

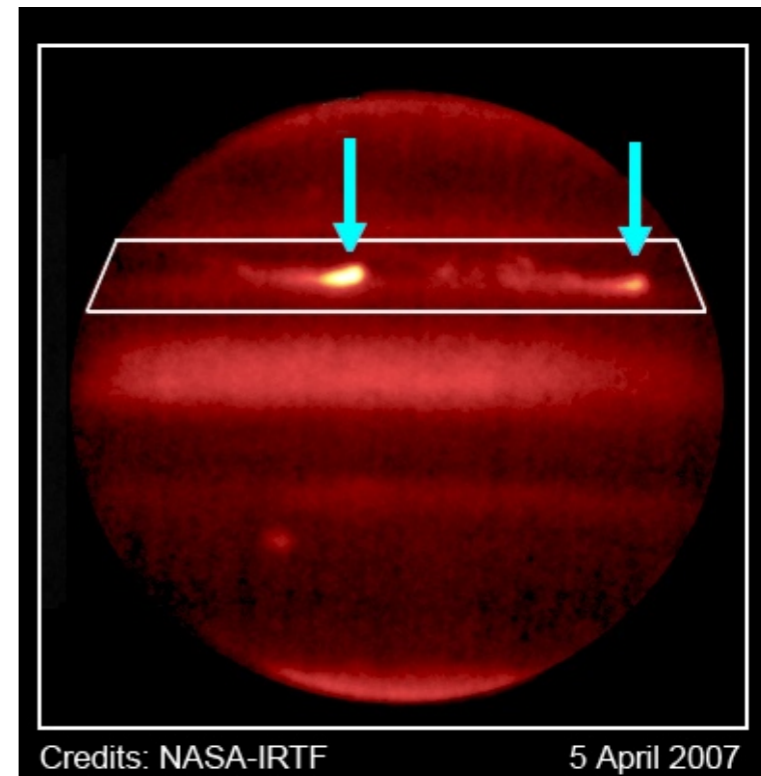
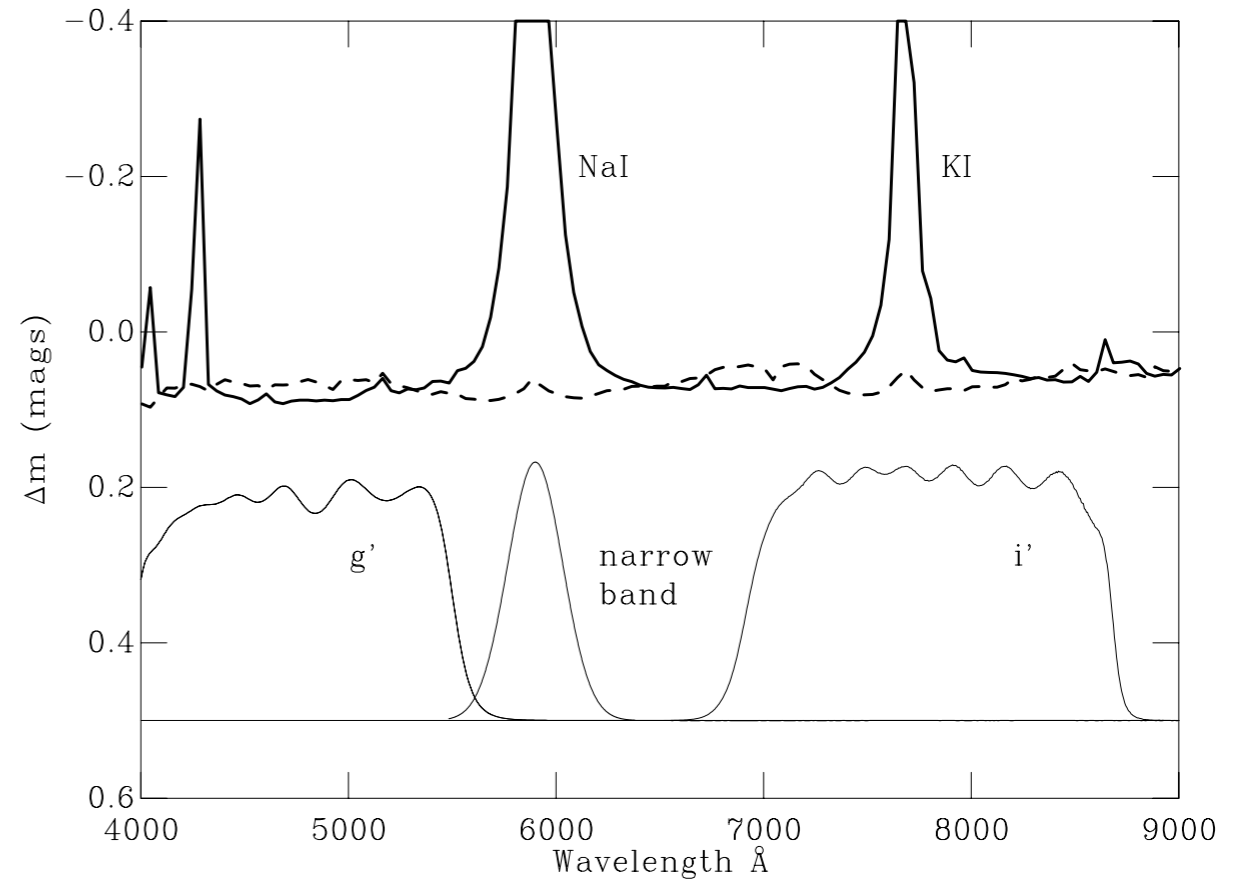
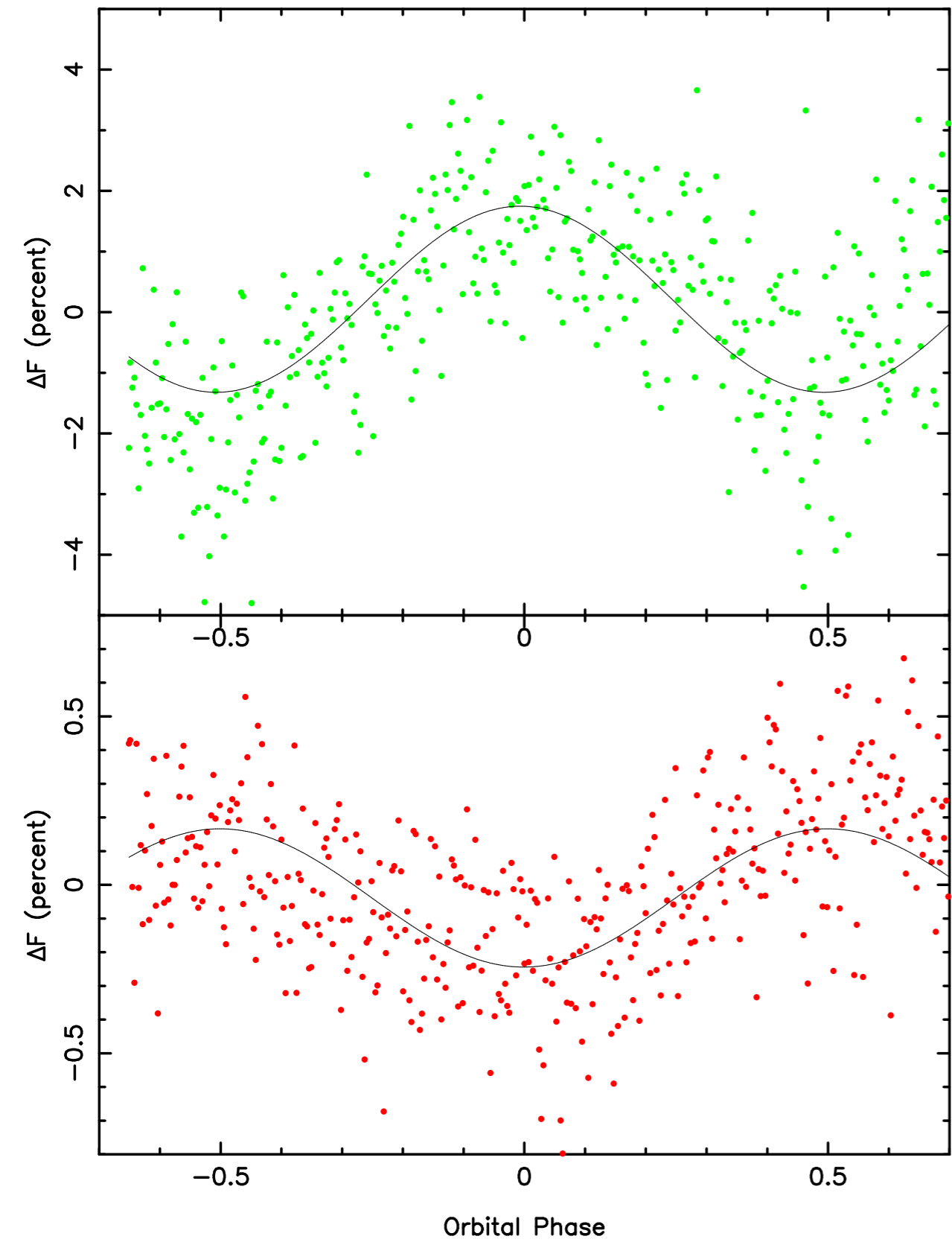


The
University
Of
Sheffield.

Clouds and Aurorae on Brown Dwarfs

Dr Stuart Littlefair, University of Sheffield

RAS, 12th April 2013

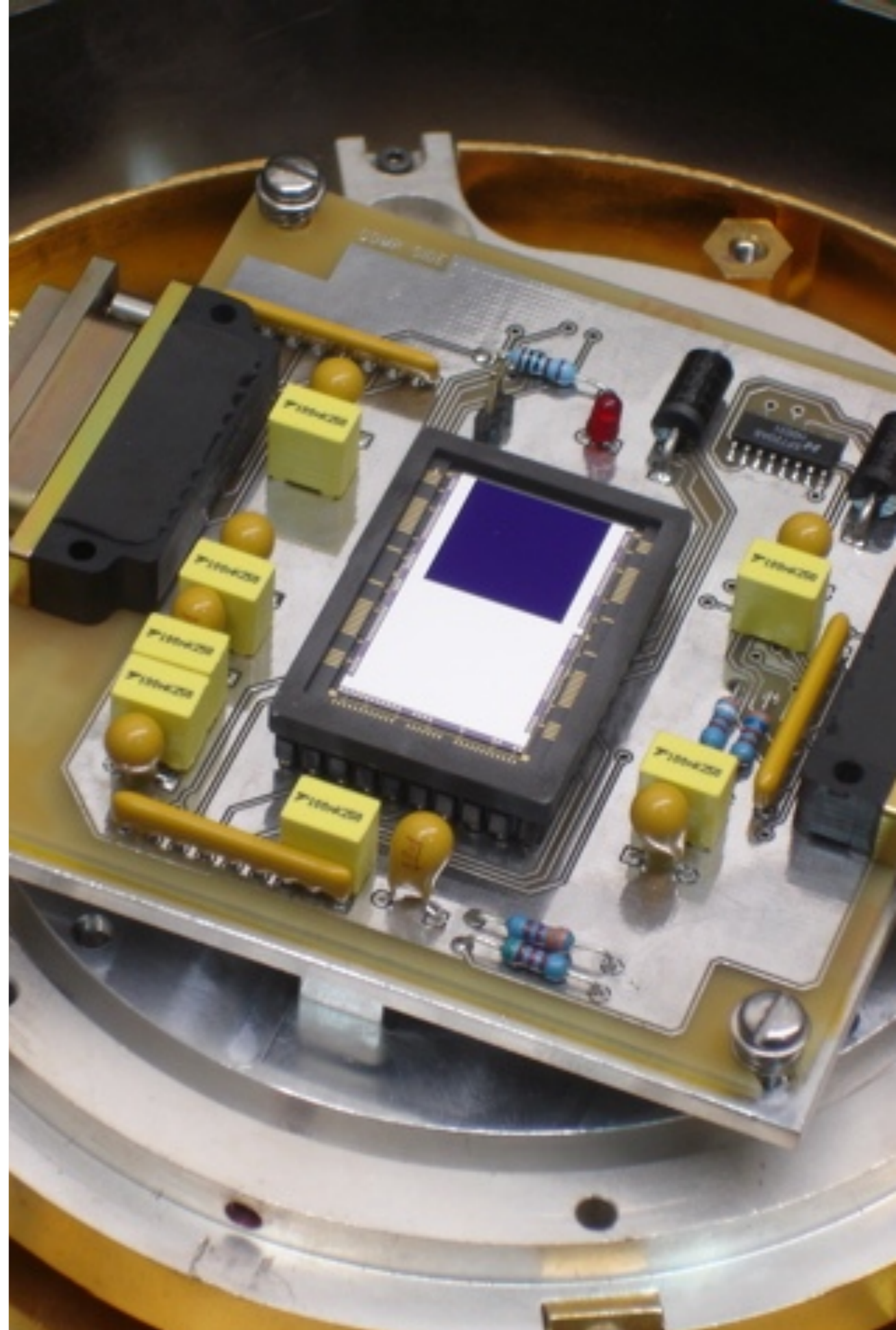


Brown Dwarf Variability (TVLM 513-46546)

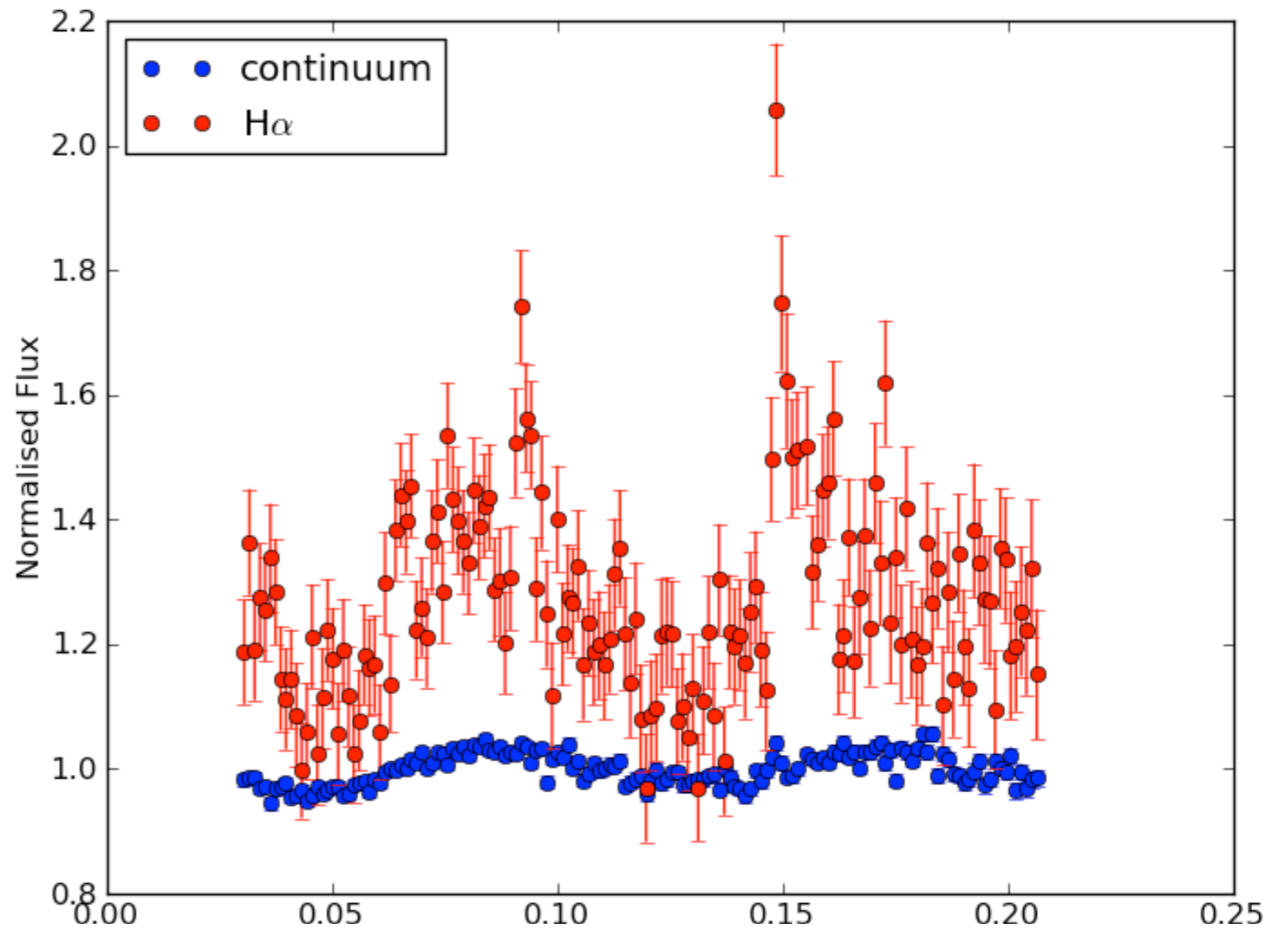
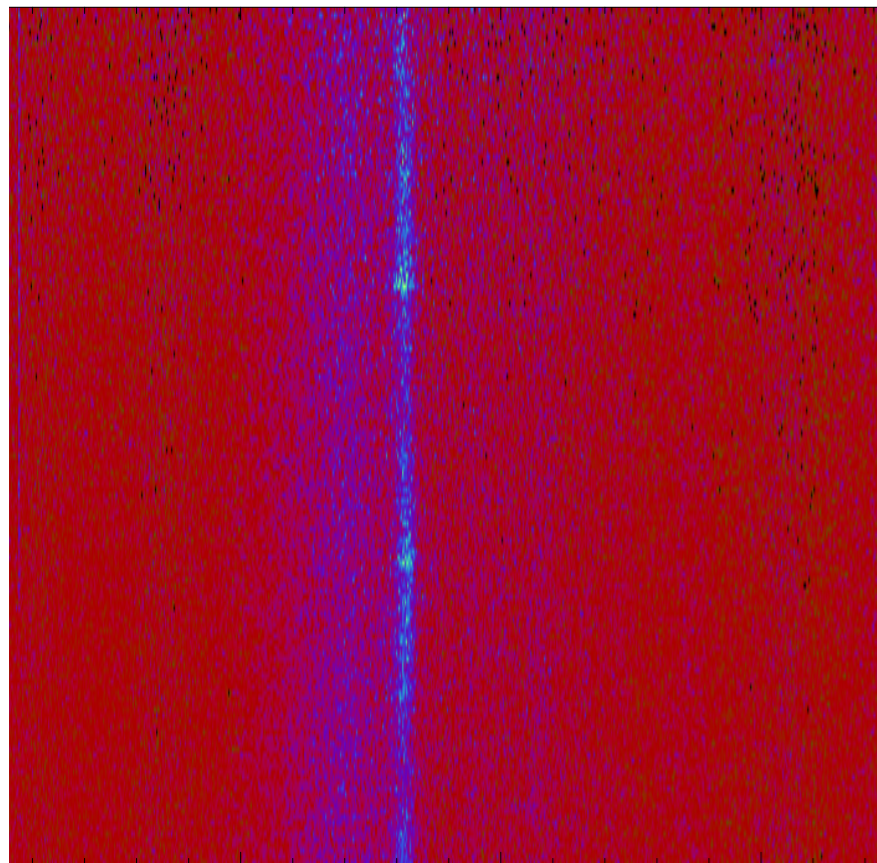
Littlefair et al 2008

ULTRASPEC

- CCDs have a flaw - Read Noise
- Becomes dominant at high speeds, and for **spectroscopy**
- EM-CCDs side-step read noise by **multiplying** the signal prior to charge-to-voltage conversion
- ULTRASPEC is (was) an EM-CCD based spectrograph for the 3.6m NTT, Chile.
- First use of EM-CCDs for astronomical spectroscopy (2006)

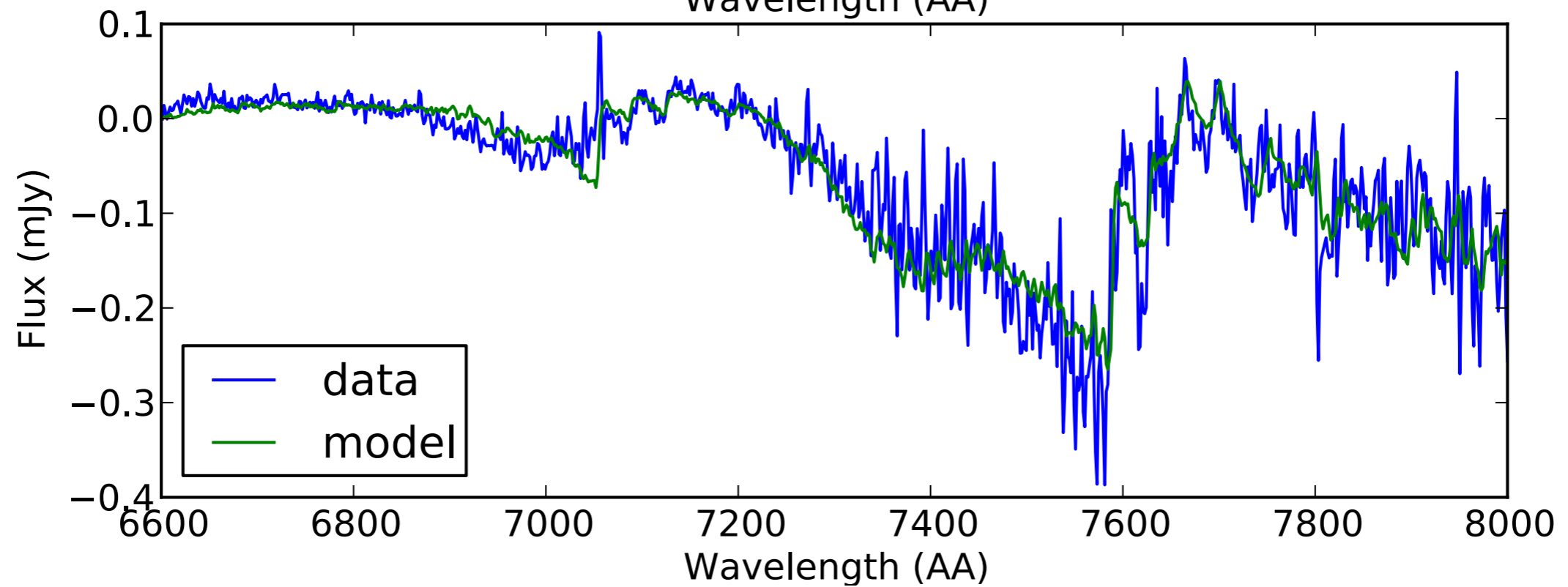
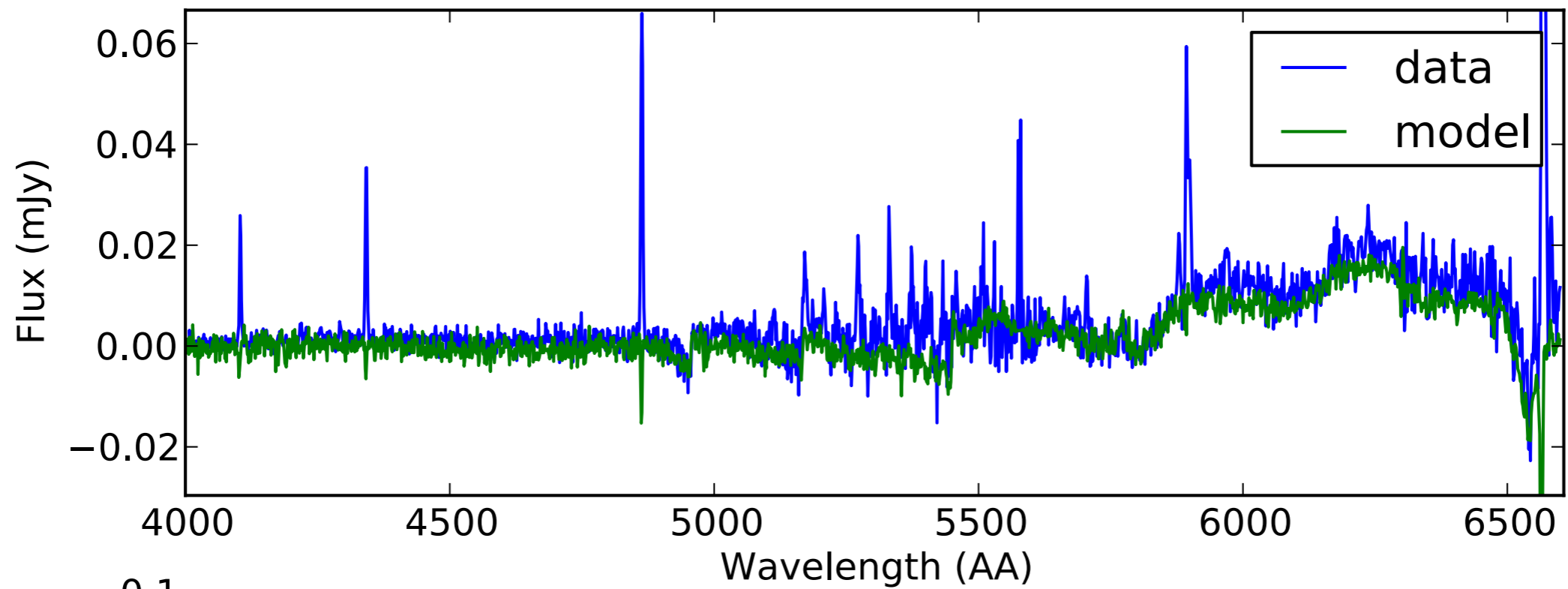


Trailed spectrum



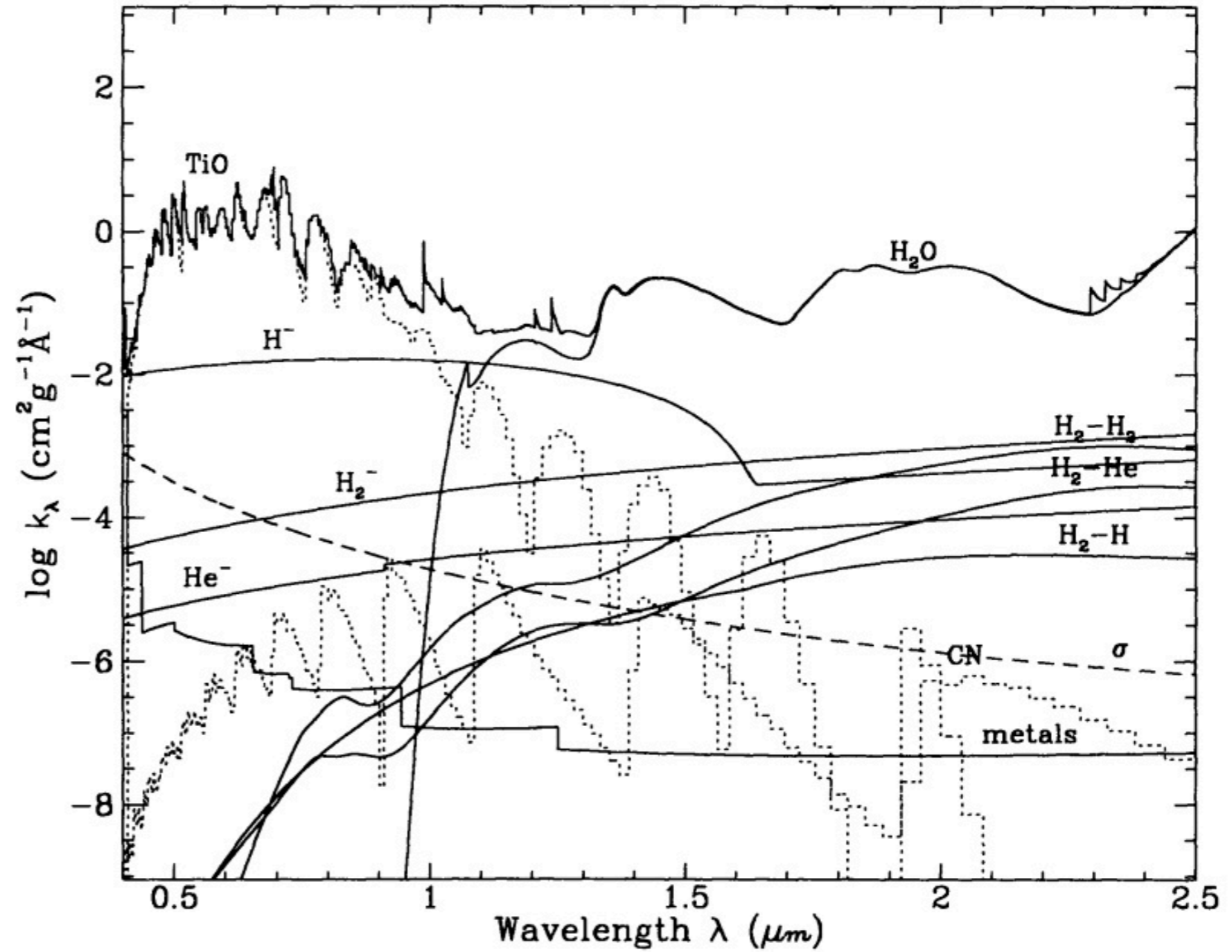
Brown Dwarf Variability

Hallinan et al (in prep!)



Brown Dwarf Variability

Hallinan et al (in prep)



The Auroral Model

Hallinan et al (in prep)

Summary

- Optical IR/Variability from brown dwarfs can arise from
 - Dust Cloud Weather
 - Starspots
- For at least some brown dwarfs the radio and optical variability can **both** be explained by the effects of aurorae
- These brown dwarfs are much more “planet-like” in their magnetic activity than they are “star-like”