Col-OSSOS: The BrightIR and FaintIR Taxonomy For Kuiper Belt Objects

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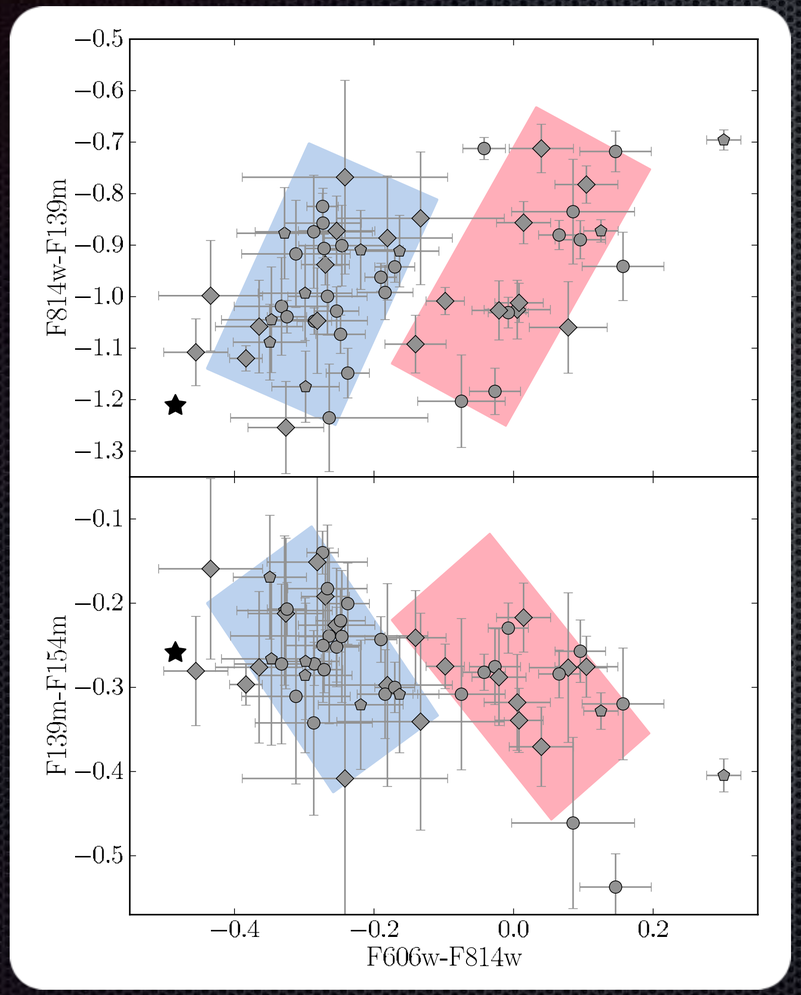
SURFACES Col-OSSOS

NRC·CNRC Canada

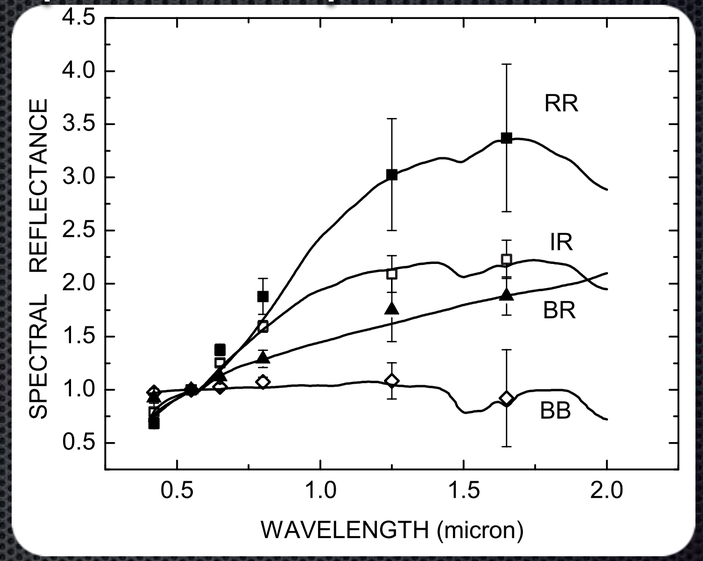
Taxonomies of KBOs

Clustering

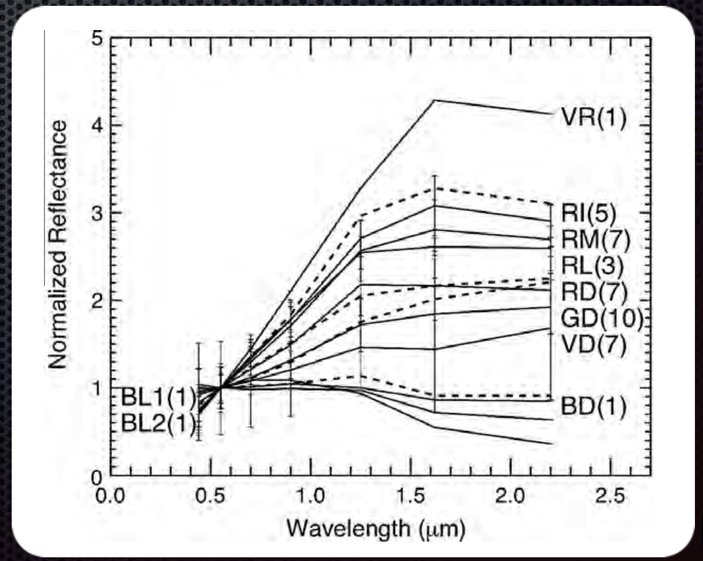


Fraser and Brown, 2012

Principle Component Analysis

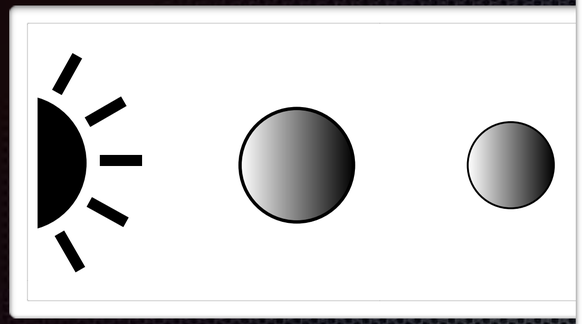


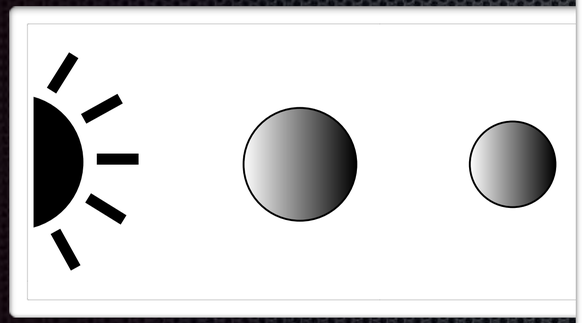
Barucci et al., 2005

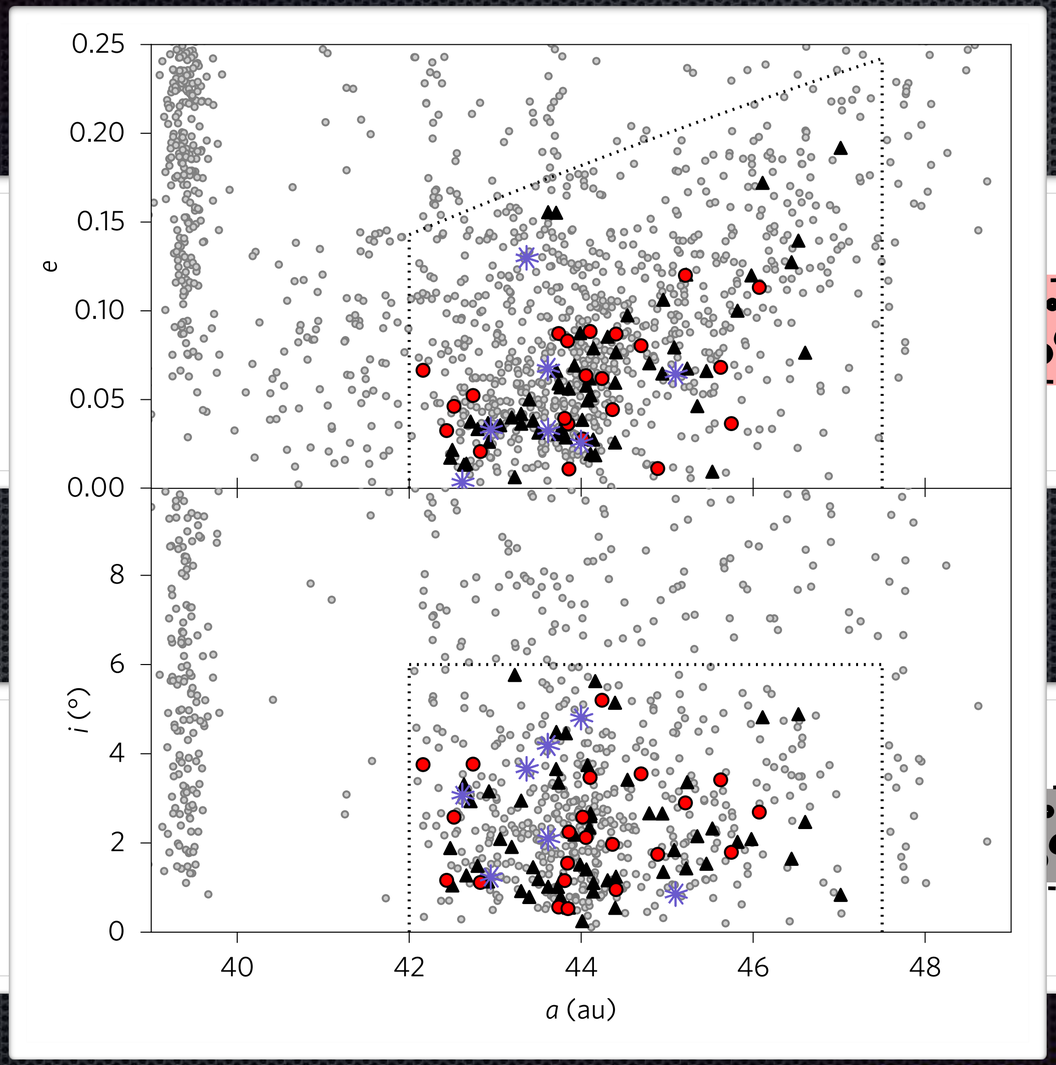


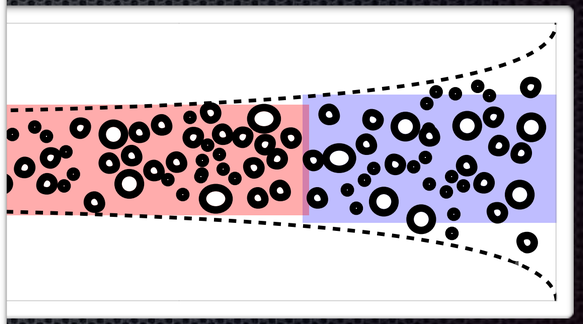
Dalle-Ore et al., 2013

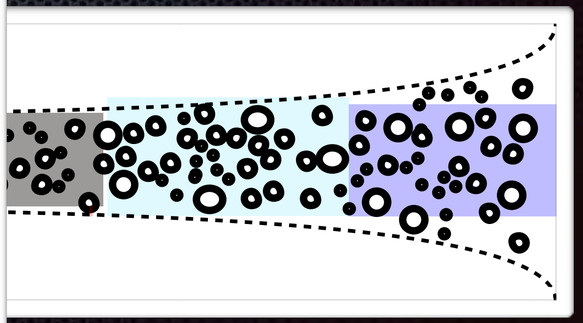
Taxonomies of KBOs









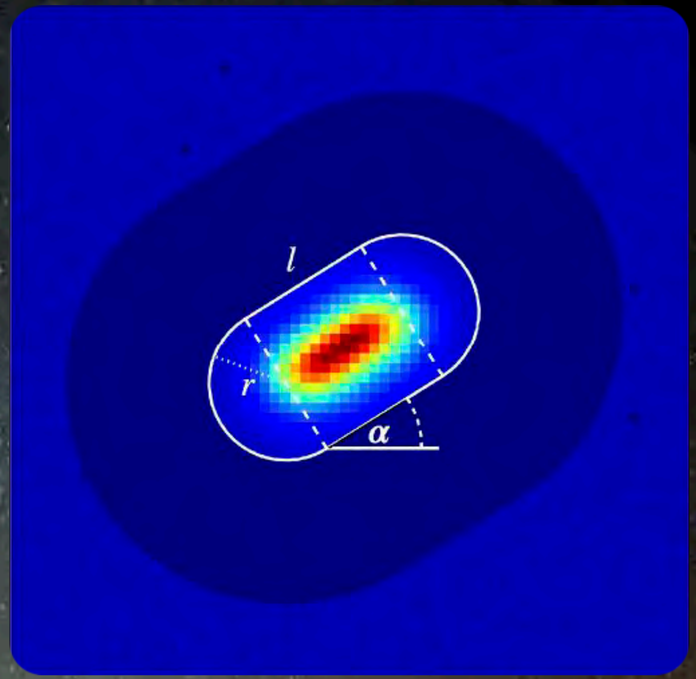


Fraser et al., 2017

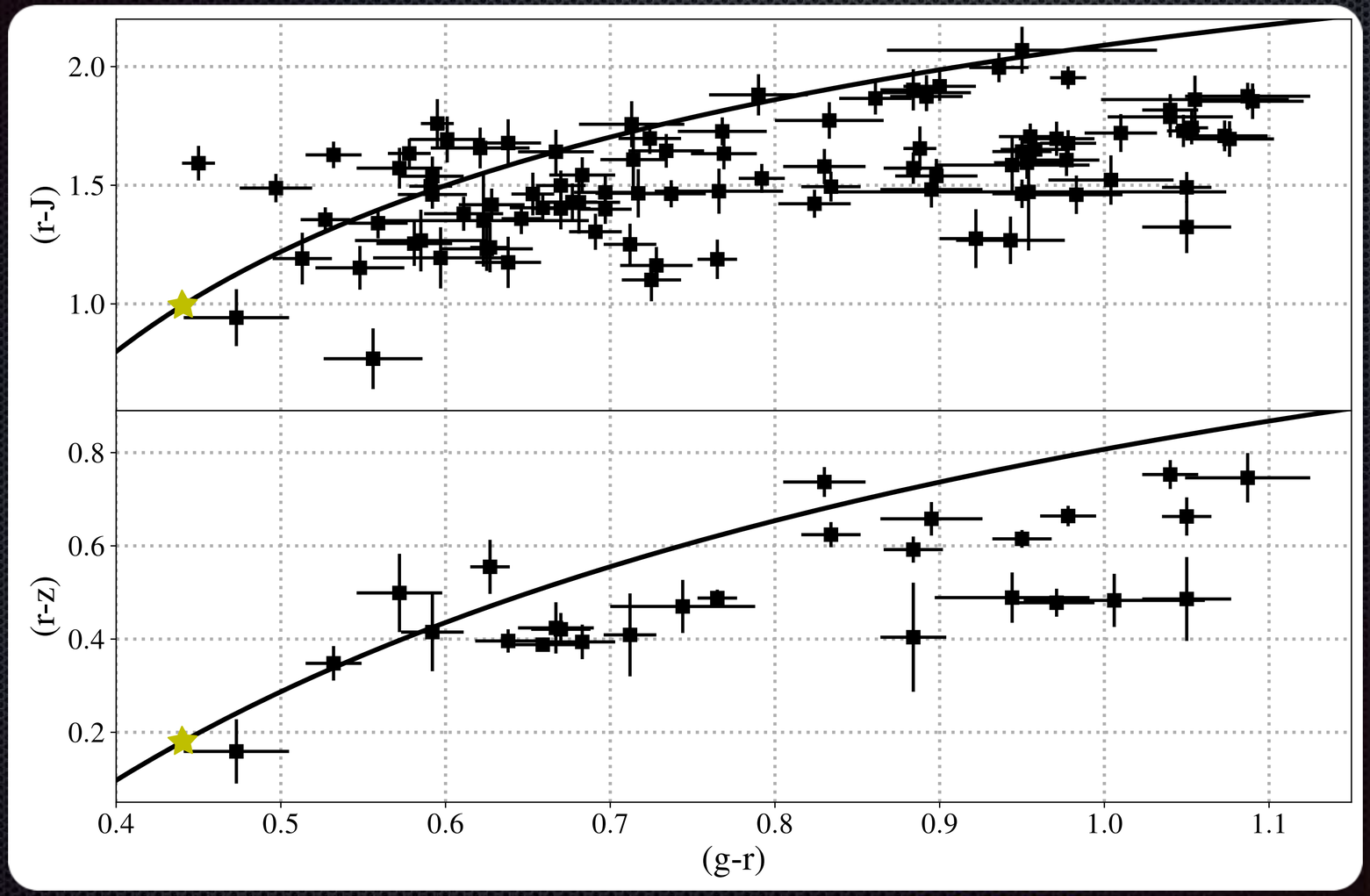
Colours of the Outer Solar System Origins Survey

- optical/NIR colours from Gemini
- UV/optical colours from CFHT
- near simultaneous observations
- 97 targets
- pill-aperture photometry for moving bodies

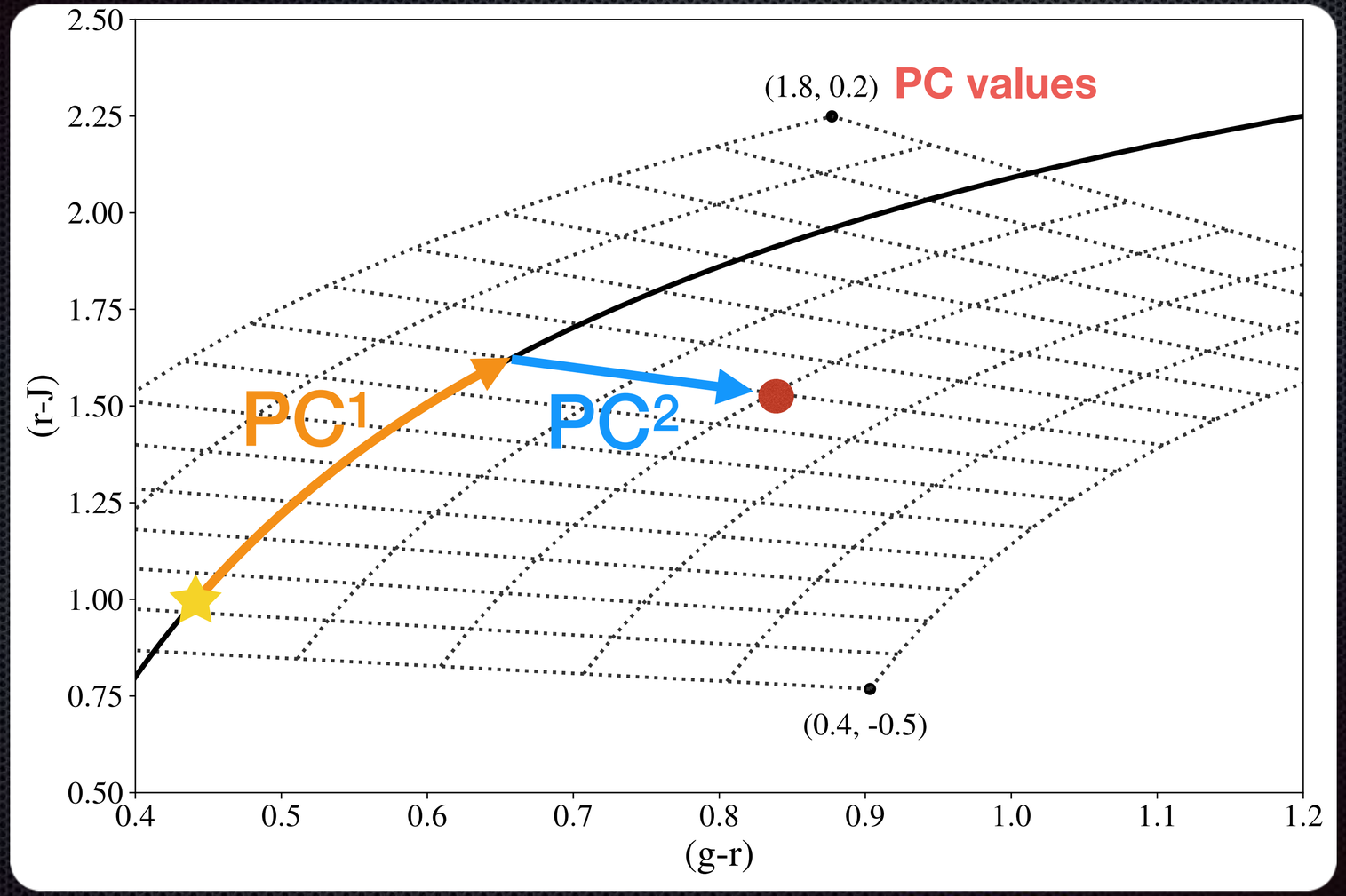
For details, see Schwamb et al. (2018)



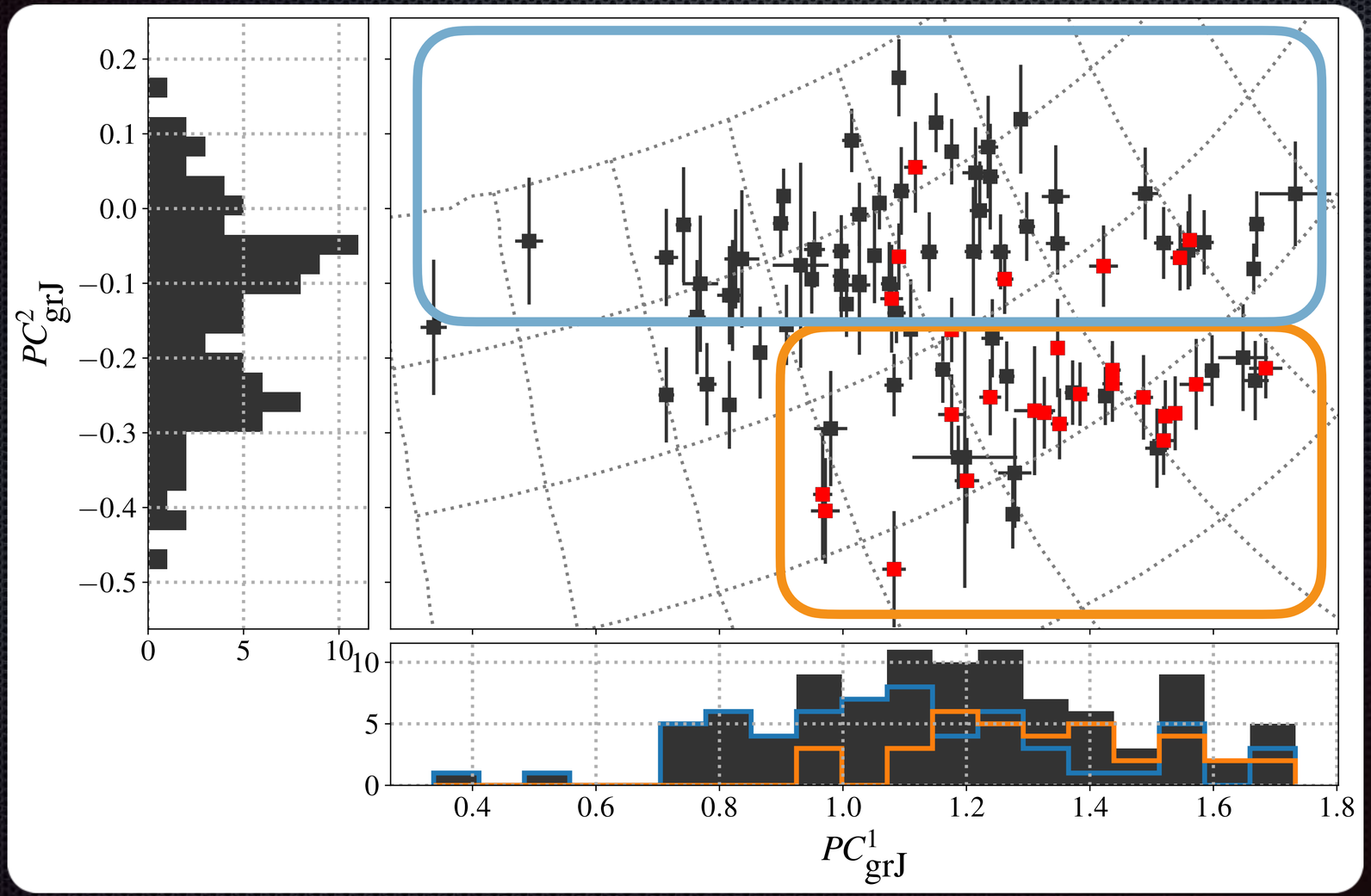
Col-OSSOS: Optical - NIR Colours



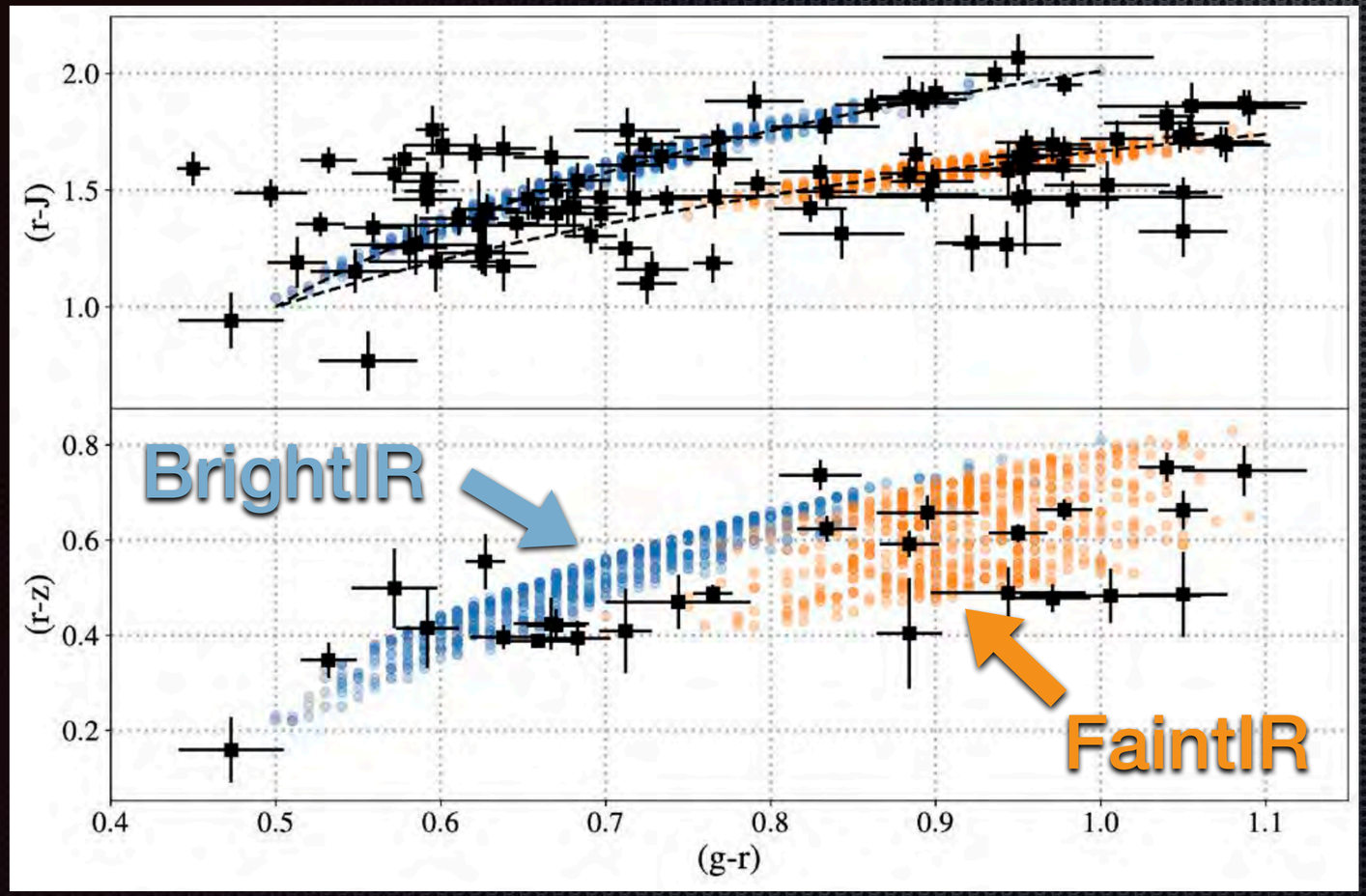
The Reddening Curve Projection

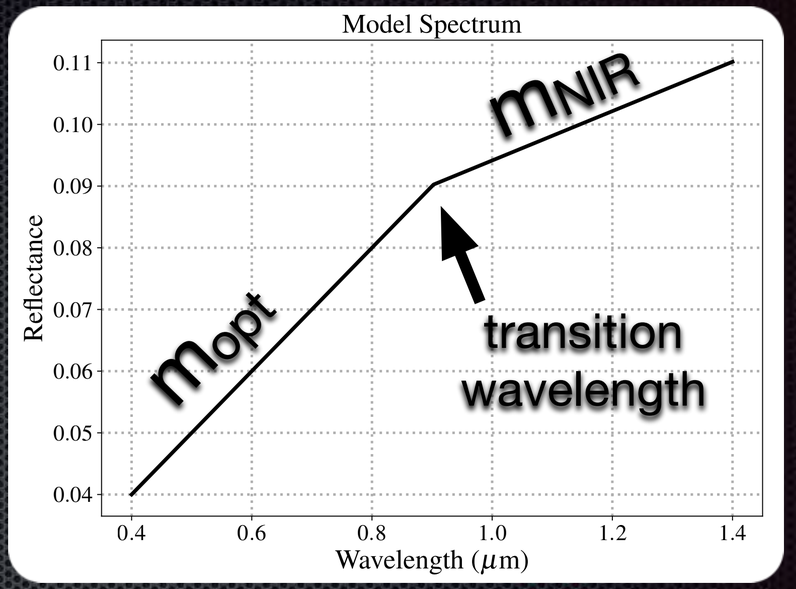


Projected (g-r) vs. (r-J)



Spectral Modelling

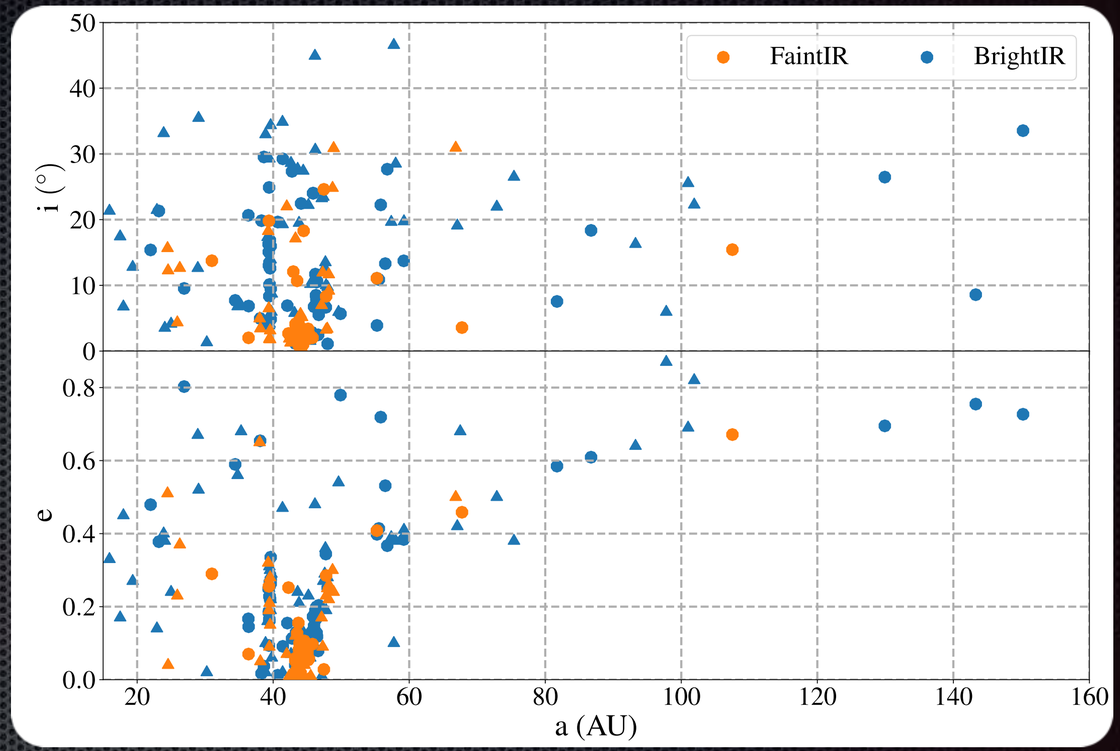


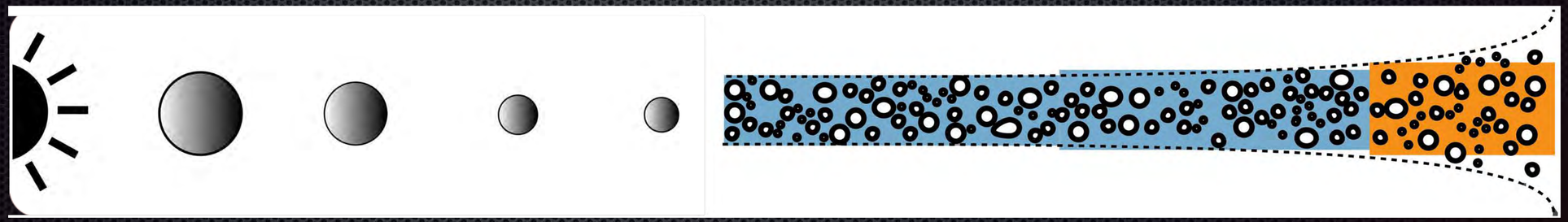


Mixing Model:

- two classes
- each class is a mixture of two materials
- material colours chosen to match only ***grJ***
- 95% of sources within 2-sigma
- Fully describes all past detected features of optical-NIR colour space

Consequence: Mixing of the Early Disk





~23 AU ~38 AU

Nesvorny et al., (2020), Buchanan et al. (in prep)

Conclusions

- reddening curve projection clearly divides 5-band optical-NIR colour distribution into **BrightIR** and **FaintIR** classes
- When chosen to match the grJ colour distribution, 2 class model fully accounts for full colour behaviour in all available spectral datasets:
  - optical colour bifurcation (Tegler and Romanishin, 2016)
  - distribution of optical colours (Peixinho et al., 2015)
  - correlated optical-NIR colours (Fraser and Brown, 2012)
- no further classes detected or required
- **Cosmogonic implication:** only 1 chemical transition in the protoplanetesimal disk