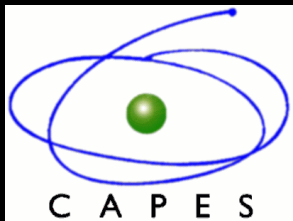


IAUS 262 - Stellar Populations: Planning for the Next Decade  
Rio de Janeiro, Brazil, 2009

# Probing the Stellar Population of Seyfert Galaxies: a Near Infrared perspective

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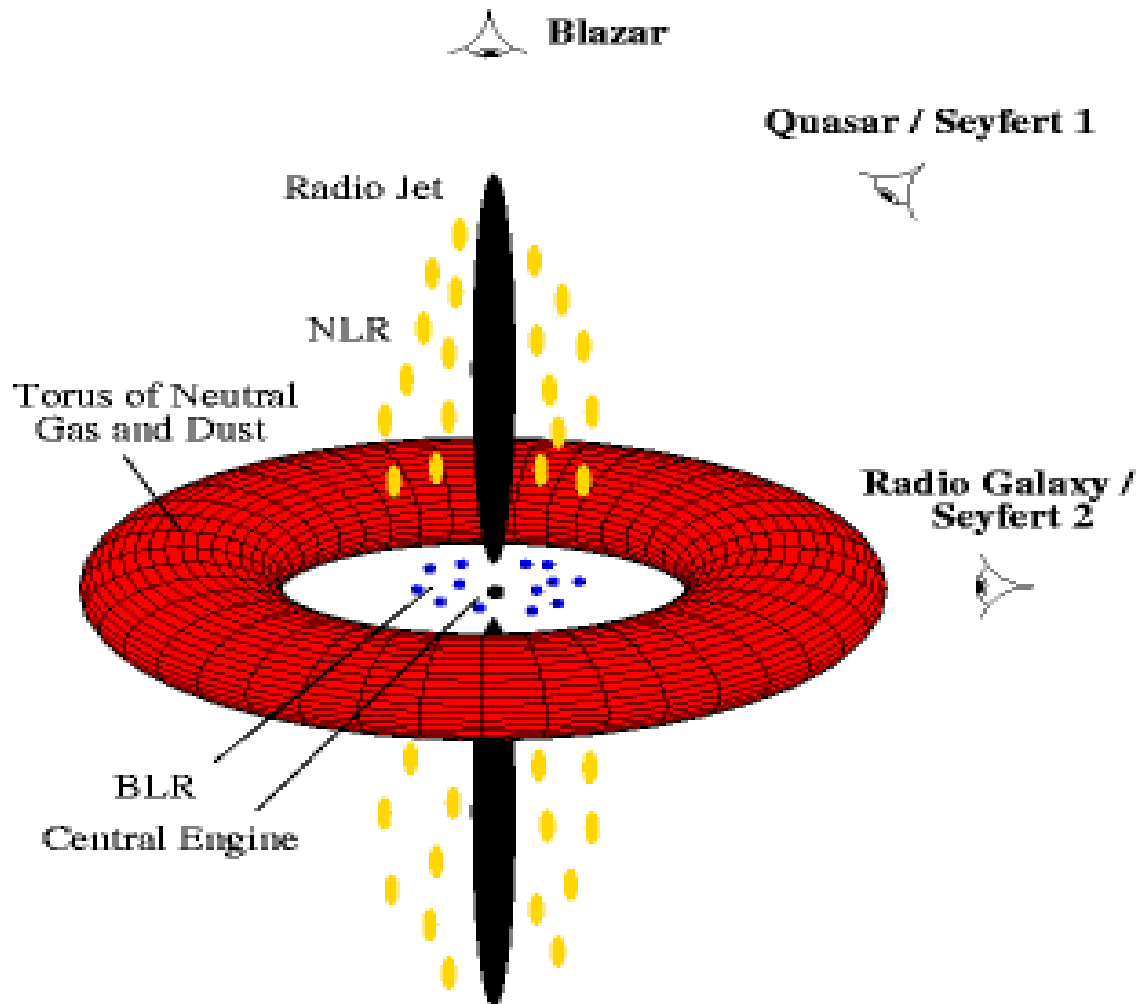
Miriani G. Pastoriza – IF-UFRGS  
Alberto Rodríguez-Ardila – LNA/MCT  
Charles Bonatto – IF-UFRGS



# Motivation

- ✓ It is possible to study, in a single shot, the 3 main AGN SED components in the near infrared (NIR);

# The main near infrared SED components



Assuming the unified model for AGNs (Antonucci & Miller, 1985)

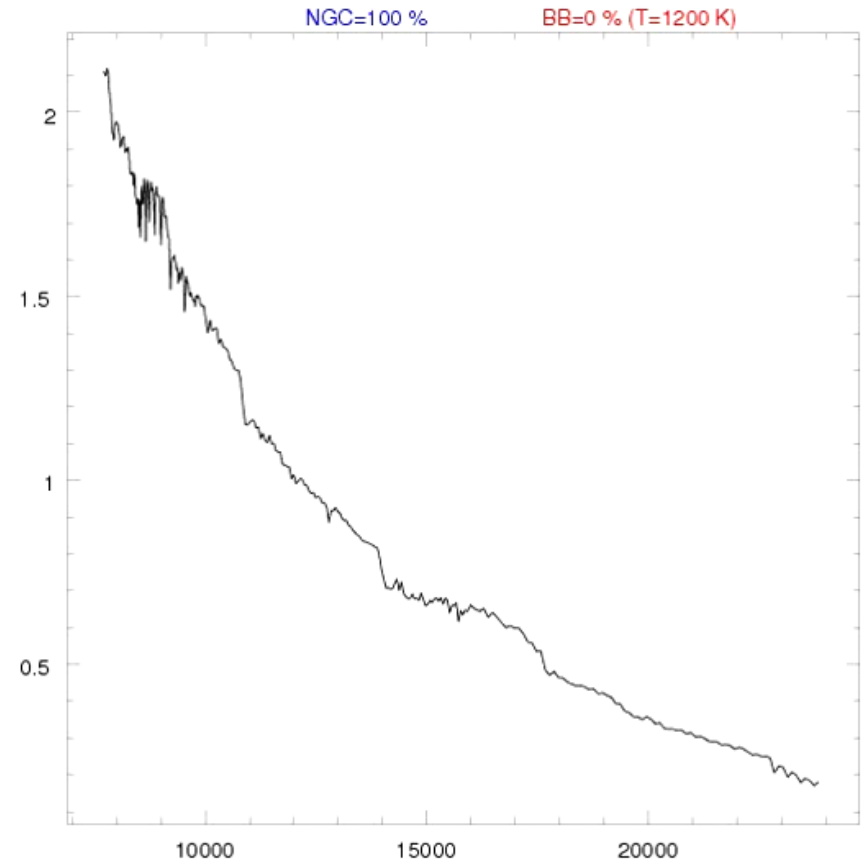
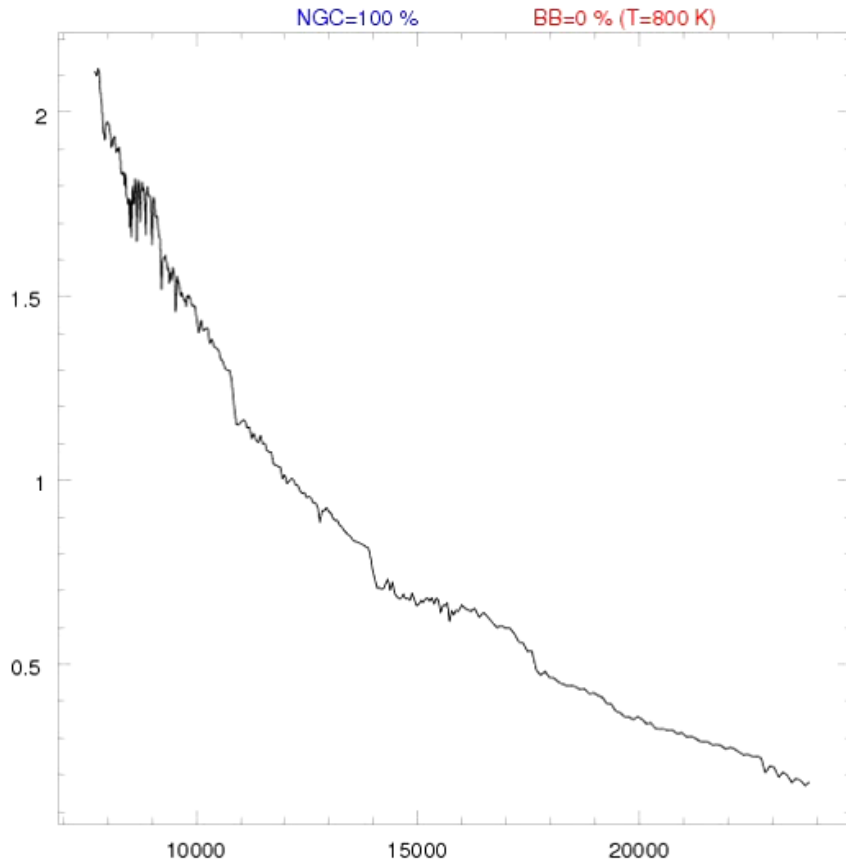
- 1- Stars;  
(Bulge)
- 2- Power Law;  
(SMBH - AGN)
- 3- Hot Dust;  
(Dusty torus)

# Motivation

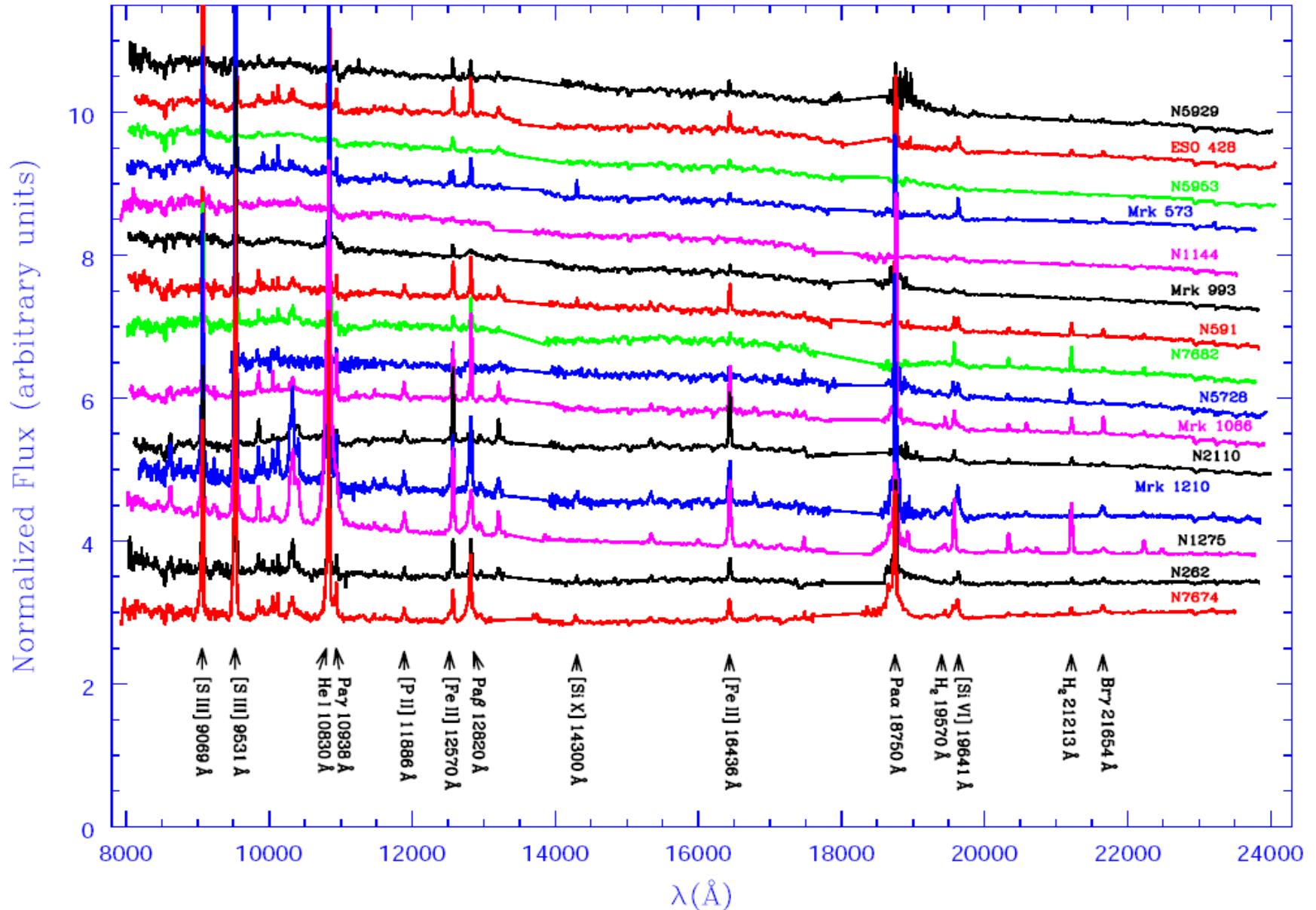
- ✓ It is possible to study, in a single shot, the 3 main AGN SED components in the near infrared (NIR);
- ✓ The NIR stellar population of Seyfert galaxies is poorly known;
  - There are no studies based on the fitting of the whole spectra;
  - Some studies based on: Br $\gamma$  emission or 2.3 $\mu$ m CO bands (e.g. Rieke et al., 1980; Origlia et al., 1993; Oliva et al., 1995, Lançon et al., 2001);
- ✓ The NIR is the most convenient spectral region, accessible to ground based telescopes, to probe highly obscured sources;

# Effect of hot dust in galaxy SED

## NGC 7714 + hot dust (800 K / 1200K)



# The Sample



# Spectral Synthesis

## ✓ Synthesis code

STARLIGHT: models the whole underlying spectrum , excluding emission lines and spurious data (Cid Fernandes et al., 2004, 2005);

## ✓ Base Set

See poster: IAUS266 - p 19

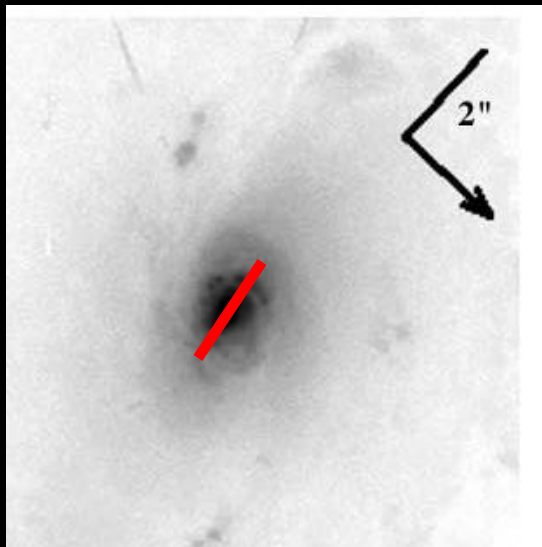
**Stellar Population (SP):** The most recent EPS models of Maraston (2005). They include the effects of TP-AGB stars and are able to fit the observations (Riffel et al, 2007, 2008);

**Featureless continuum (FC):** Power Law of the form  $F_{\nu} \sim \nu^{-1.5}$  ; represents the non-thermal contribution of the AGN (e.g. Cid Fernandes et al., 2004);

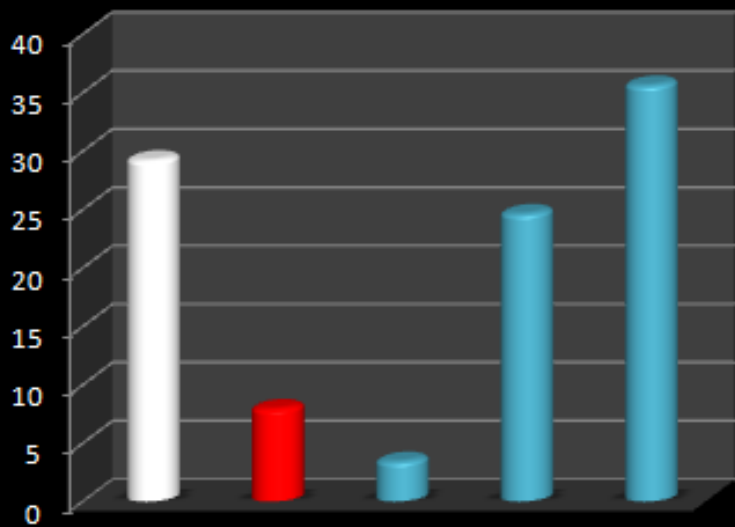
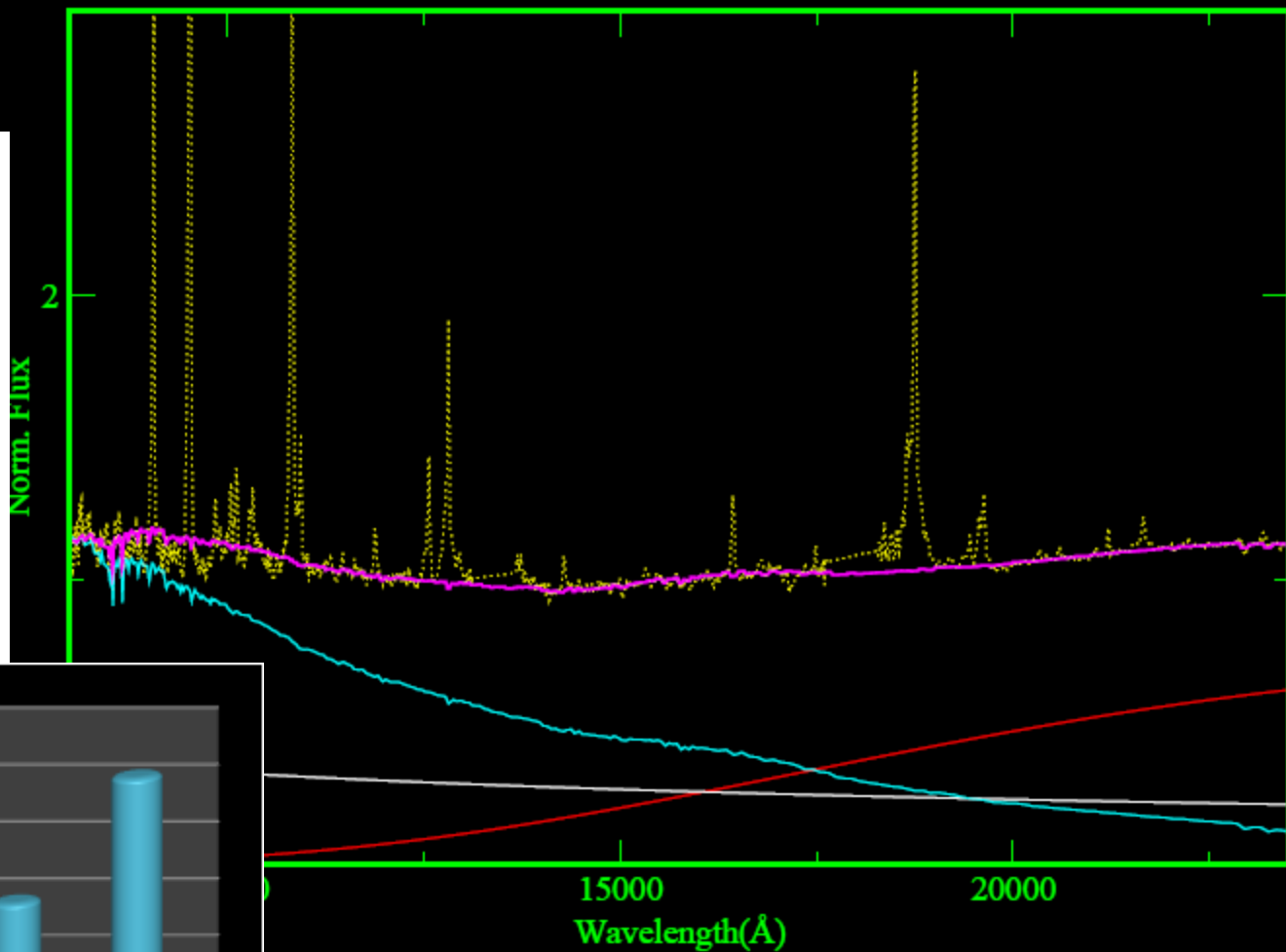
**Planck distribution (BB):**  $700 \leq T \leq 1400$  K; to represent the hot dust.

# Results

Malkan et al. (1998)

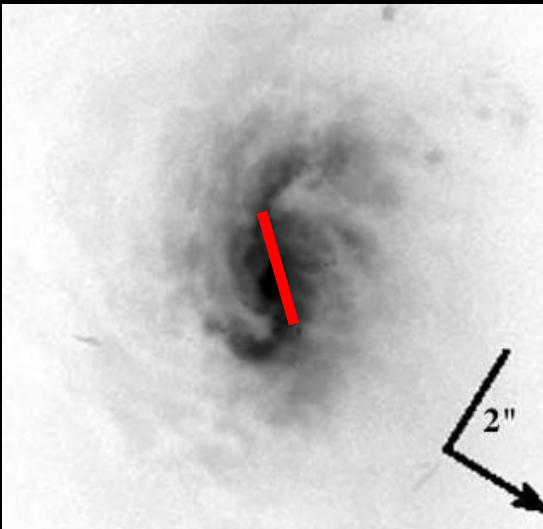


NGC 7674  
 $A_v = 1.03$  mag

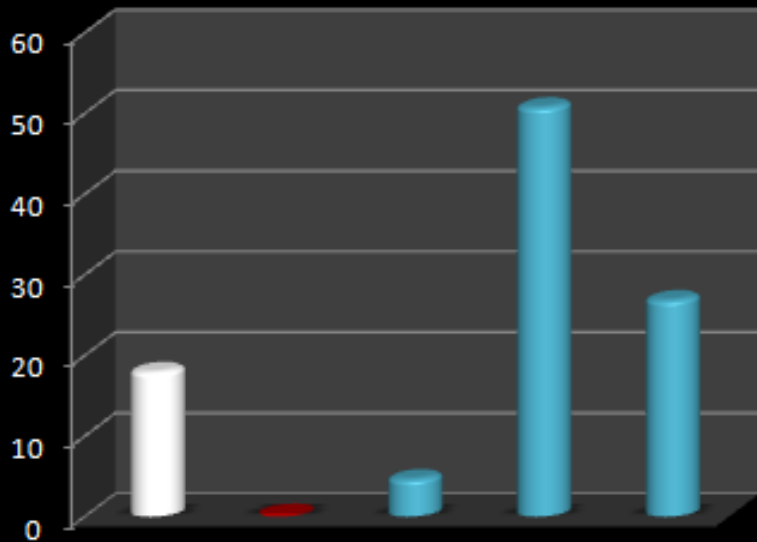
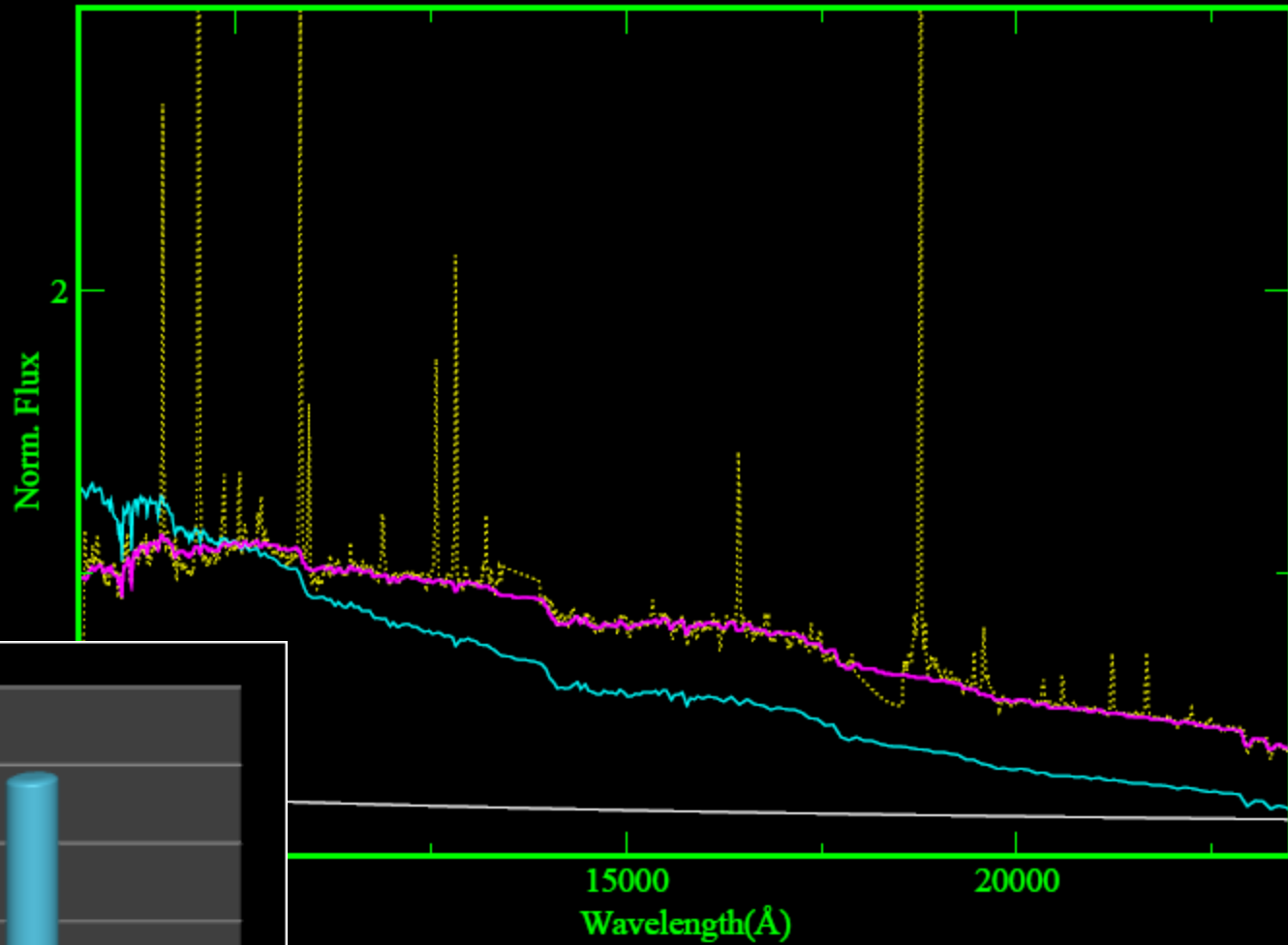


# Results

Malkan et al. (1998)

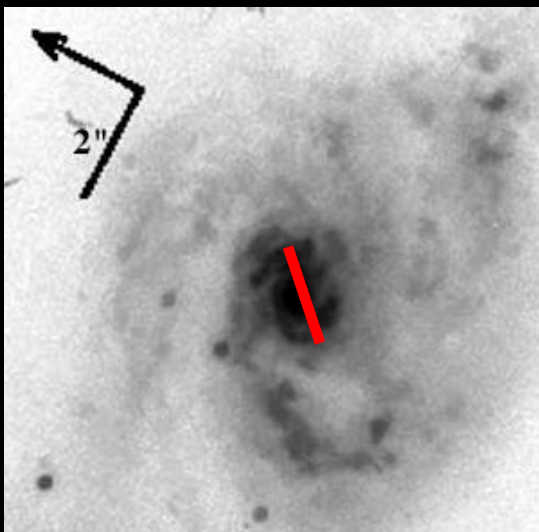


Mrk 1066  
 $A_v = 1.54$  mag

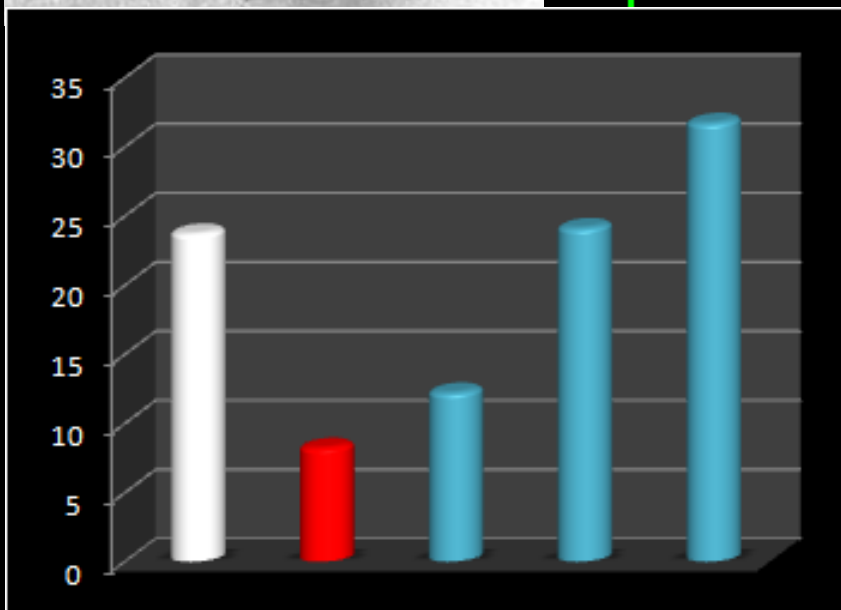
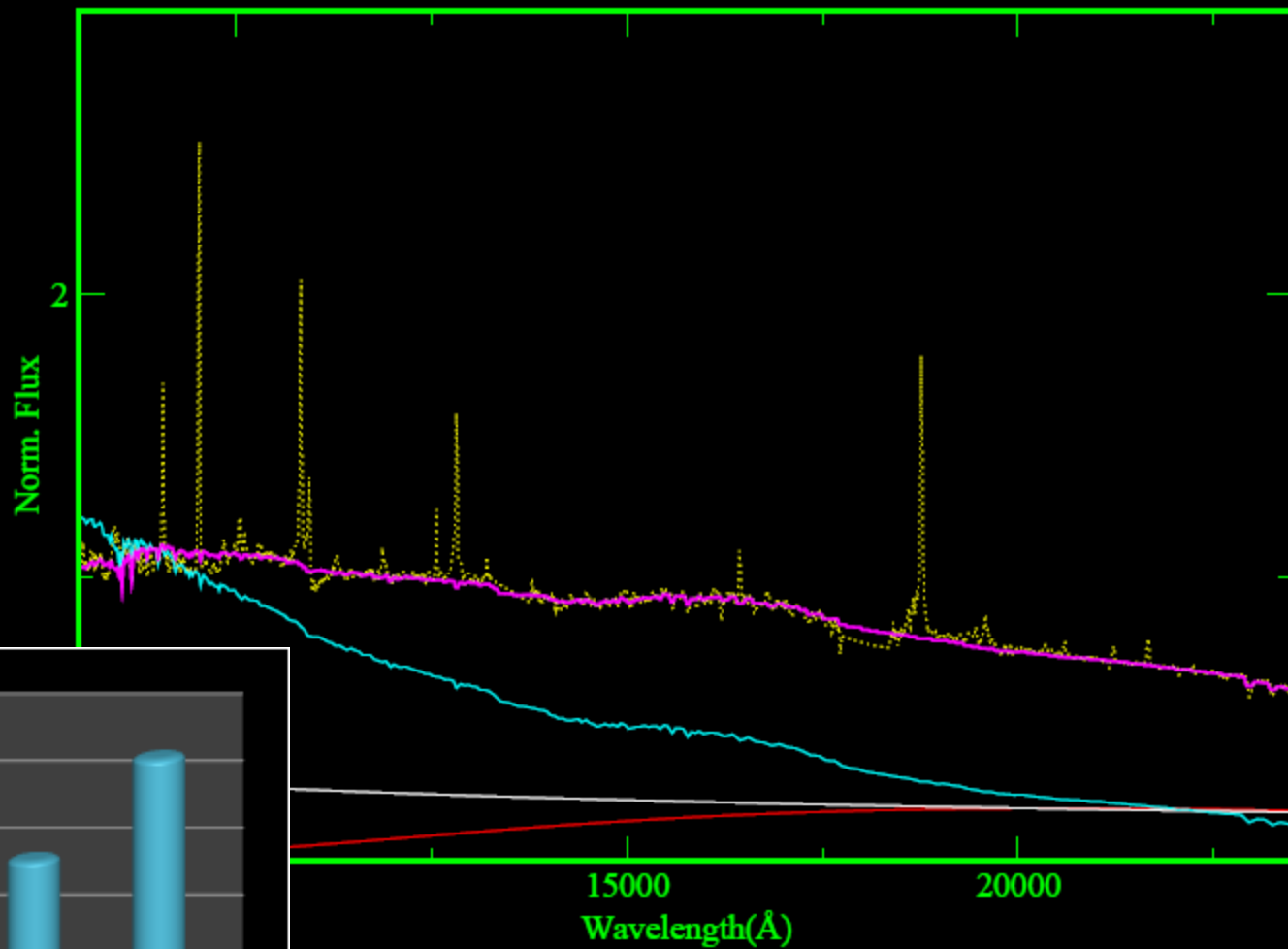


# Results

Malkan et al. (1998)



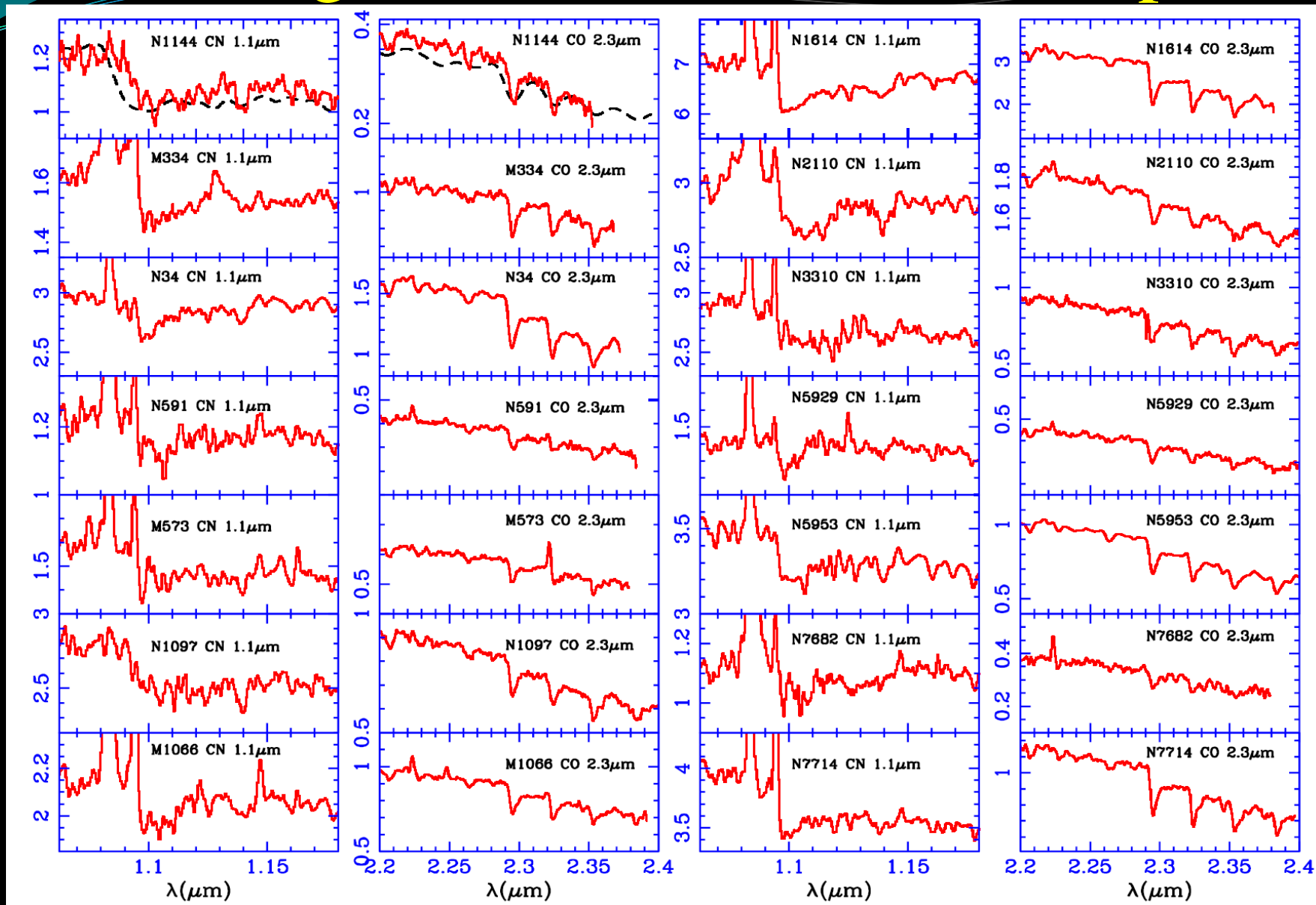
Mrk 334  
 $A_v = 1.36$  mag



# Results – general view

- ✓ A substantial fraction of an Intermediate age ( $\sim 1$  Gyr) stellar population is detected ( $\sim 40\%$ );
- ✓ This age is consistent with the CN band (Riffel et al. 2007, Maraston, 2005);

# Results – general view – TP –AGB phase



# Results – general view

- ✓ A substantial fraction of an Intermediate age ( $\sim 1$  Gyr) stellar population is detected ( $\sim 40\%$ );
- ✓ This age is consistent with the CN band (Riffel et al. 2007, Maraston, 2005);
- ✓ Significant differences are observed between Sy 1 and Sy2 galaxies in the following components:

	Seyfert 1	Seyfert 2
Hot Dust	90%	25%
Featureless Continuum	100%	50%

- ✓ This analysis allows us to determine the hot dust mass for 13 objects;

See posters: IAUS267 – p22 and p 76

# Summary

- ✓ The simultaneous fitting of SP, FC and hot dust components allows a proper analysis of each one of them;
- ✓ There are significant differences between the NIR stellar populations of Sy 1 and Sy 2 galaxies;
- ✓ The CN band is confirmed as an unambiguous evidence of intermediate age stellar populations;
- ✓ Hot dust is necessary to explain the excess observed in the K-band spectra of almost all Sy 1 sources and in ~25% of the Sy2;