Using MagAO and GPI to obtain complete SEDs and empirical bolometric luminosities of young giant exoplanets

SEDs & Lbols of young EGPs

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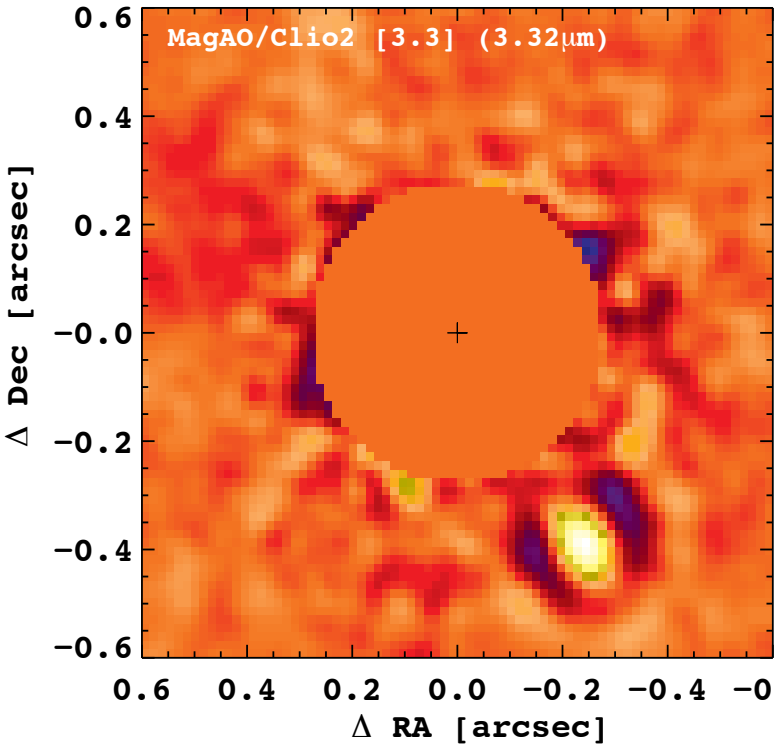
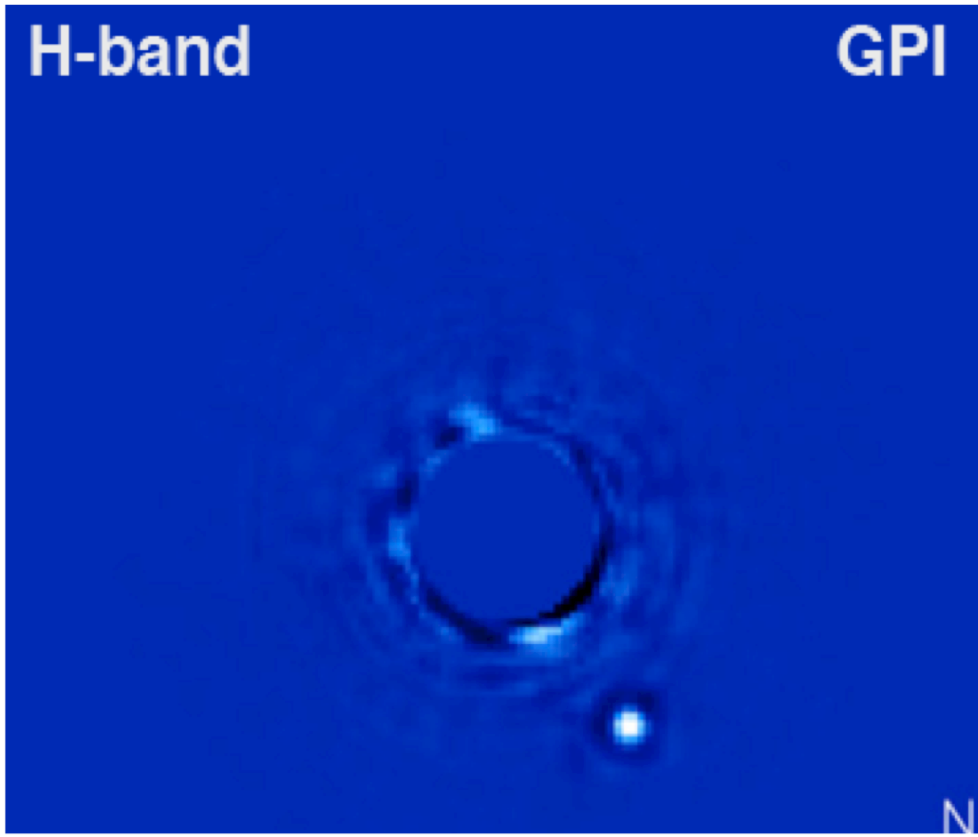
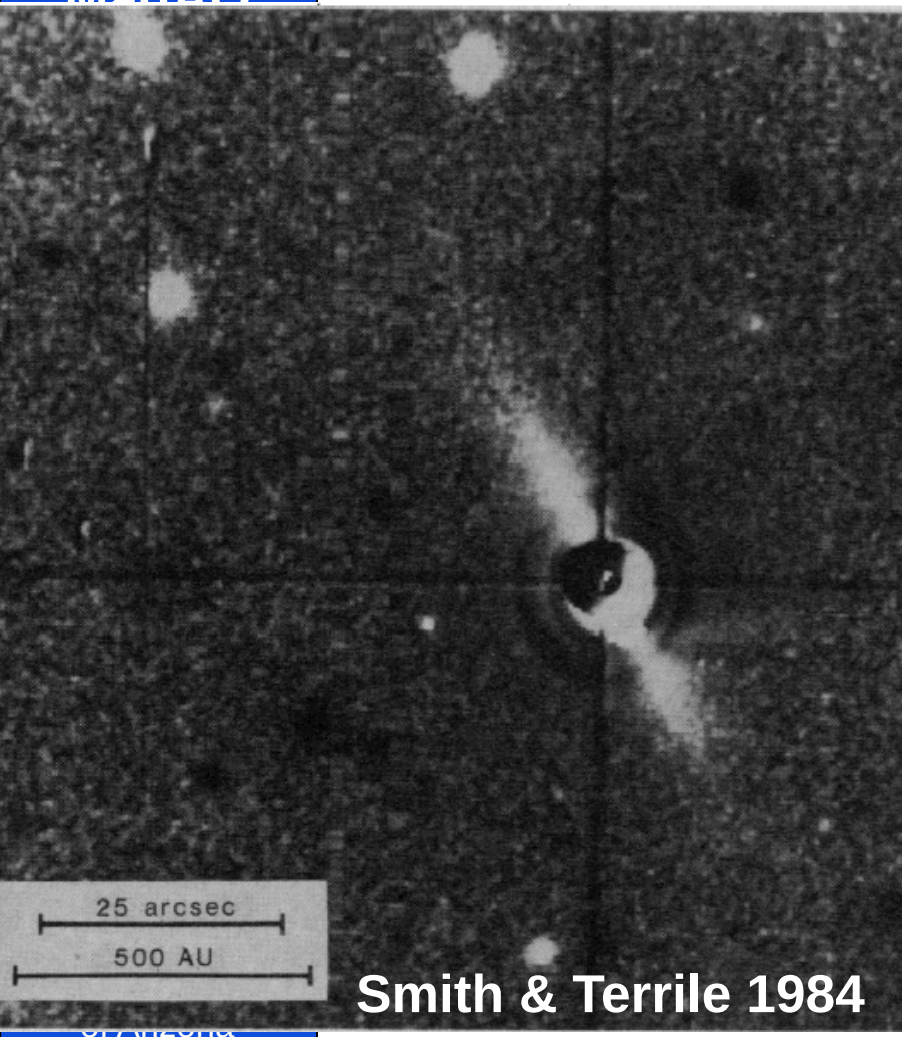
3.3 um MagAO/Clio



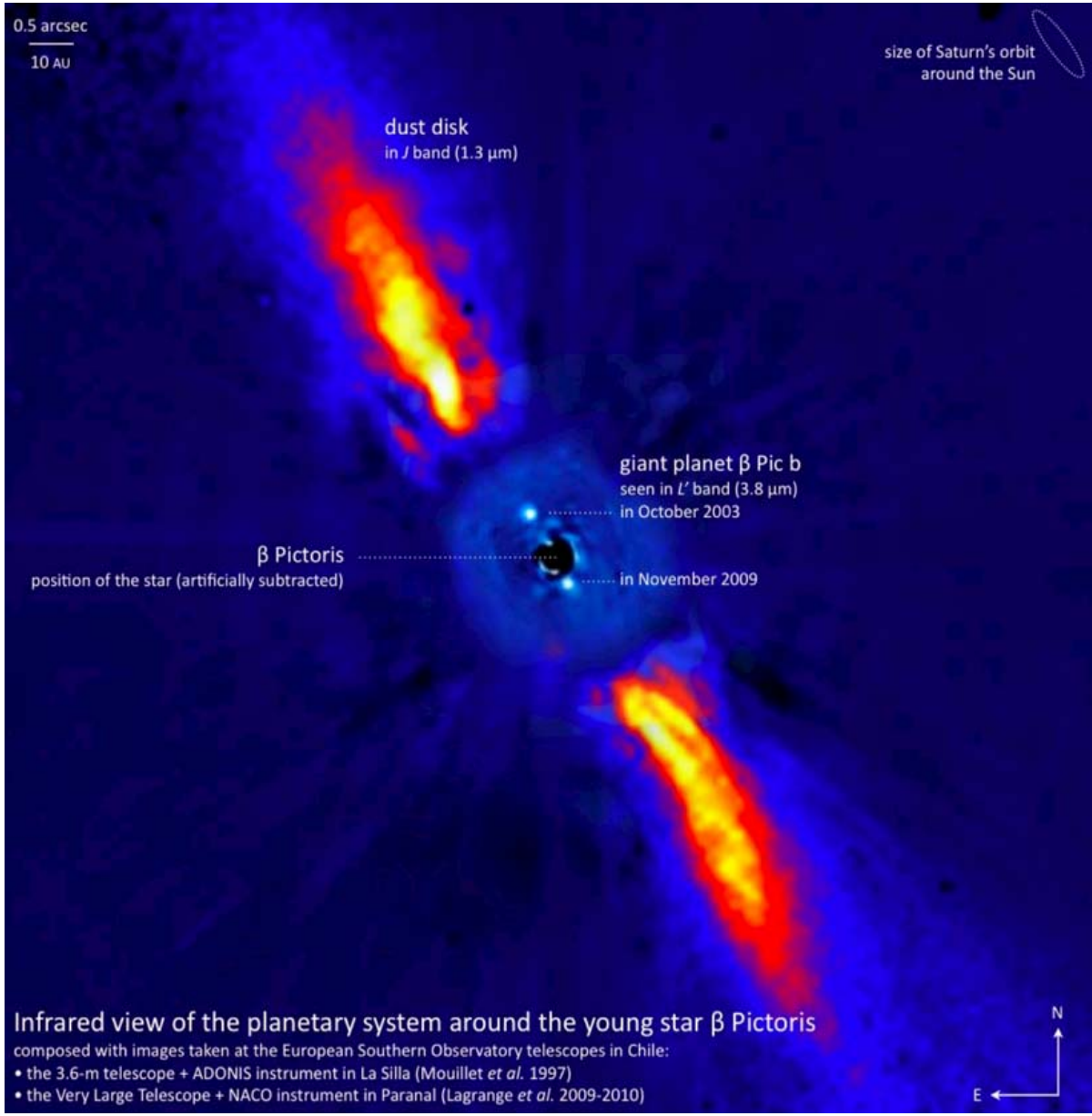


Beta Pictoris – First star known to host bodies analagous to those seen in the Solar System

Using MagAO



Smith & Terrile 1984



Lagrange et al 2009

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Magellan AO

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of Arizona

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Gemini Planet Imager

Using MagAO

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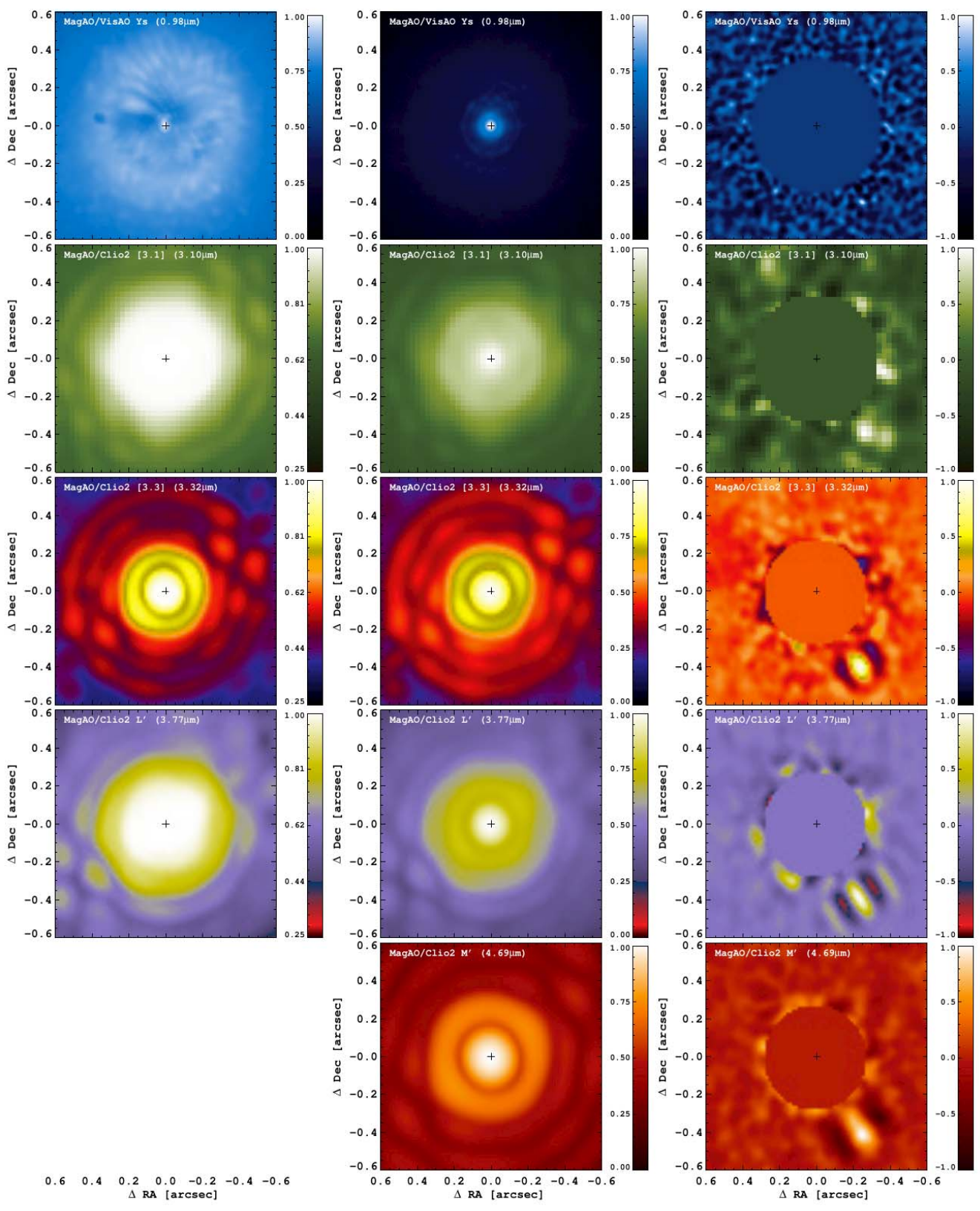
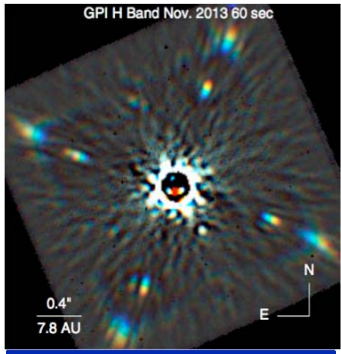
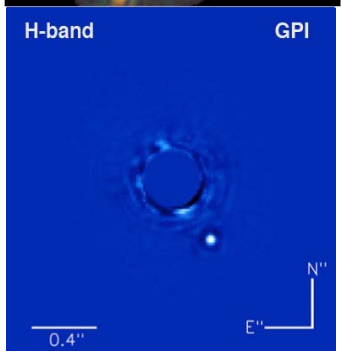


Males et al 2014





Macintosh et al 2014

Morzinski et al 2015

Beta Pic b: L2.5

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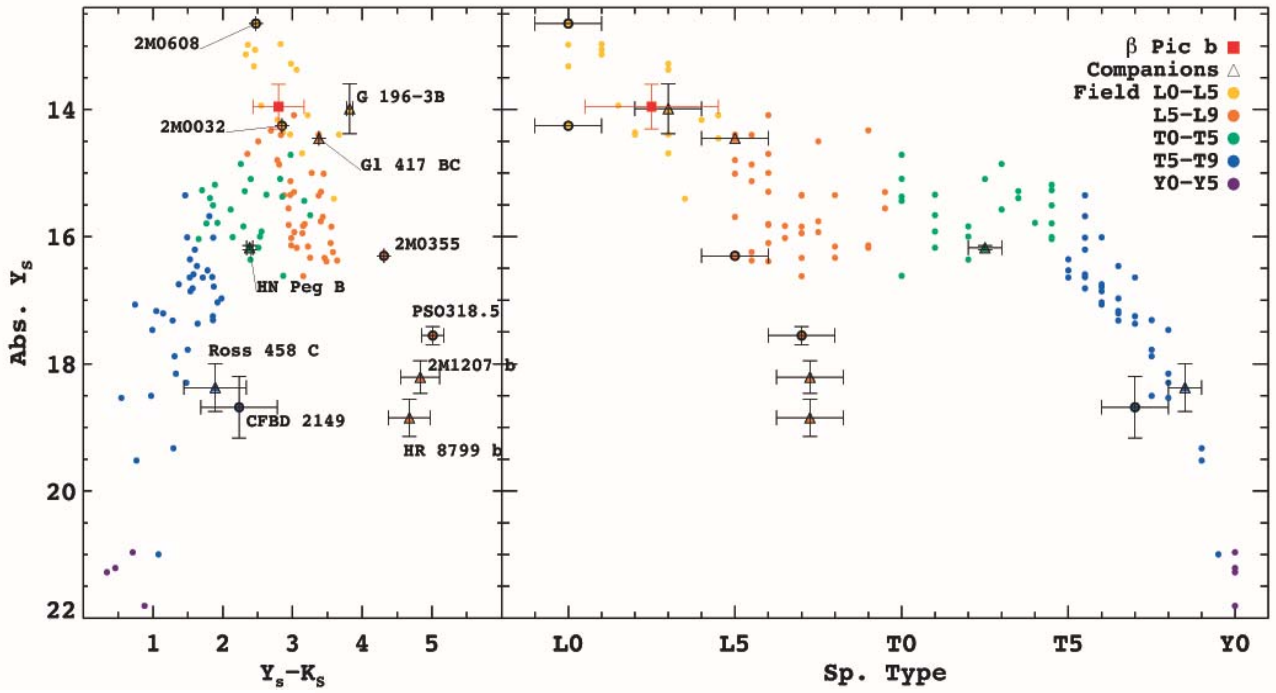
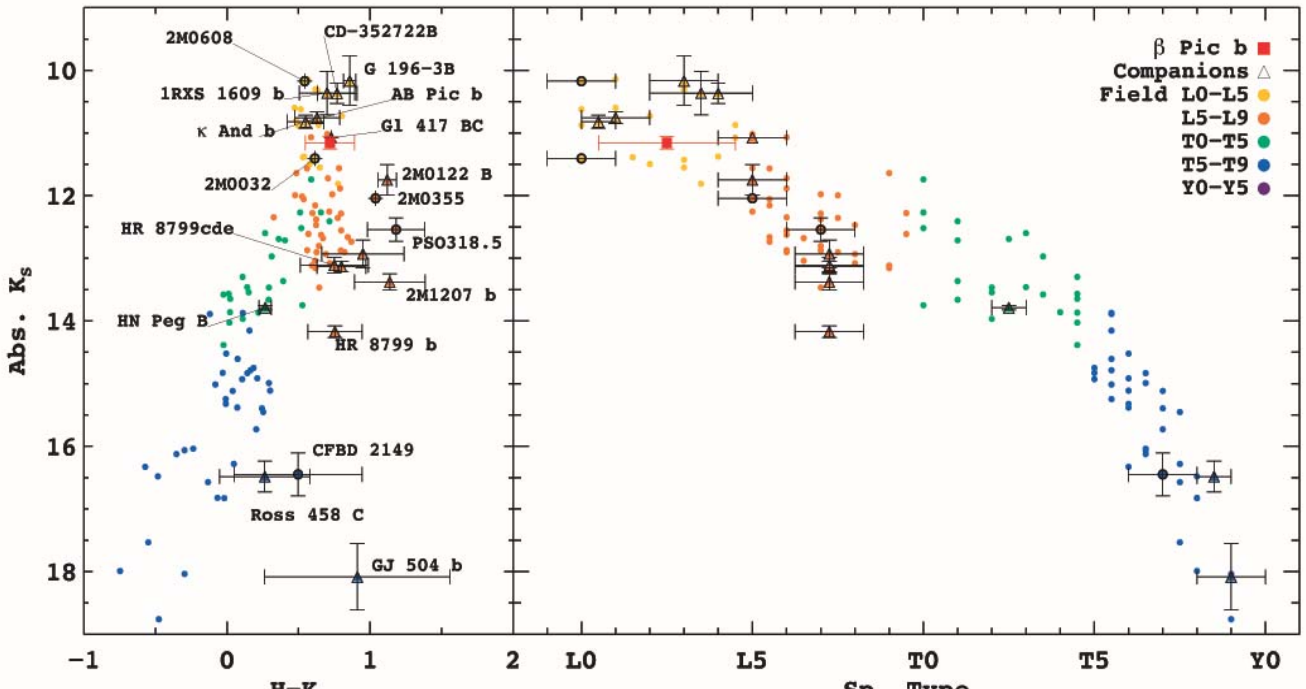


Males et al 2014



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GPI H spectrum: Teff 1600-1700 K; logg 3-5

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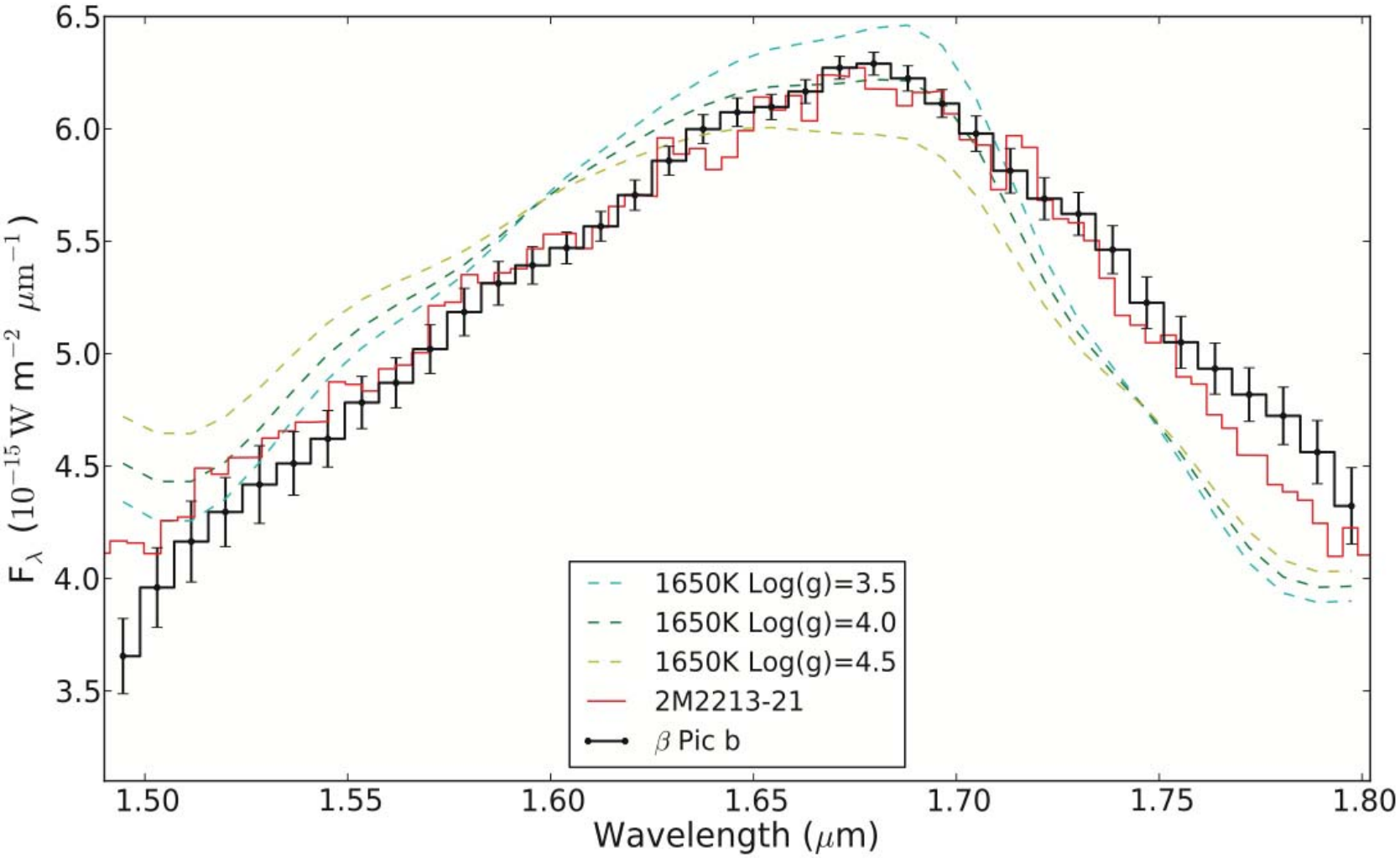

Chilcote et al. 2015

Spectrum of Beta Pic A

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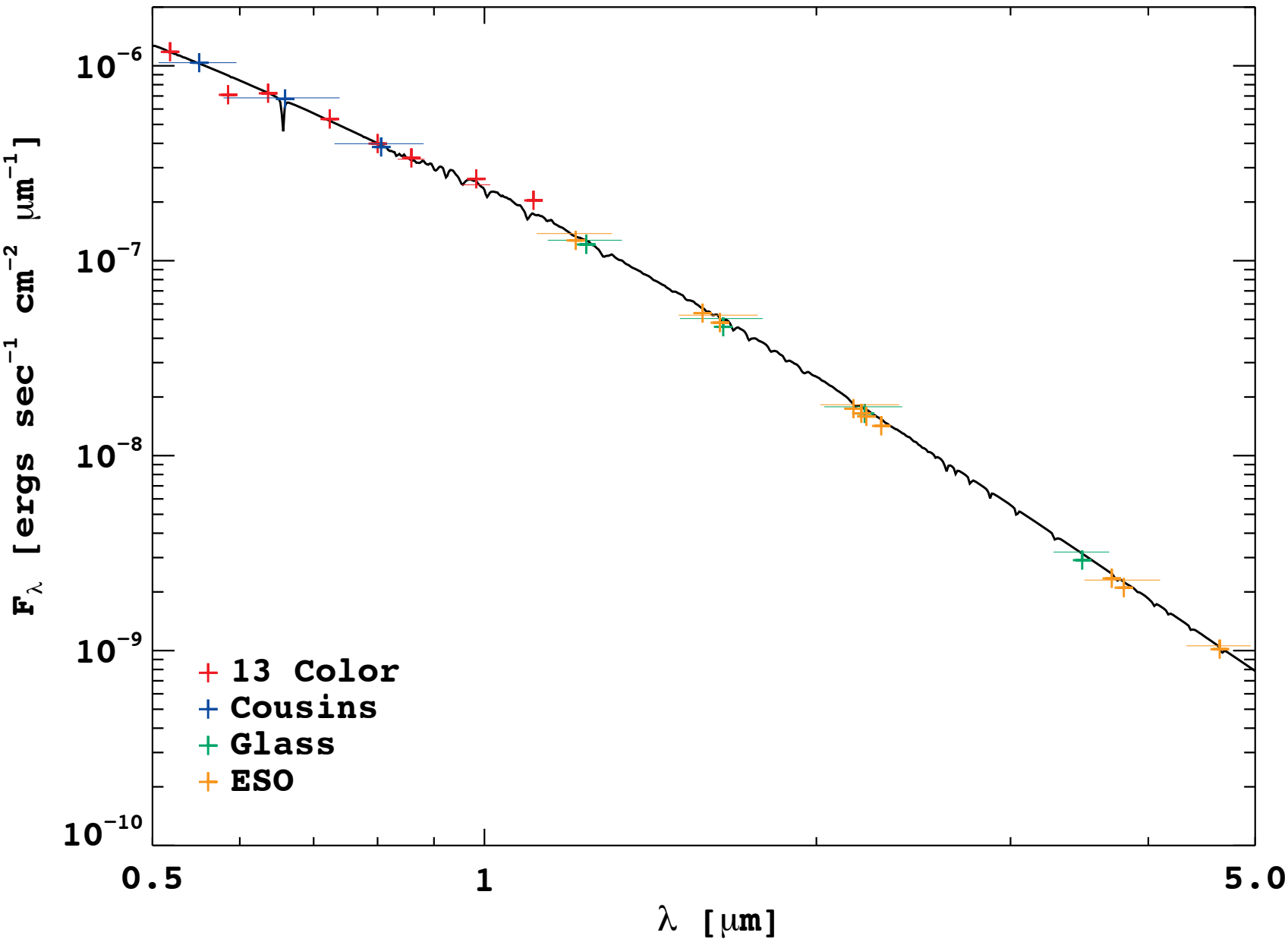

Beta Pic b Spectral Energy Distribution 0.9-5um

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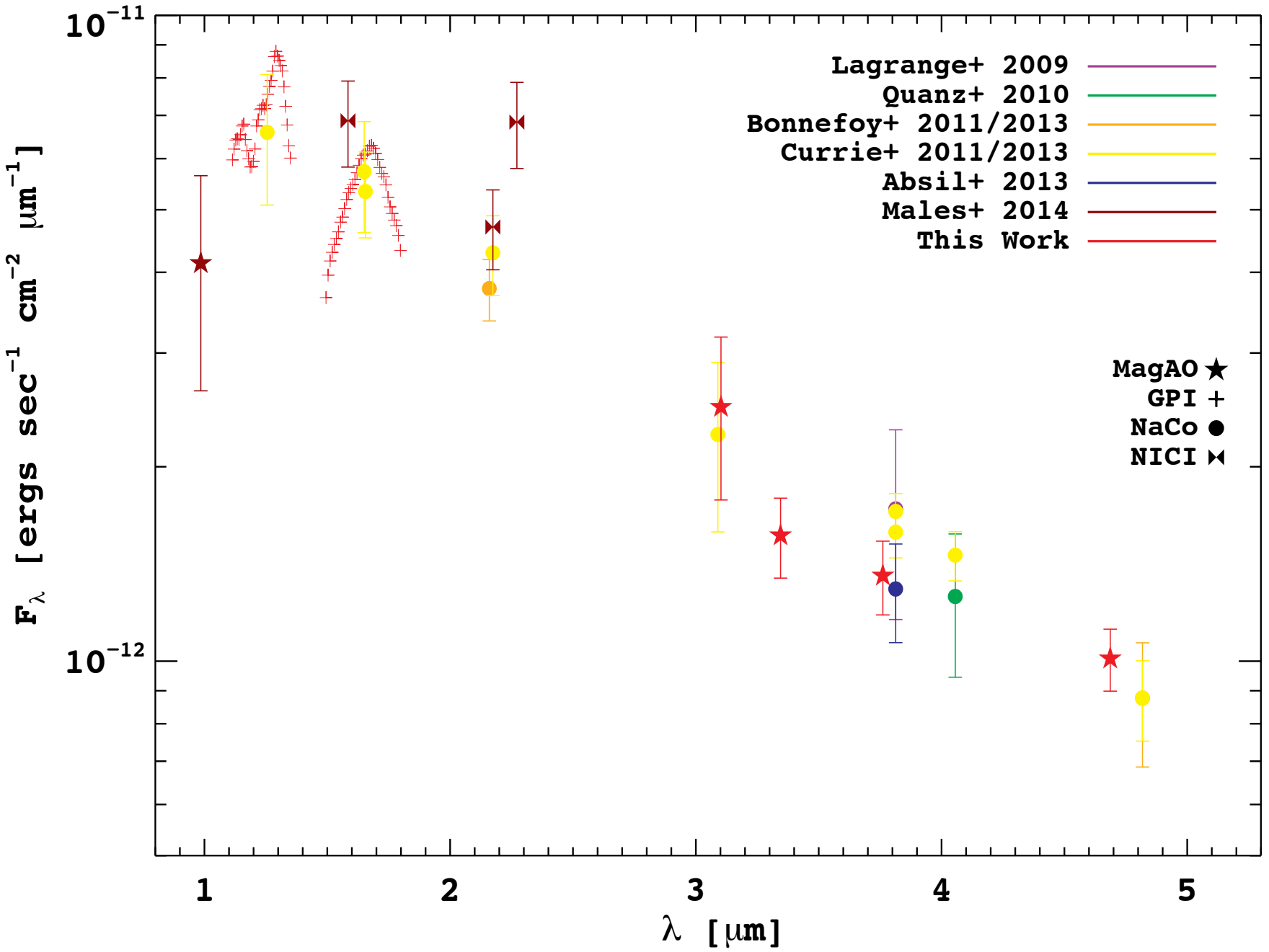

Teff 1500-1700 K; logg 3-5

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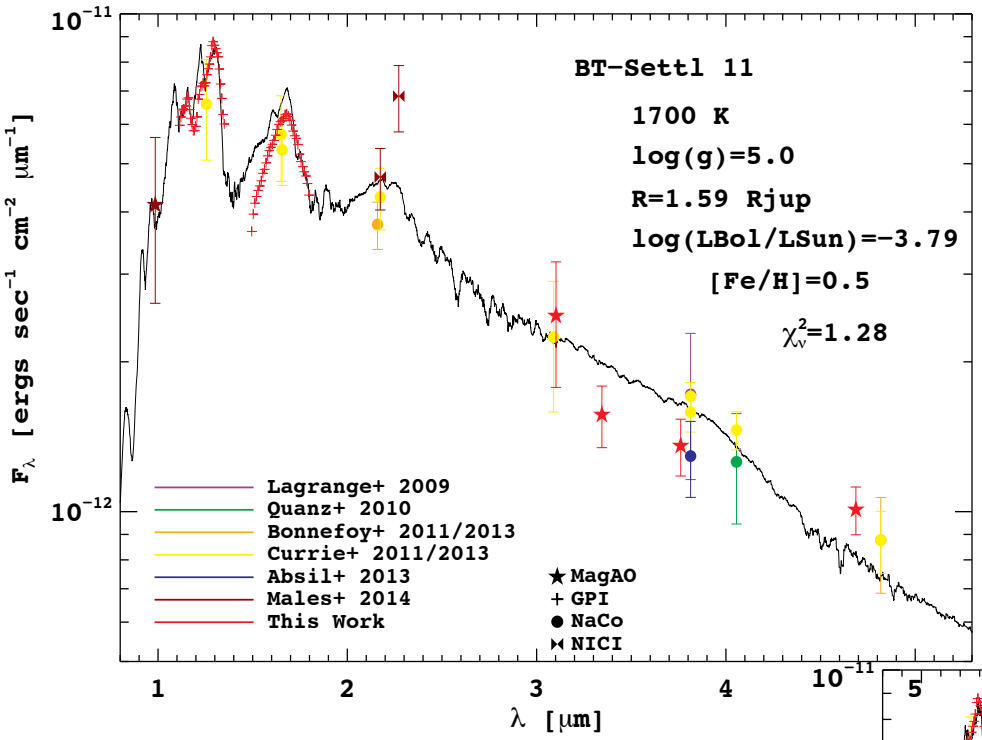

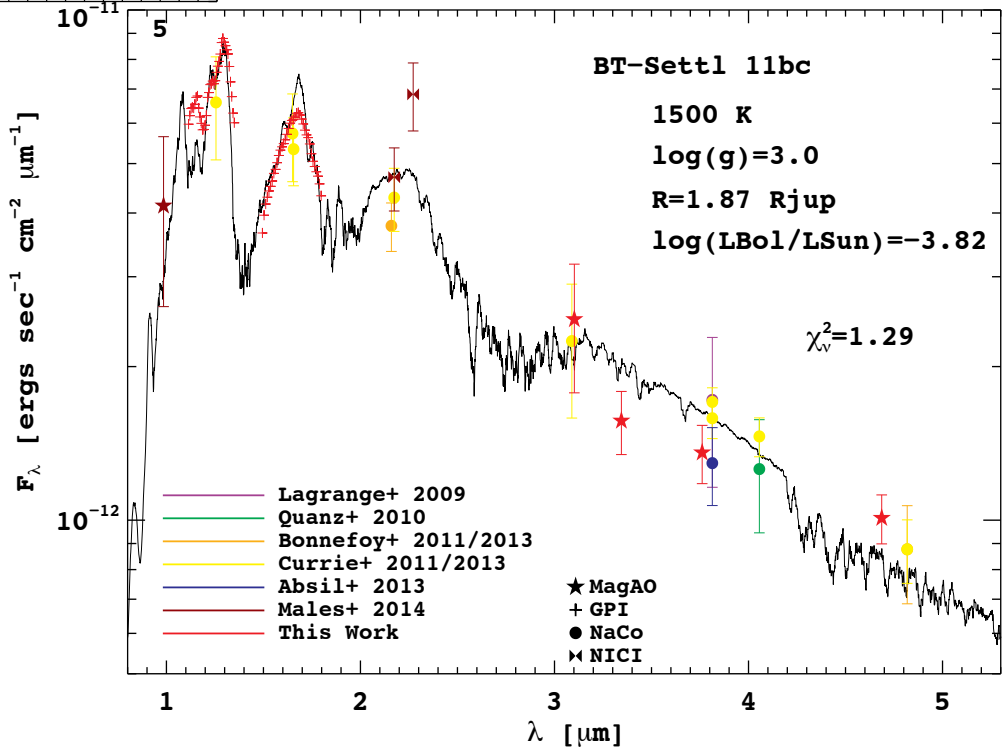

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Blackbody fit: Teff 1800 K

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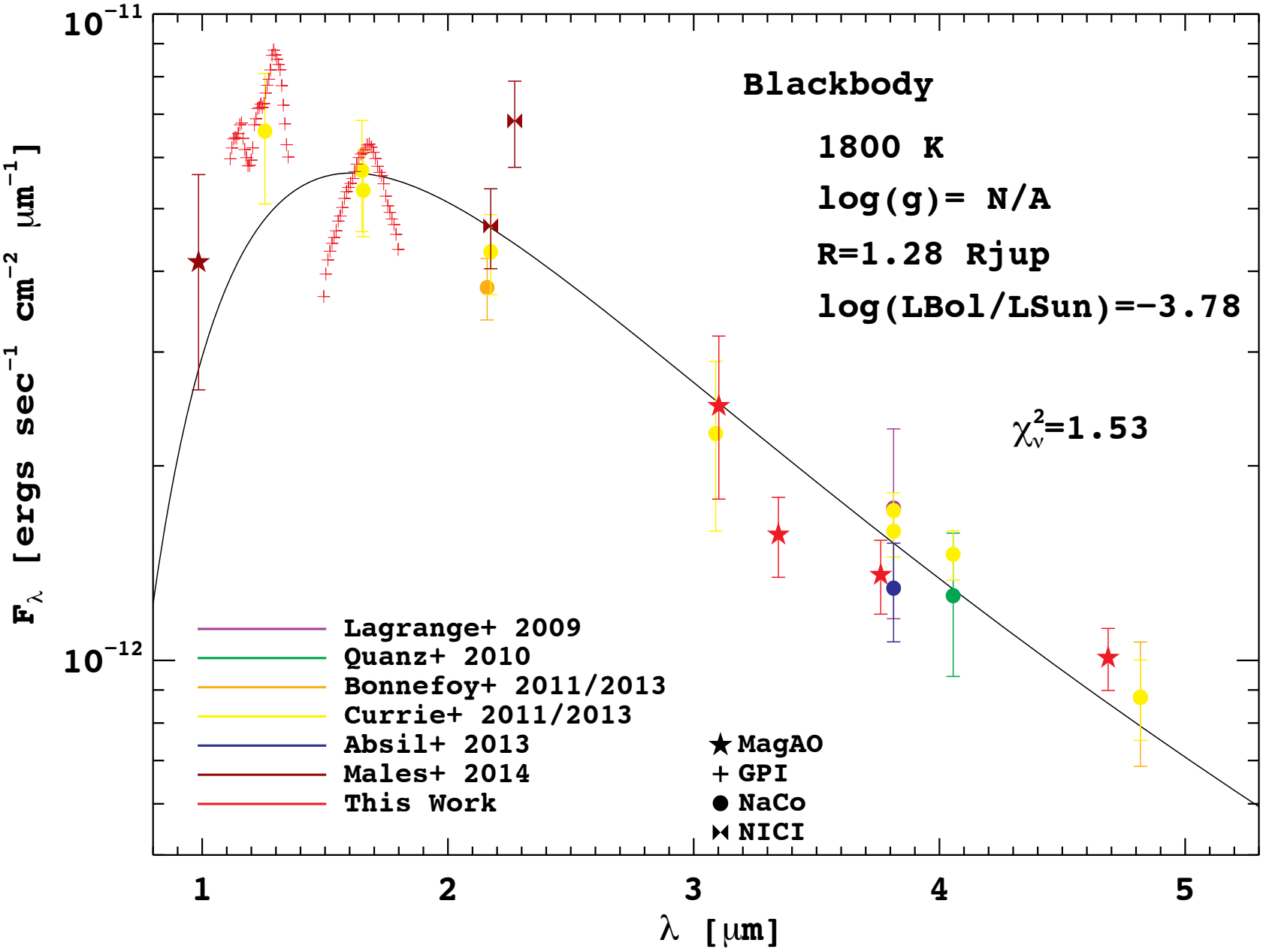

Blackbody families

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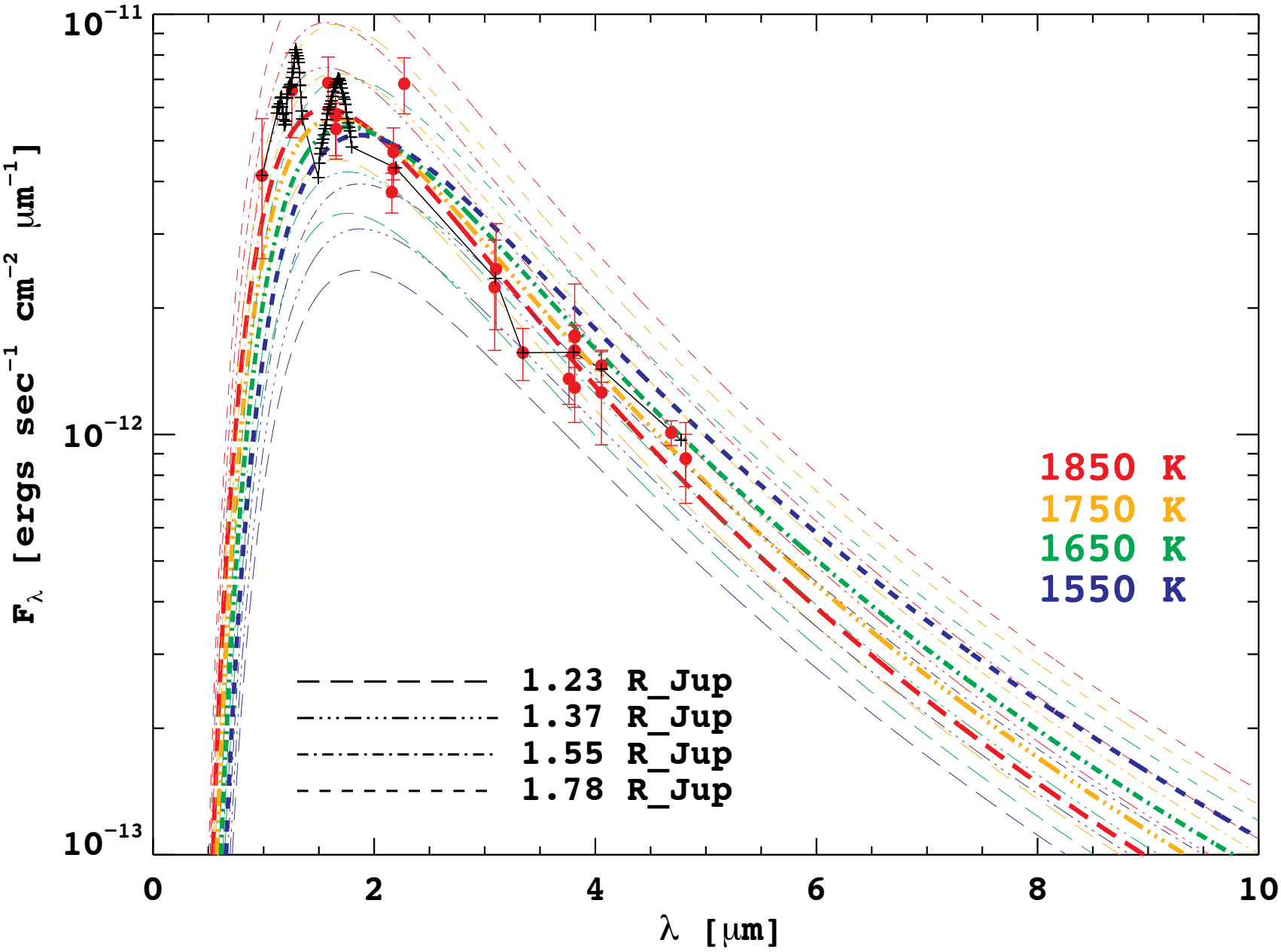

VisAO constrains Teff while Clio constrains R

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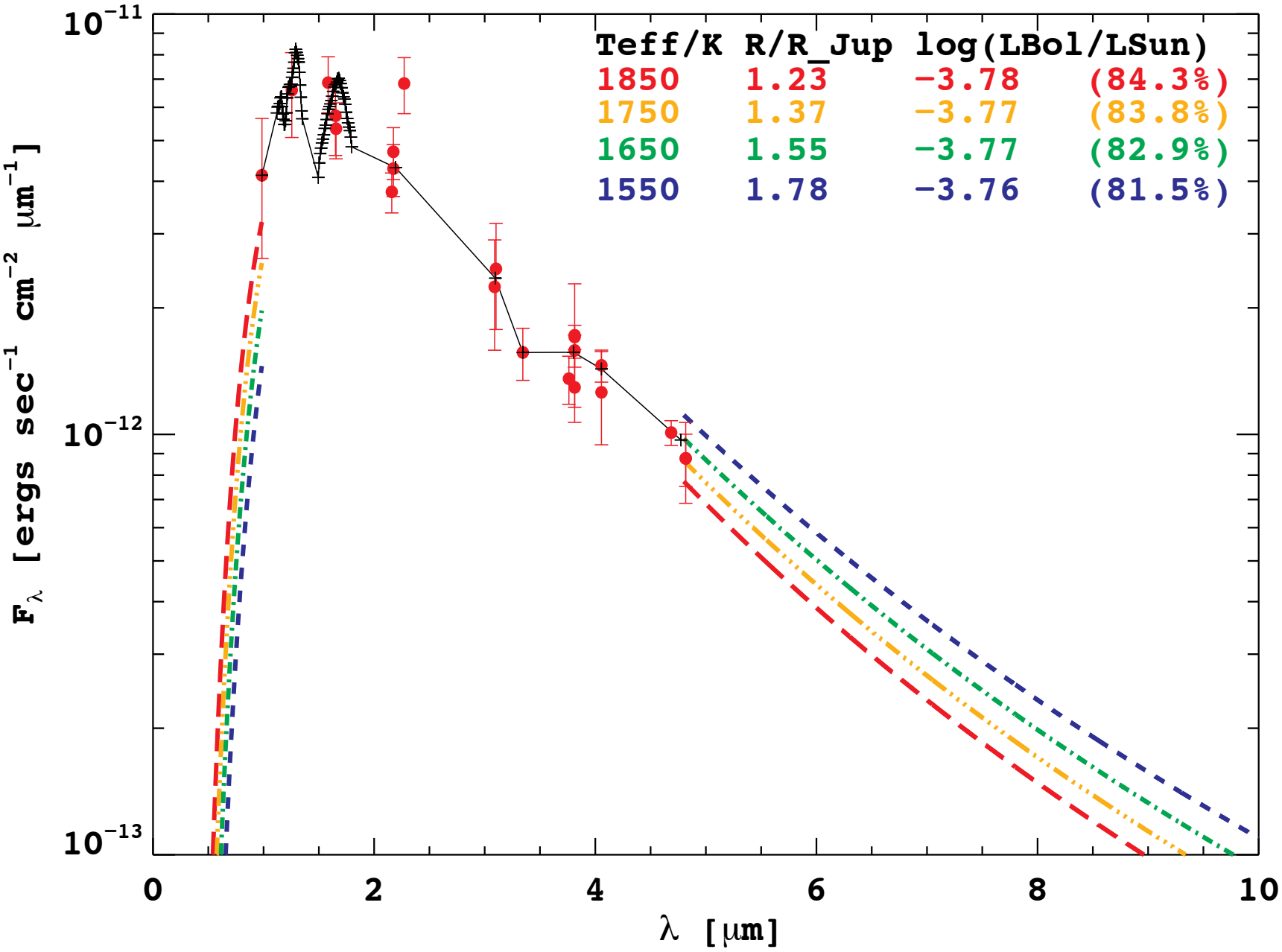

Beta Pic b fits the hot-start evolutionary models

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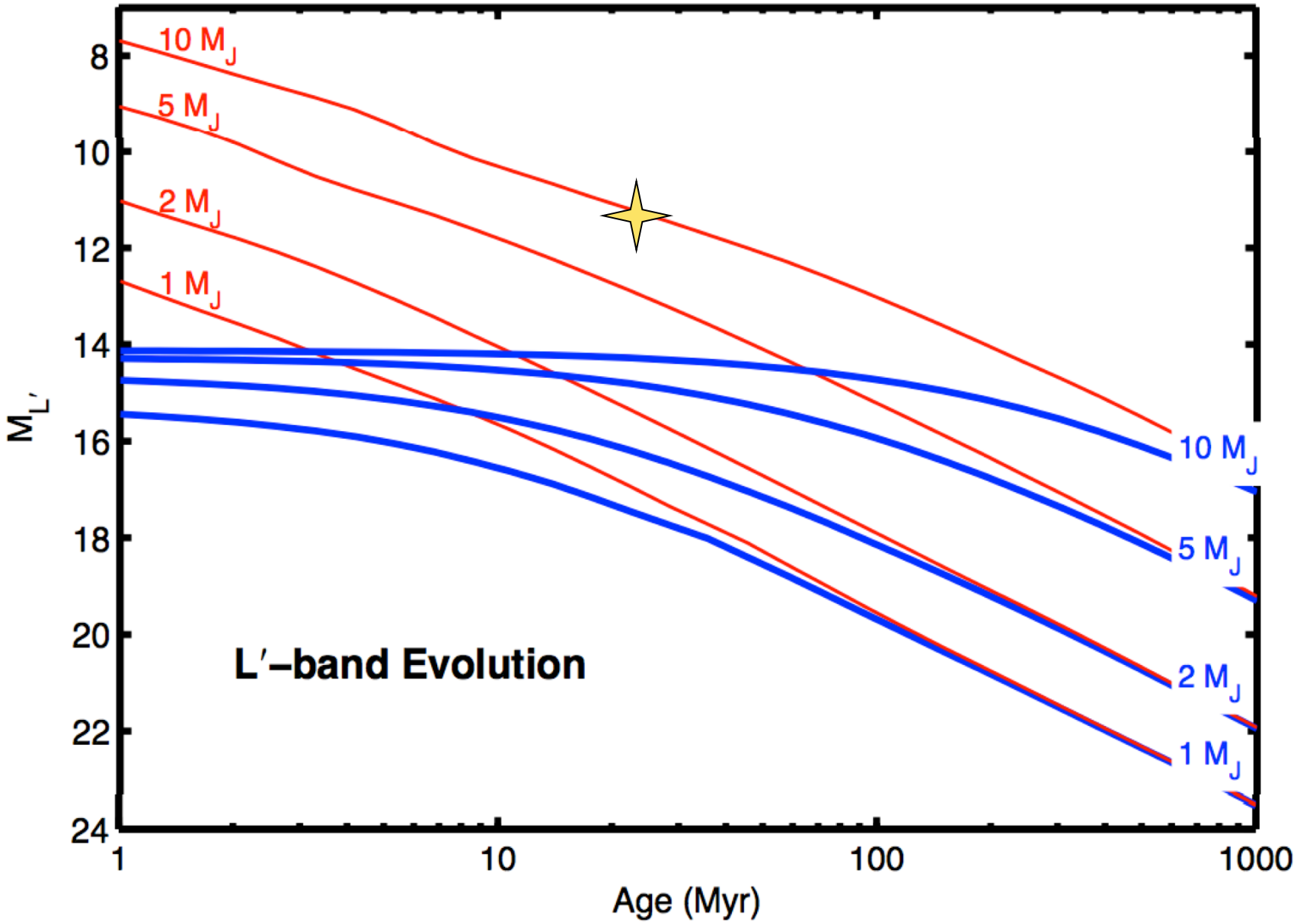

Spiegel & Burrows 2012

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Measuring L_Bol for tens more planets with GPI & MagAO will fill in the formation picture

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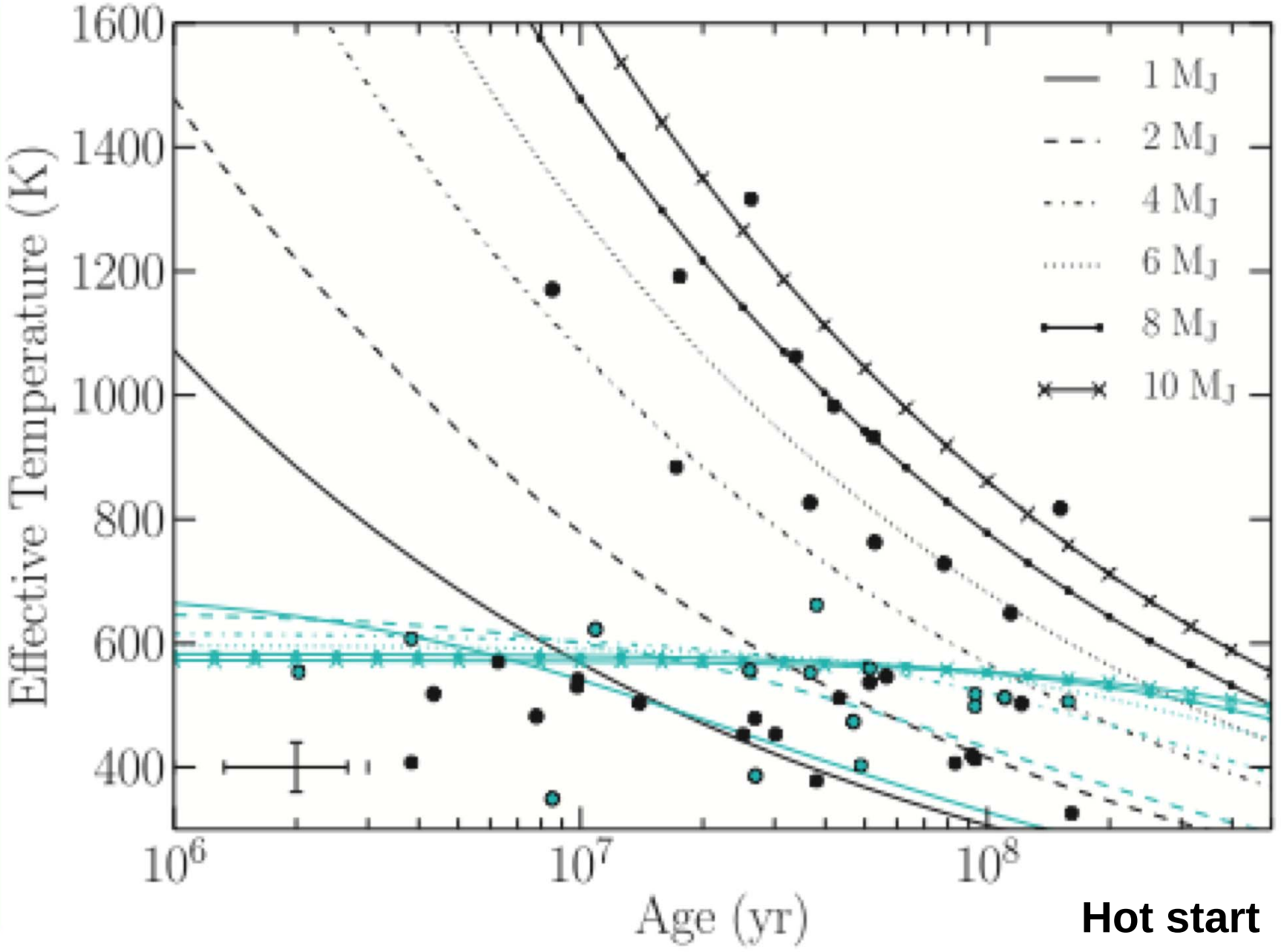

McBride et al 2011

Hot start

Cold start

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Energy budget: to model cooling evolution

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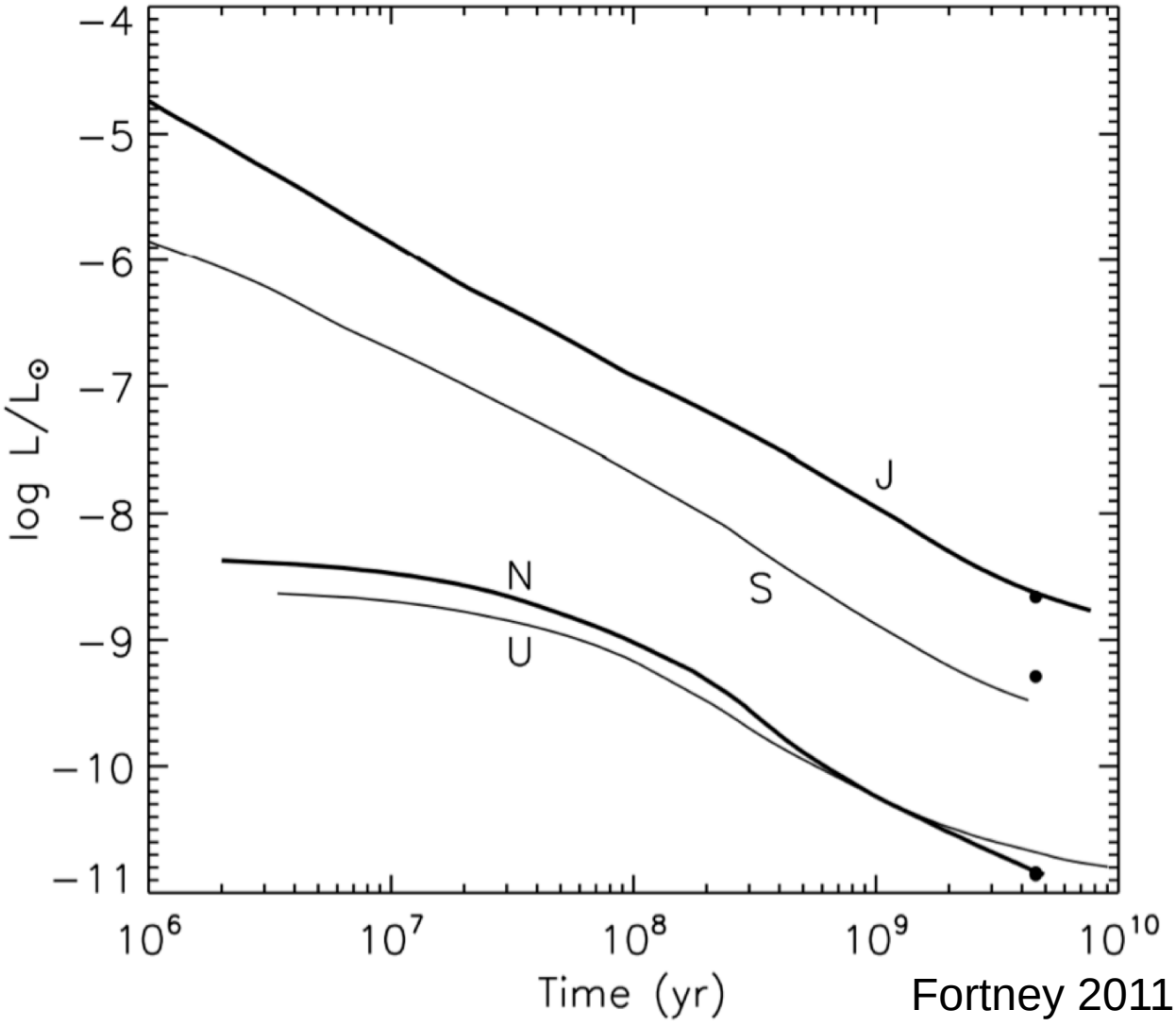
- Insolation/irradiation
- Gravitationally contracting
- Differentiation

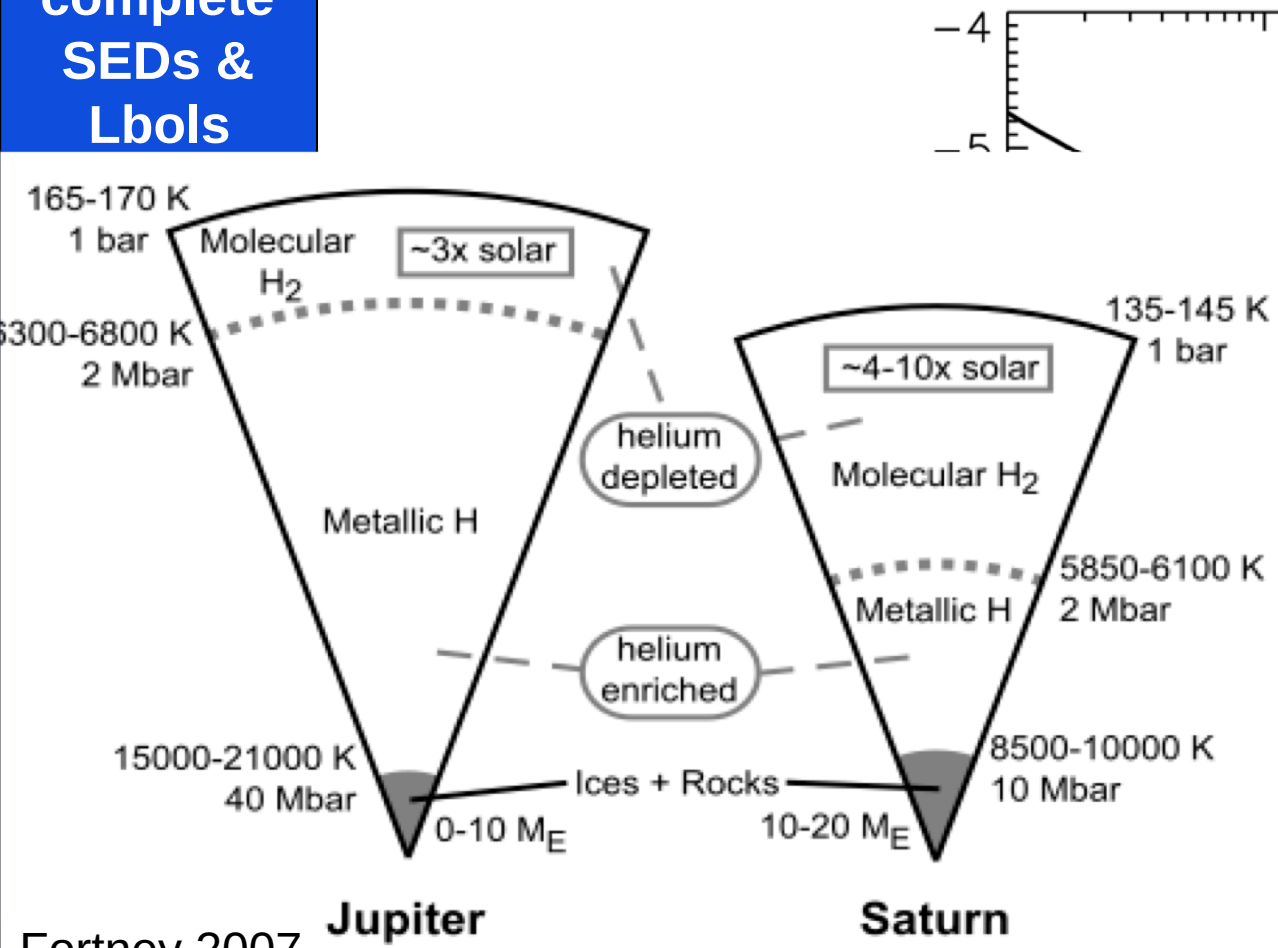


Fortney 2011

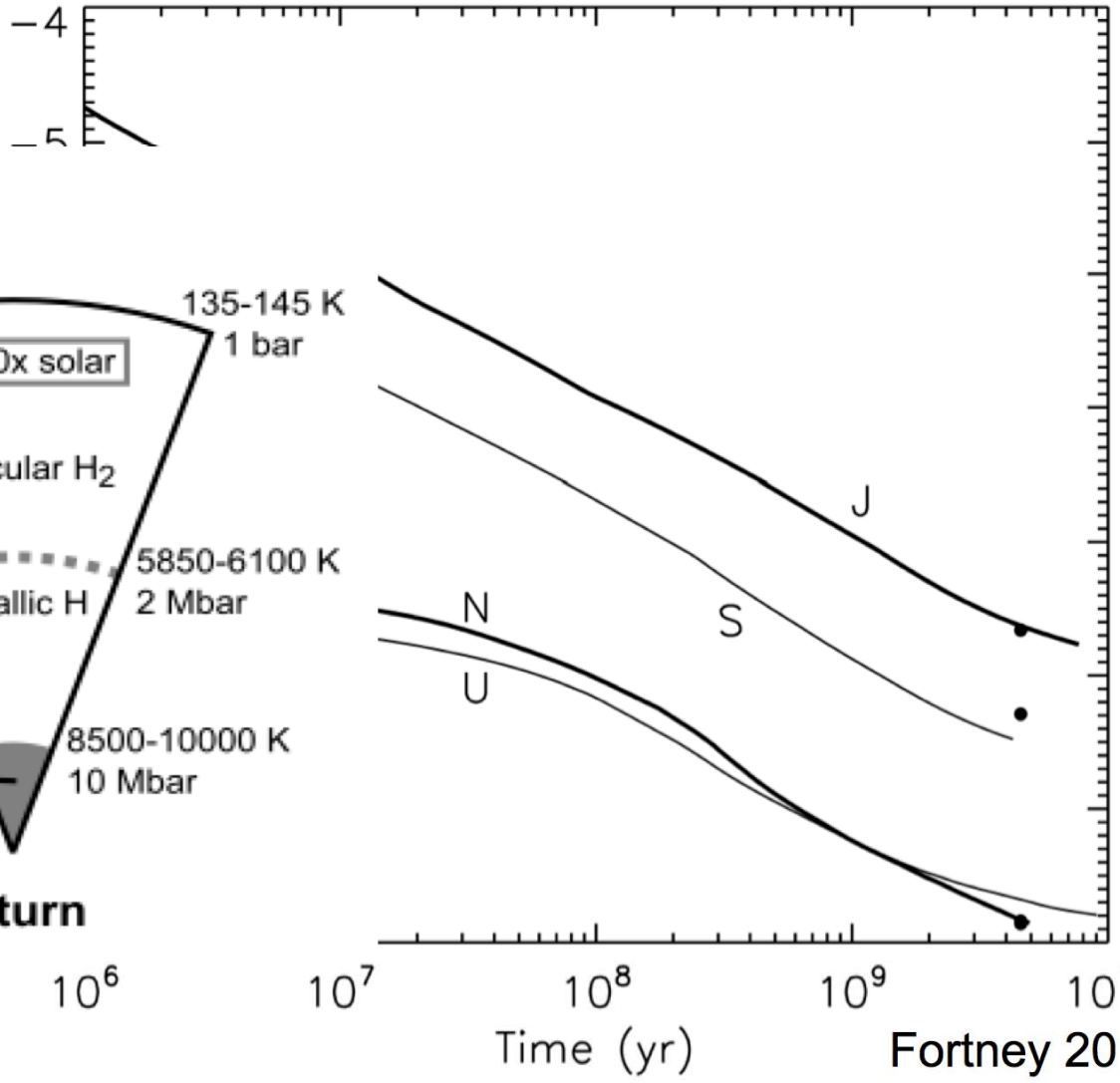
Cooling evolution: Interior models

Using MagAO & GPI to obtain complete SEDs & Lbols

- Insolation/irradiation
- Gravitationally contracting
- Differentiation



Fortney 2007



Fortney 2011

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- Fundamental parameters describing formation & evolution remain to be measured
- Broad spectral coverage of the full O/IR SED with MagAO, plus spectra with GPI, is a powerful tool to measure L_Bol and atmospheric properties
- Fully characterizing tens of Jupiter analogs with MagAO+GPI will give a better picture of the formation mechanisms
- This is still a data-starved field with a lot of exciting developments to come with cutting-edge instruments like MagAO, GPI, & JWST!


Thanks: Michelson Sagan NExScI Dawn et al!
MagAO
YURI BELETSKY


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