Characterizing embedded YSOs with Herschel spectra

Michelle Rascati

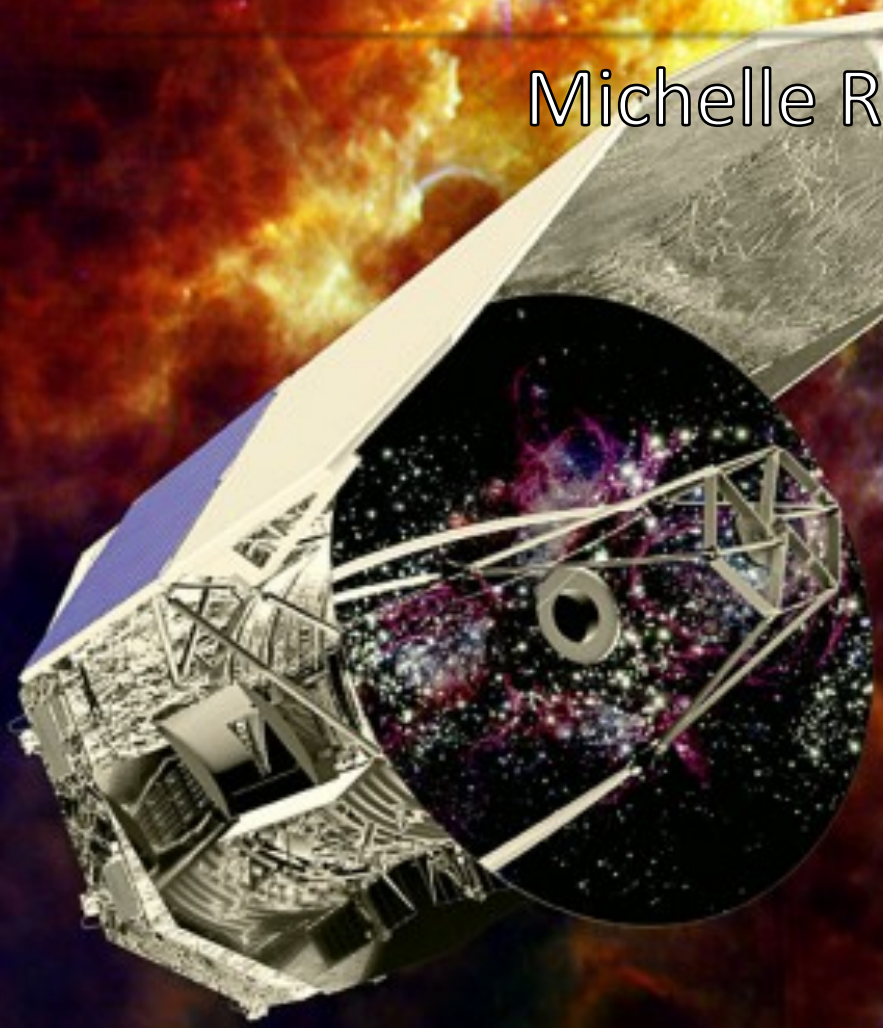
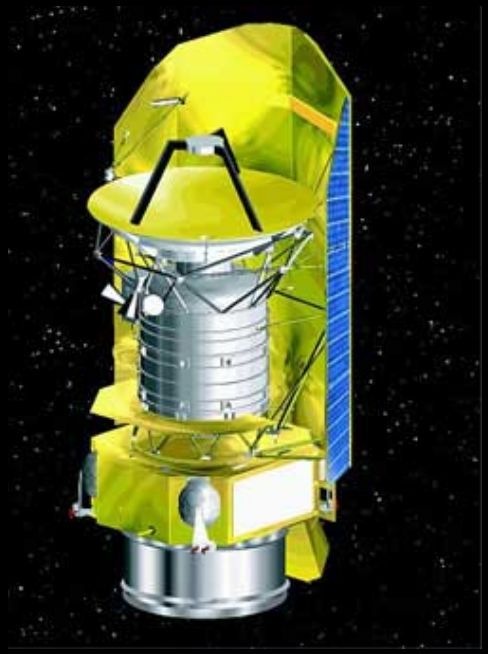


Image: ESA – C. Carreau

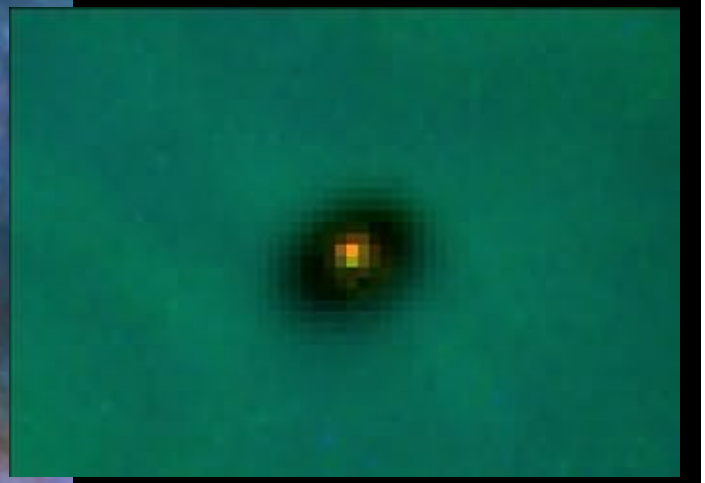
Project

An Open Time Key Project on Herschel Space Observatory

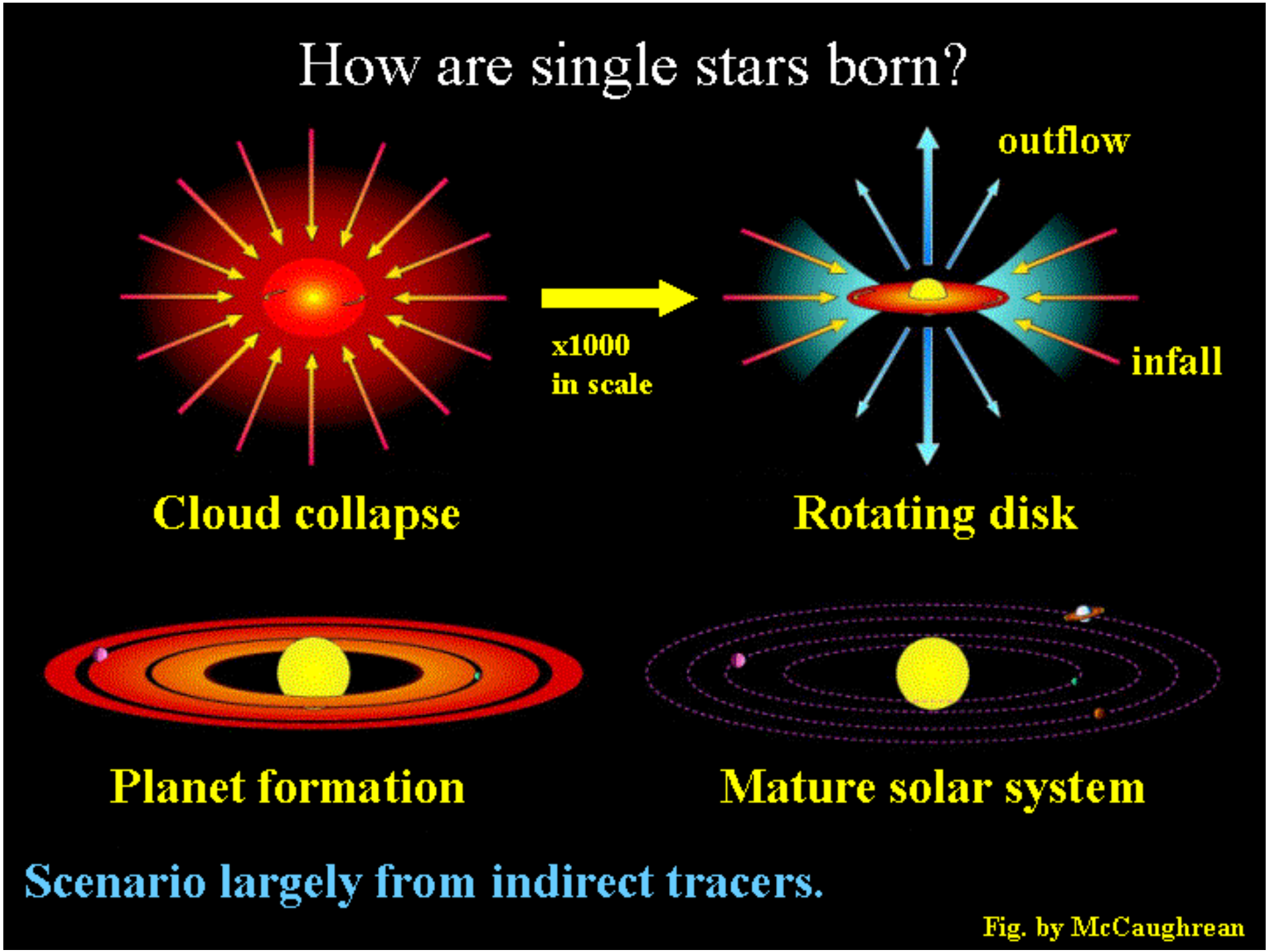


Drs. Joel Green and Neal Evans

Young Stellar Objects

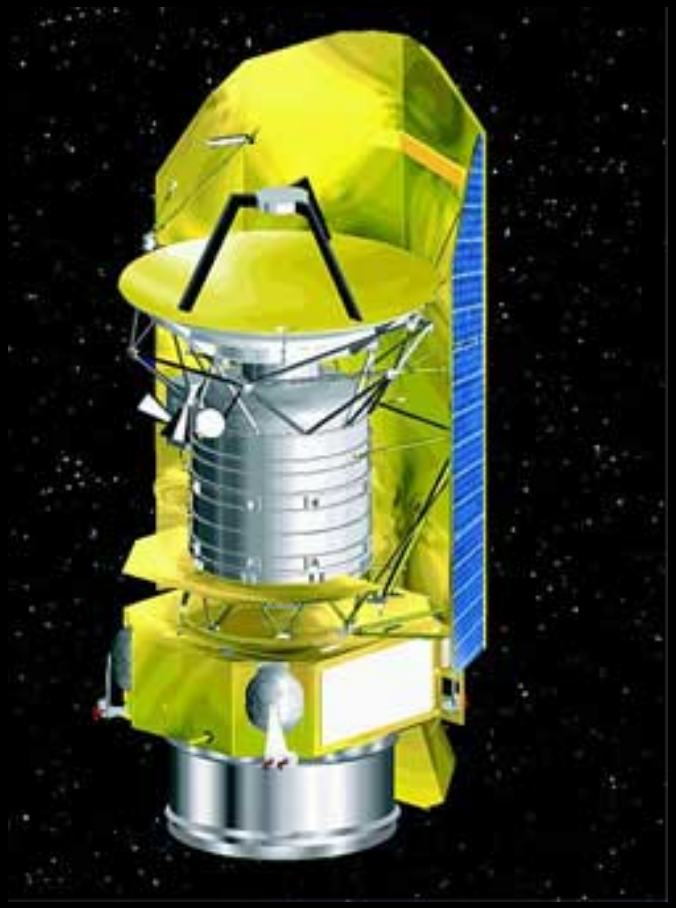


Photos: NASA - Hubble

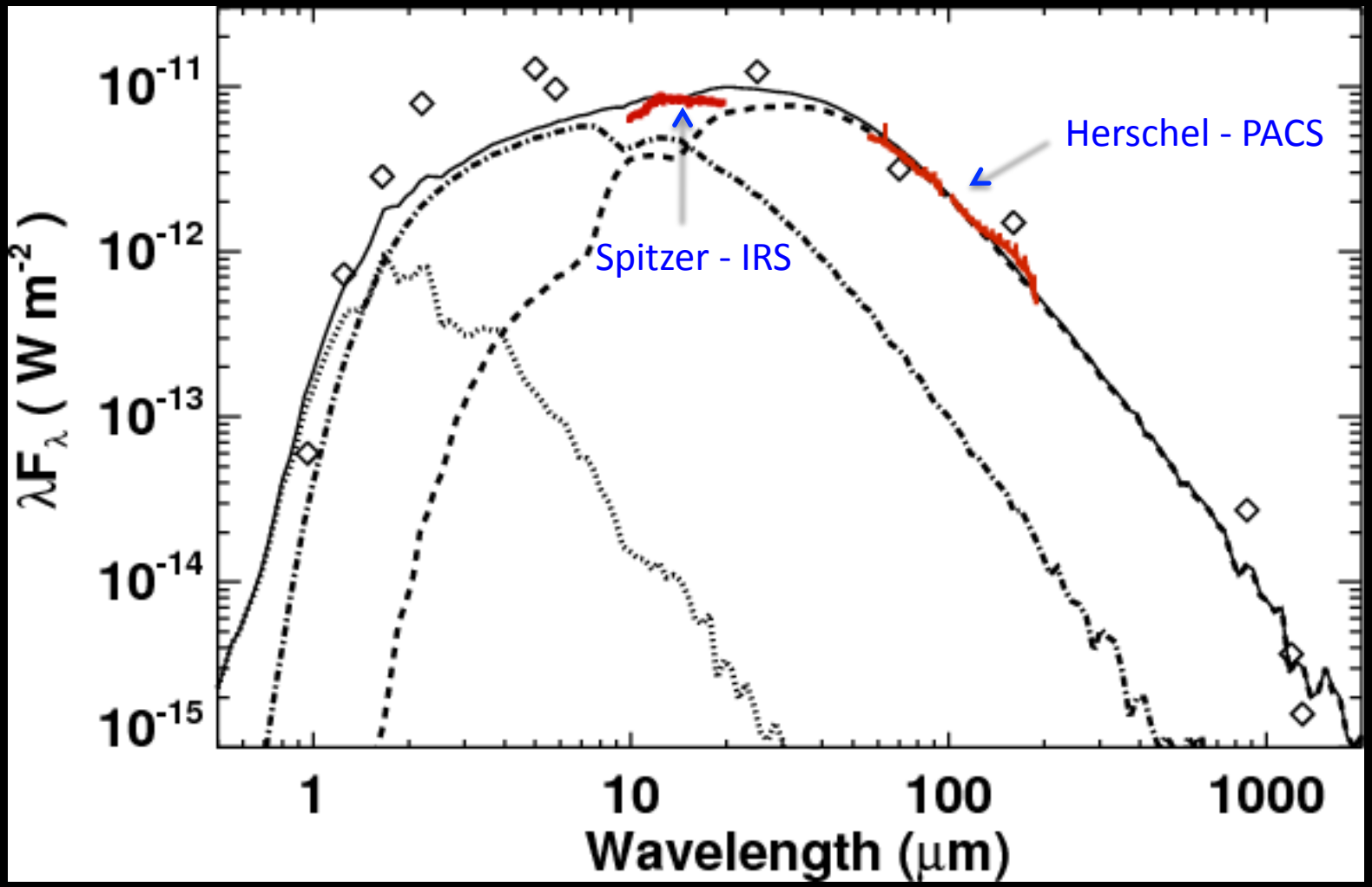

How are single stars born?
outflow
x1000
in scale
infall
Cloud collapse
Rotating disk
Planet formation
Mature solar system
Scenario largely from indirect tracers.
Fig. by McCaughrean

Herschel

- Launched May 2009
- FIR and SMM wavelengths
- PACS – spectrometer from 55-210 microns

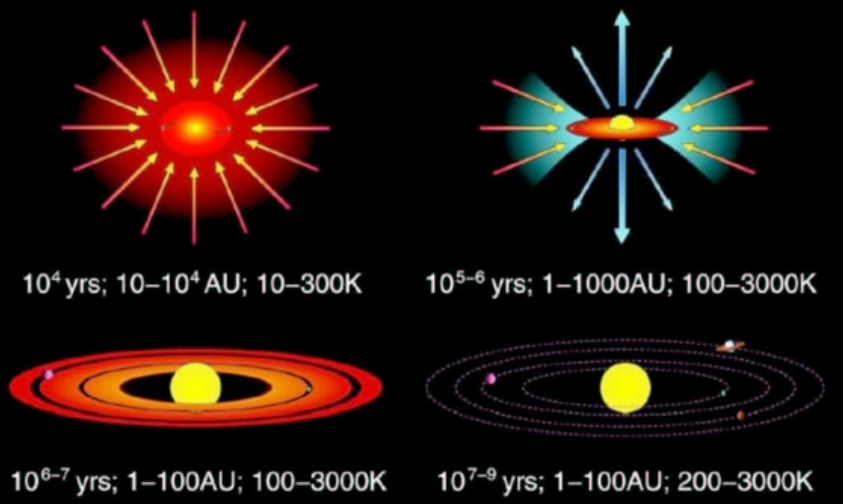


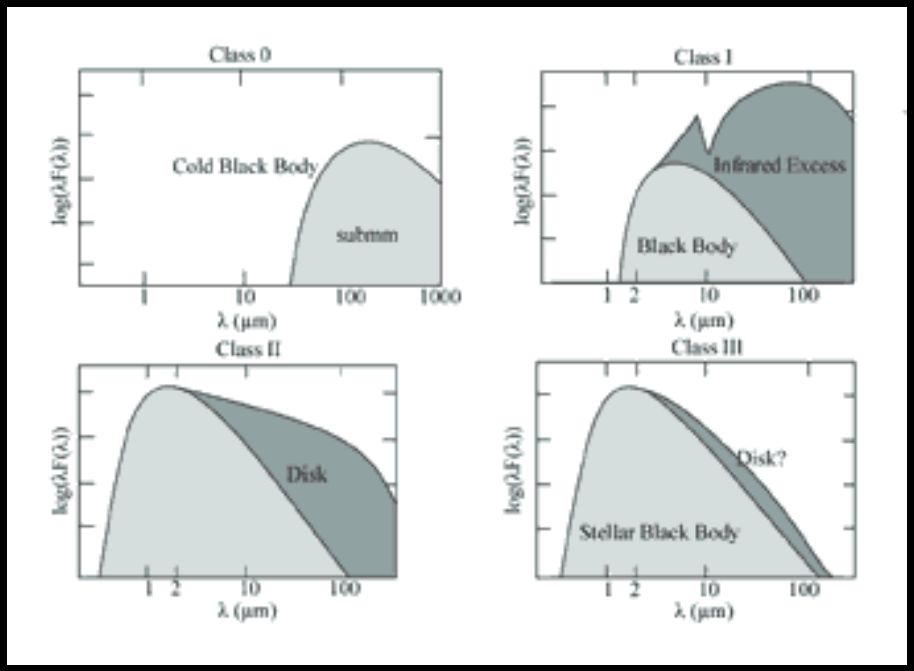
SED – Spectral Energy Distribution



DK Cha – van Kempen et al. 2010

SED – Spectral Energy Distribution

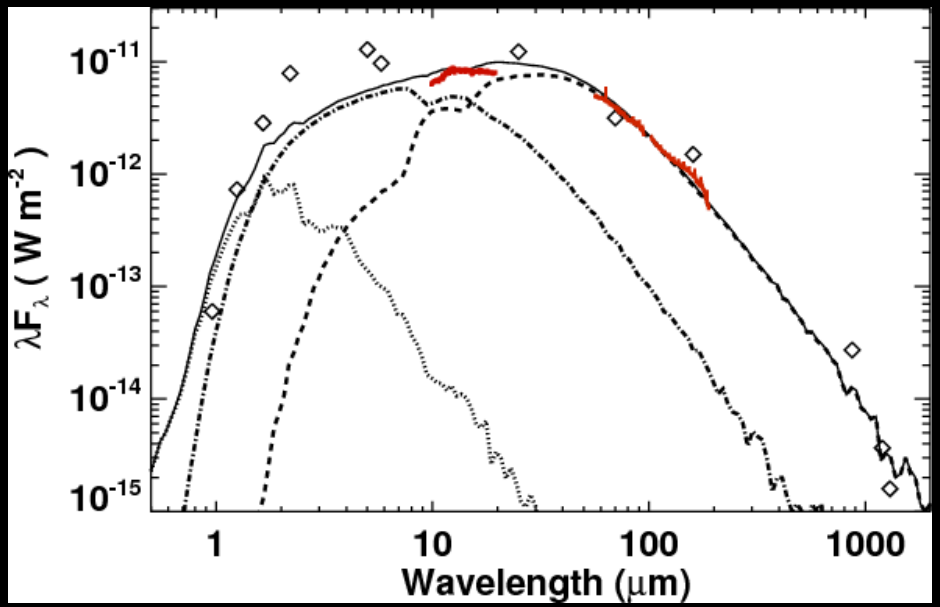




Characterizing the SED

Bolometric Luminosity

- Total Luminosity over all wavelengths
- Integrate Flux in SED
- $L_{bol} = 4 \pi d^2 F$



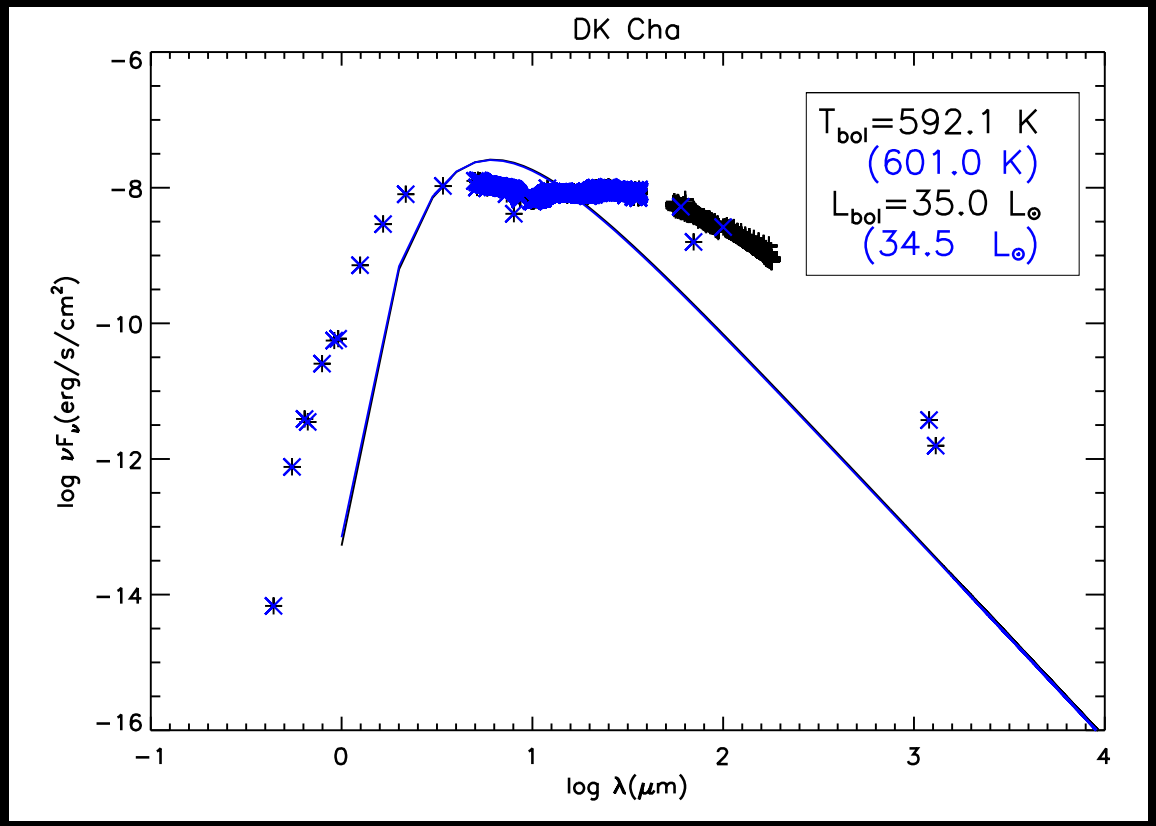
Bolometric Temperature

- Temperature a blackbody would have with mean frequency of SED
- Integrate:

  $< \nu > = \int \nu F_\nu \, d\nu \, / \int F_\nu \, d\nu$
- $T_{bol} = 1.25 \times 10^{-11} < \nu > (K)$

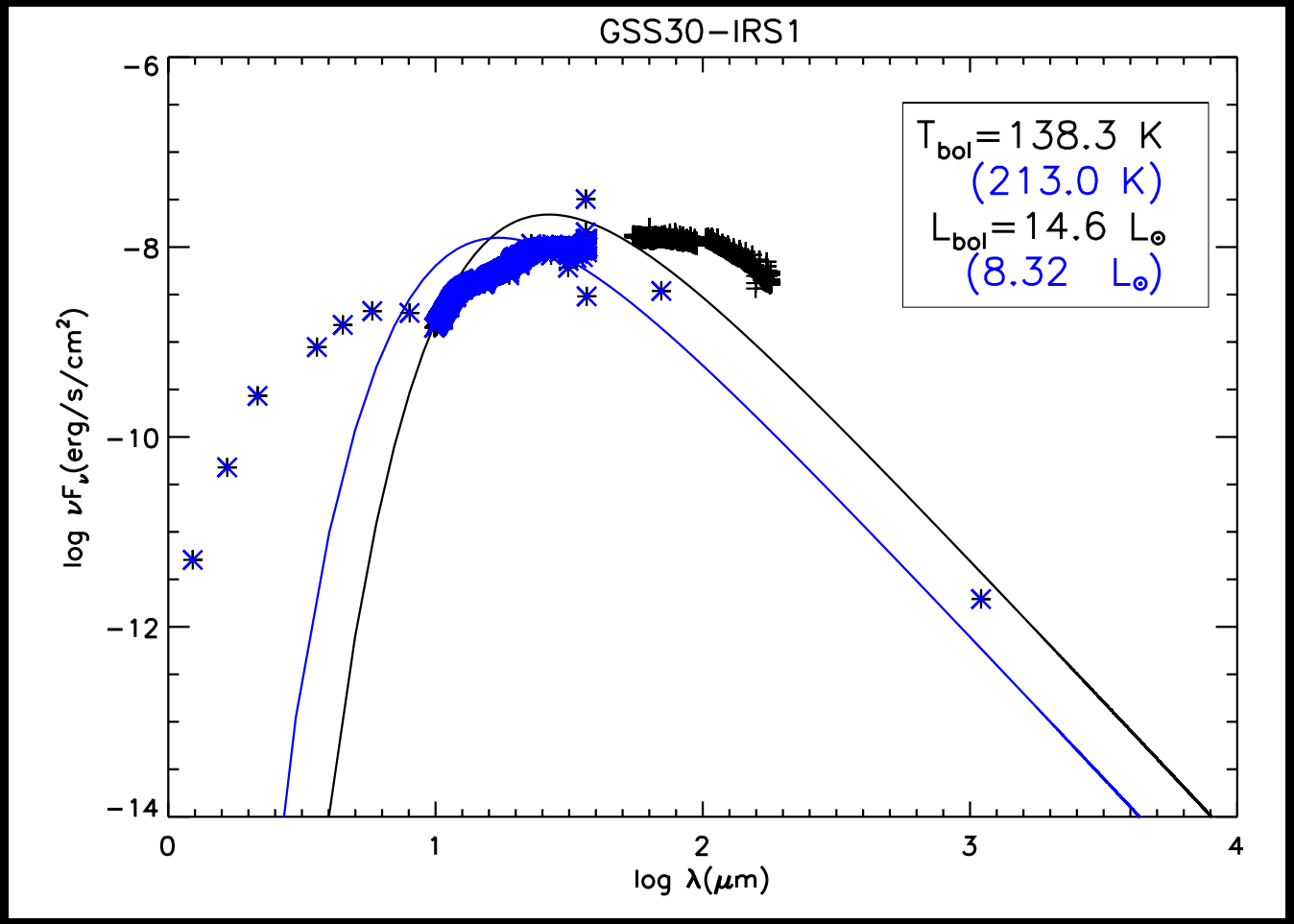
My Results

Comparing L_{bol} and T_{bol} with and without PACS spectra



Found that PACS typically does not alter values significantly

My Results



Not enough SMM ancillary data