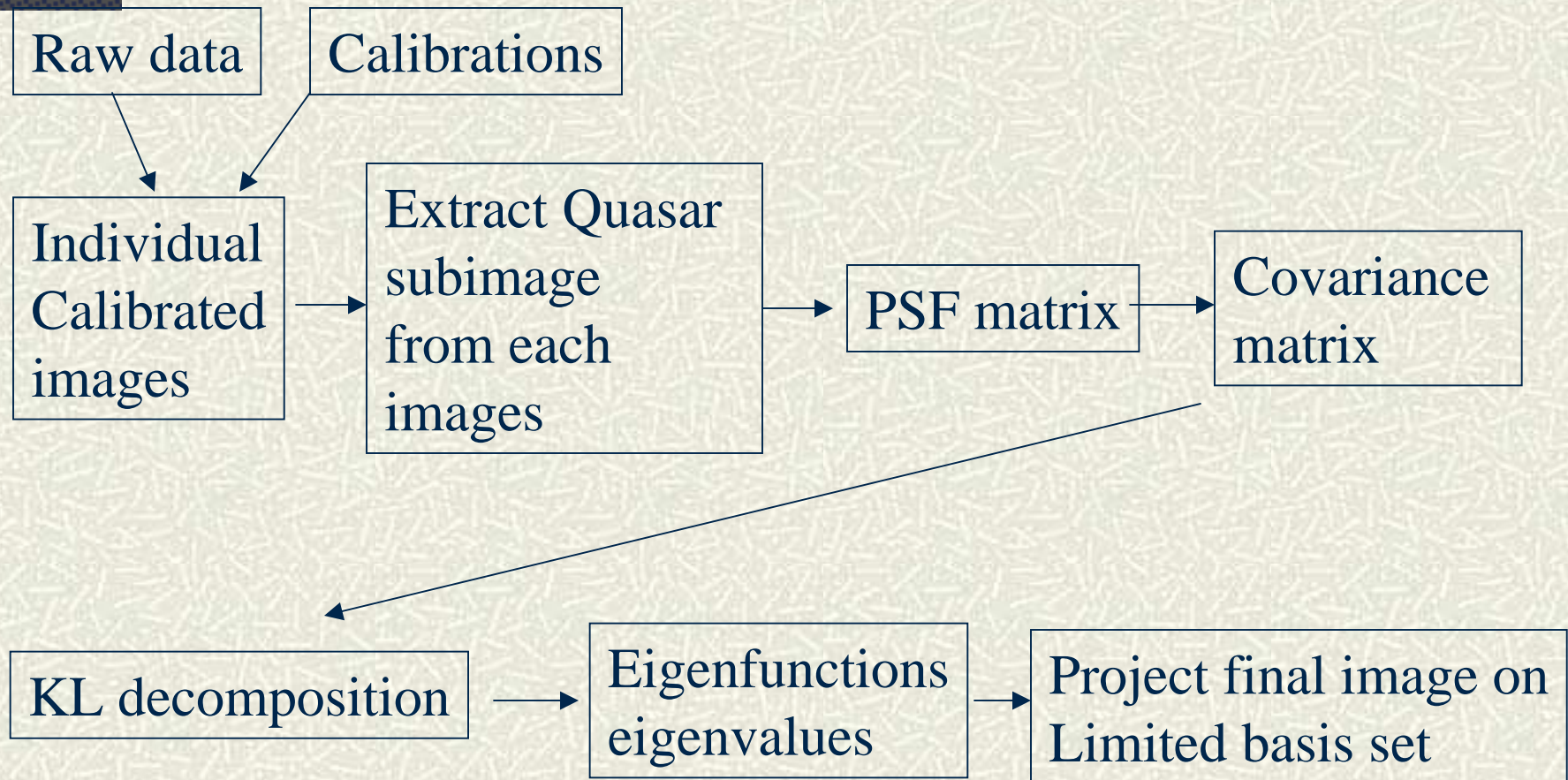


# Karhunen-Loeve

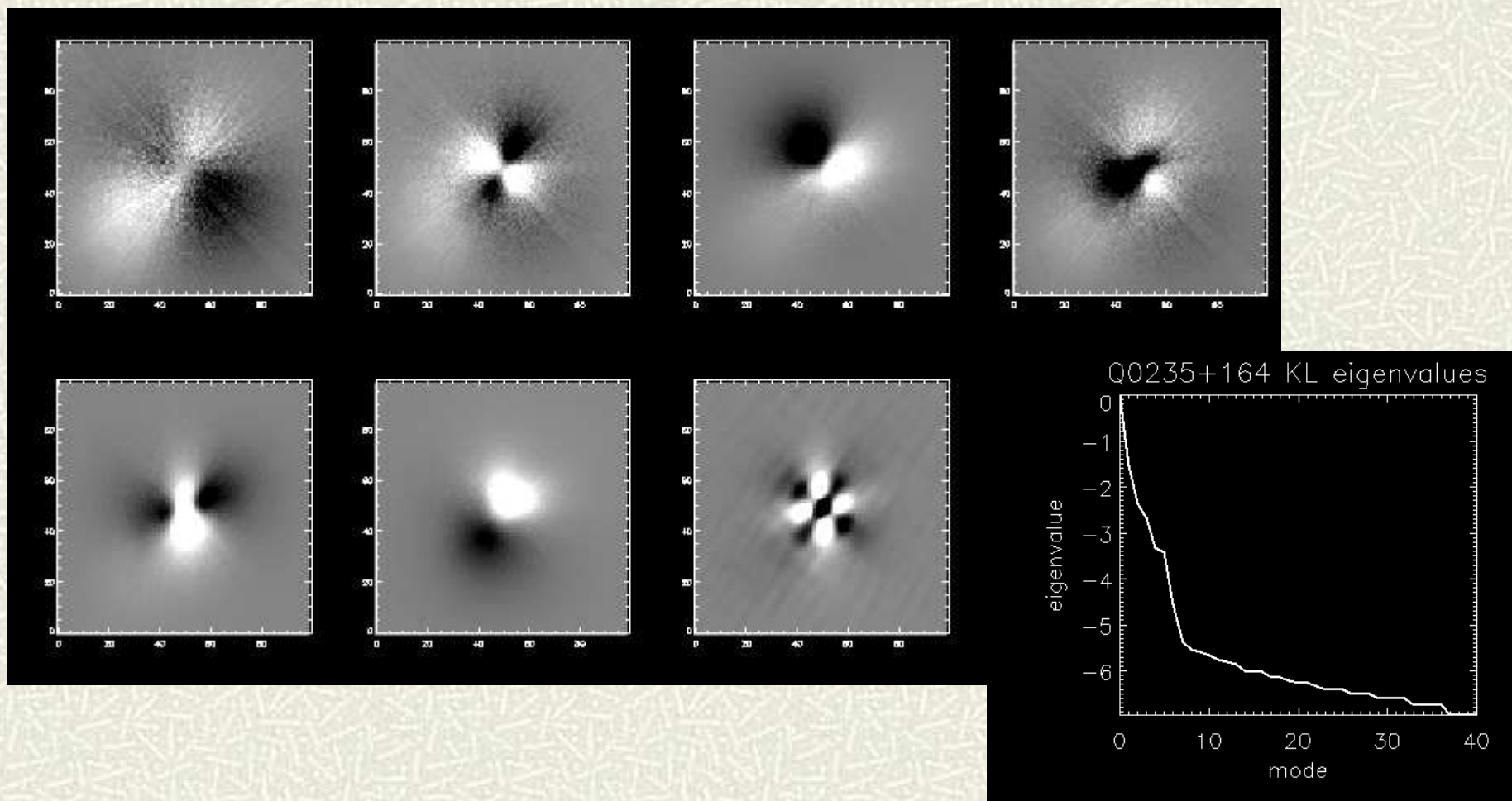
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- # Use to find an optimal, orthogonal basis that describes the spatial/temporal variations in a set of images
  - # Assume that variations in image are due to variations in AO correction (with time)
  - # Any structure in image fit well by first few modes of basis is highly variable -> assume not real and remove
  - # Previously used to describe anisoplanatism: Lauer 2002, SPIE, 4847, 167.
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# PSF temporal variations

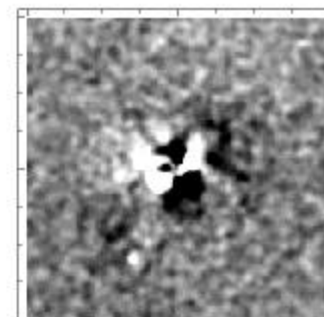
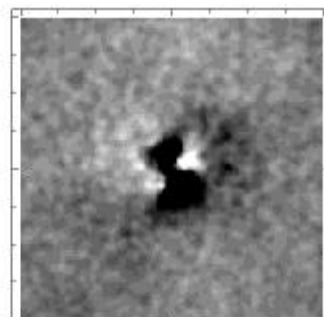
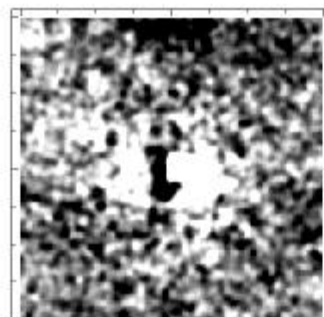
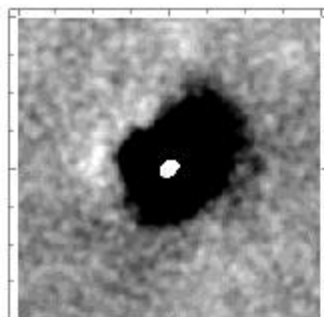


# Example basis set

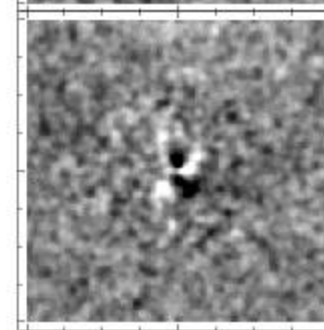
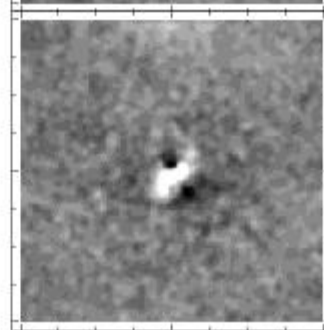
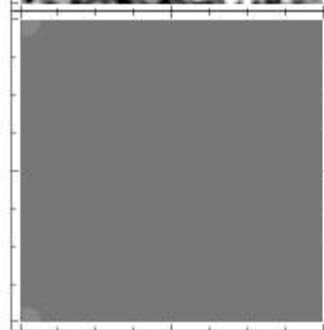
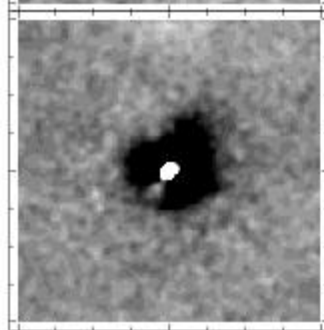


# Applied to same field

QSO Residual



Star Residual



Cal Star PSF

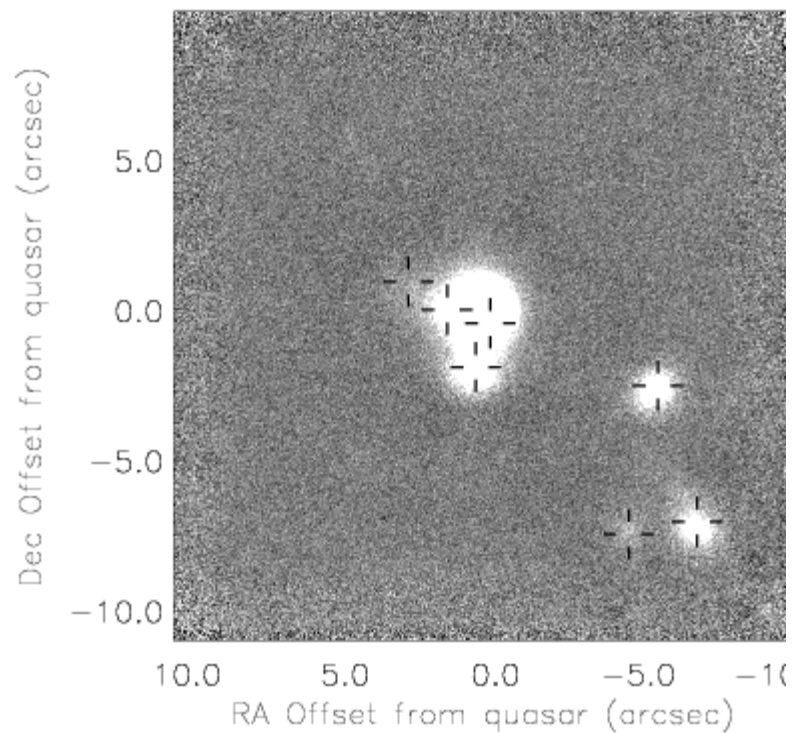
Field Star PSF

Az Ave PSF

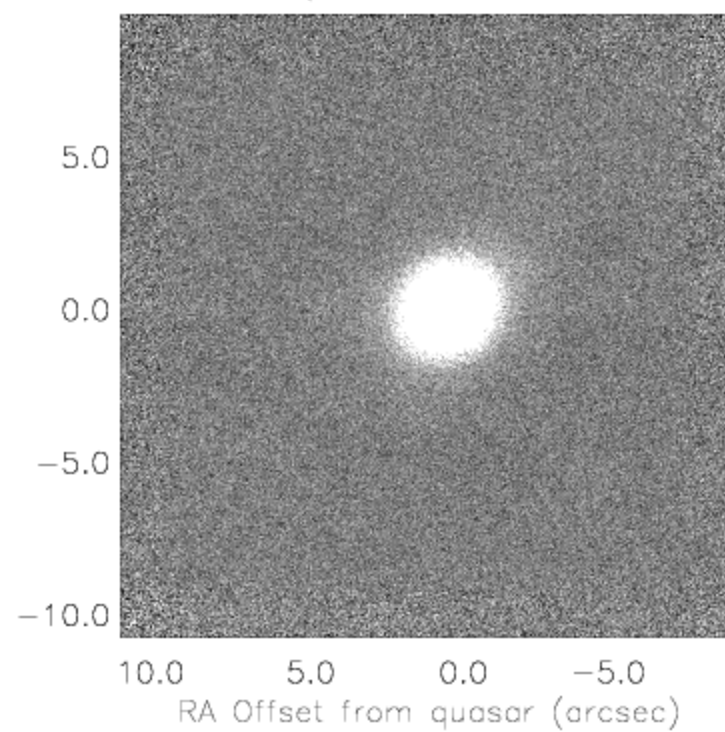
KL PSF

# Example fields

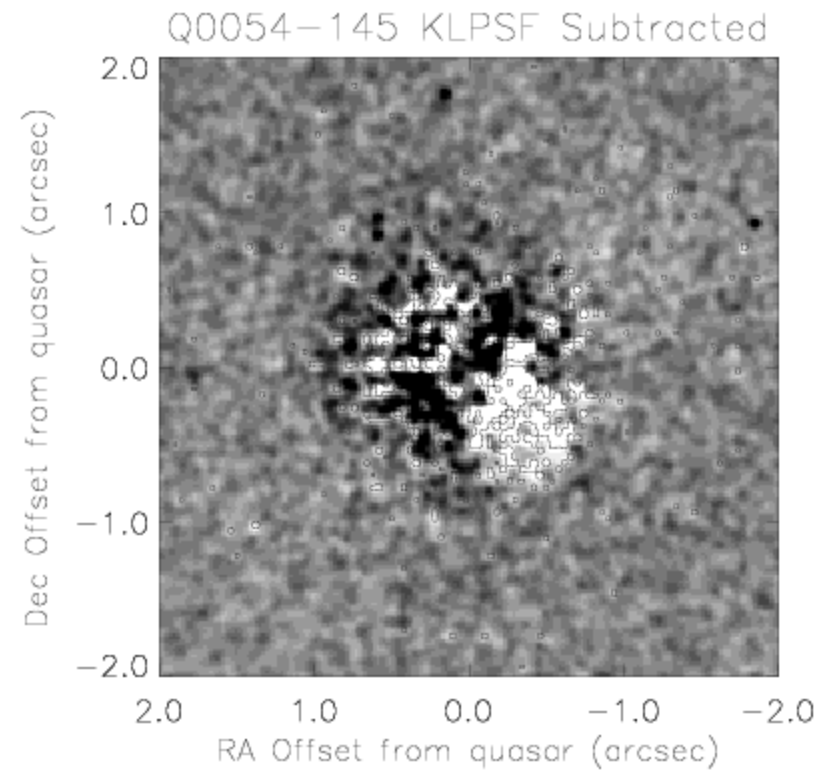
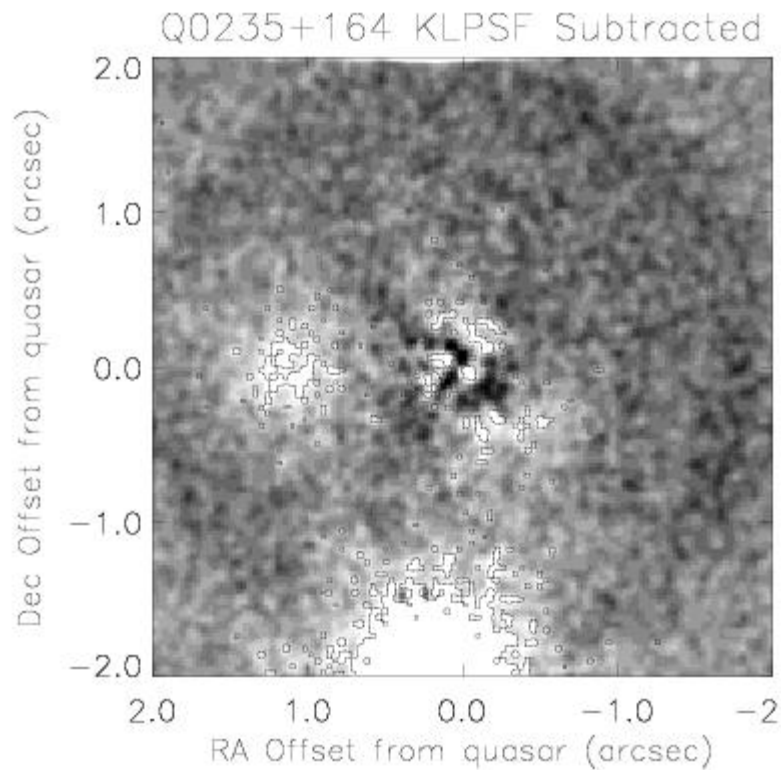
Q0235+164 H



Q0054+145 H



# KL subtracted subimages



KLsub 10%-100% smaller residual rms than az-ave sub