# Atmospheric Studies with GTC: Qatar-1b

Sergio Hoyer Severo Ochoa Fellow Instituto de Astrofísica de Canarias







#### The GTC exoplanet transit spectroscopy survey:

- A project to take advantage of the 10m GTC capabilities.
- OSIRIS instrument in the spectroscopic mode.
  (2 CCDs, 2048x4102 pix2, FoV ~ 8 arcmin)
- ~10 planets already observed (1-2 transits).
- WASP43b (Murgas et al. 2014)

Team:

E. Palle, R. Alonso, G. Nowak, F. Murgas, H. Parviainen, L. Nortmann, N. Iro, G. Chen

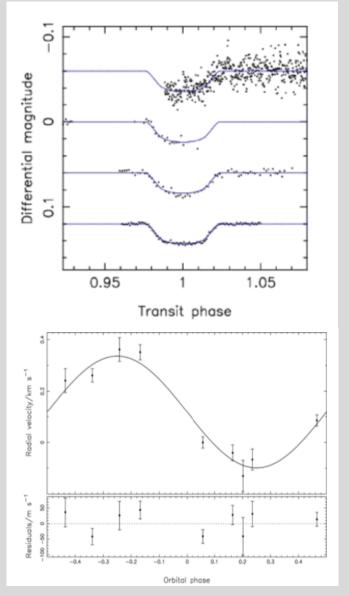


### Qatar-1b (Alsubai et al. 2011)

- 1.1 x Jupiter Mass
- 1.16 x Jupiter Size
- Orbital Period of 1.42 days
- Host Star:

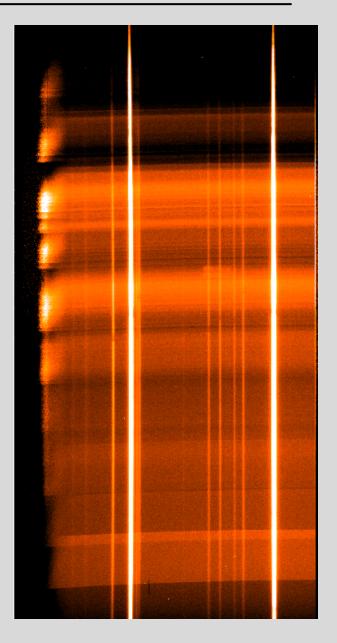
K dwarf, T\_eff ~ 4900 K, V=12.8 mag



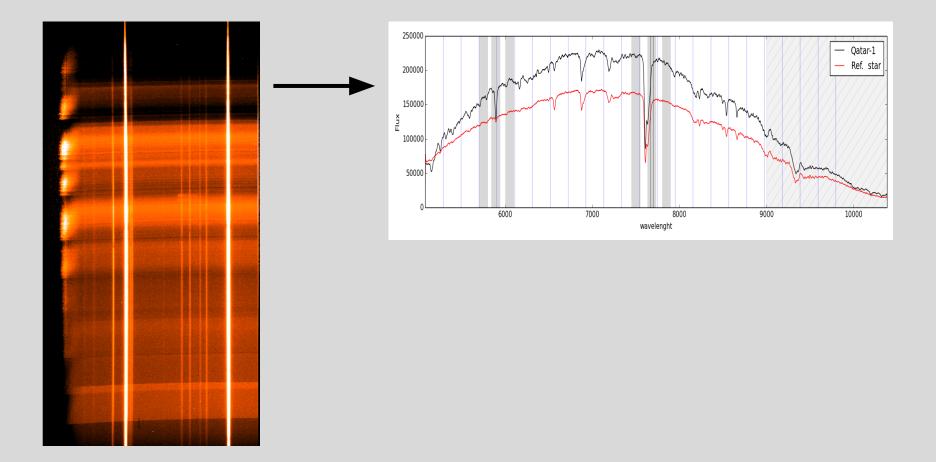


# Transmission Spectroscopy with GTC Observation Setup

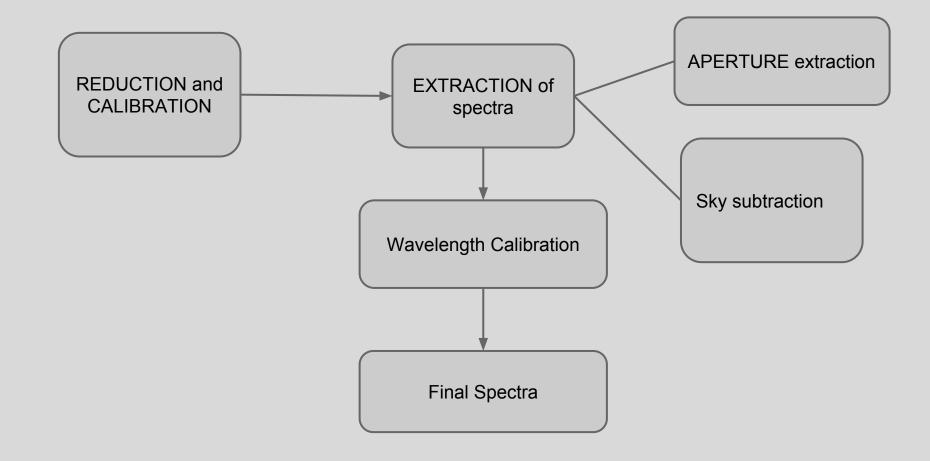
OSIRIS - spect. mode Long+Wide Slit (40 arcsec) R1000R grism Target + Reference in same chip (2098 x 4102 pix)



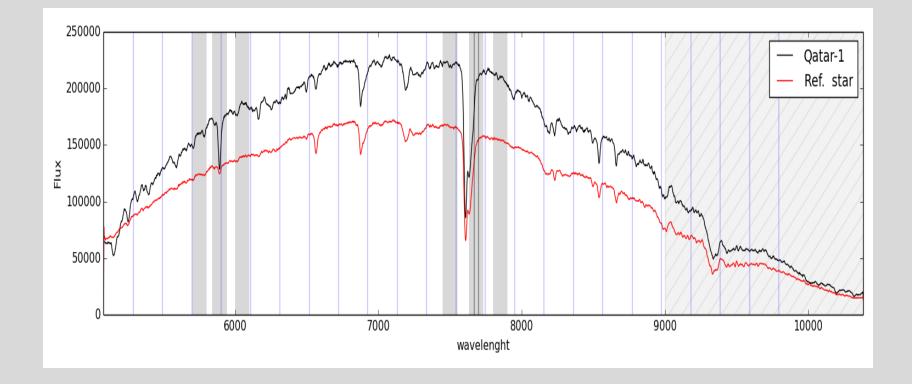
#### **Observation Reduction and Calibration**



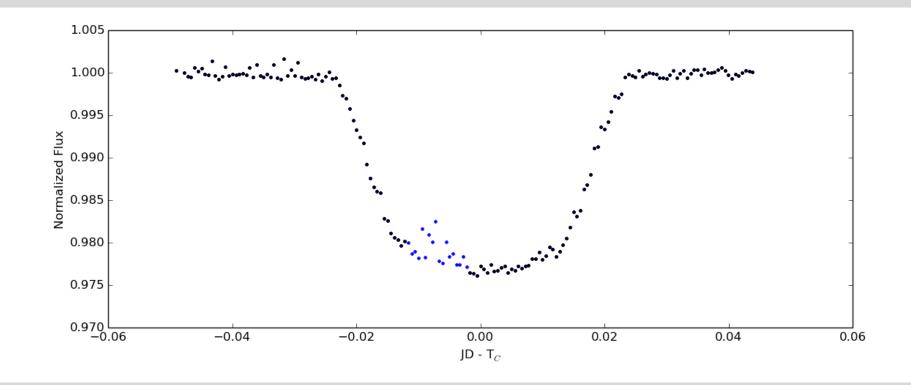
## **Pipeline Steps**



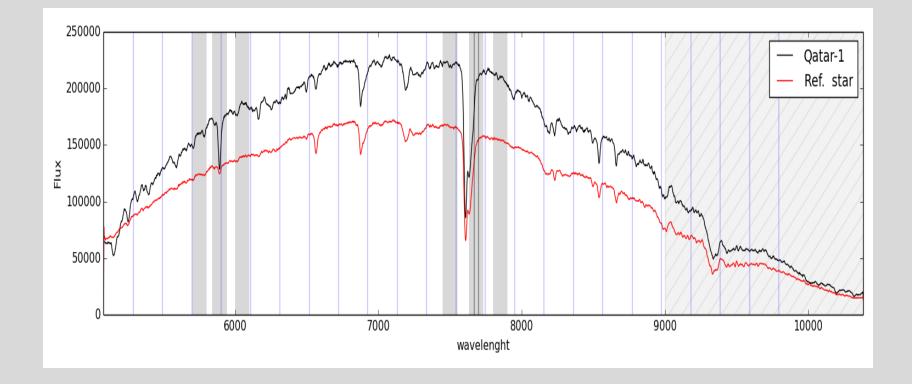
#### **Transmission Spectroscopy with GTC**



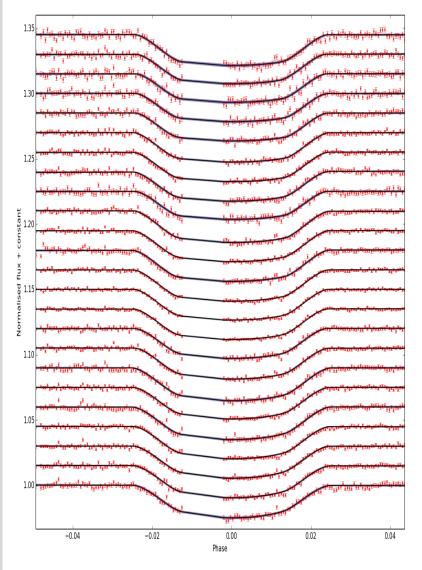
#### White light curve (dispersion about 400 ppm)

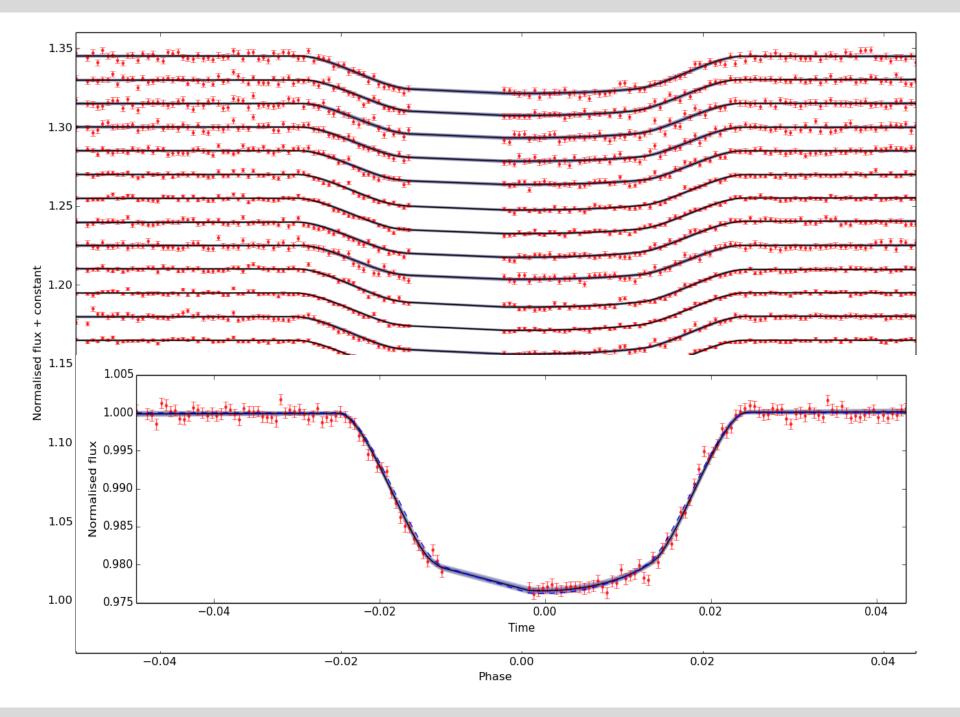


#### **Transmission Spectroscopy with GTC**



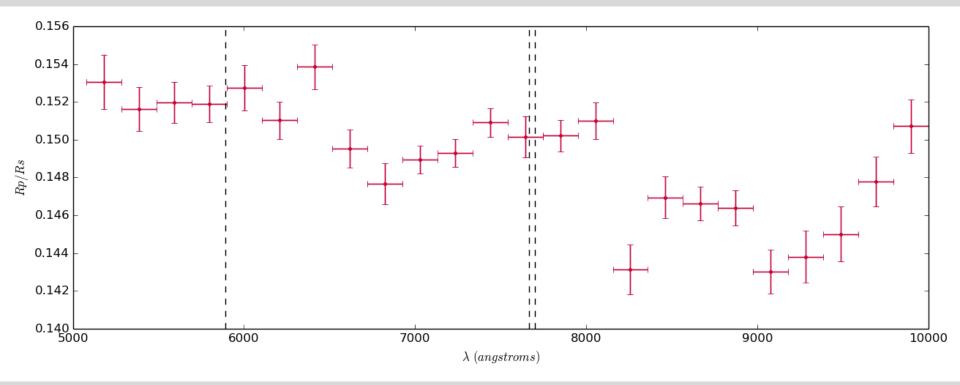
Light curves of the 24 "wide" bands





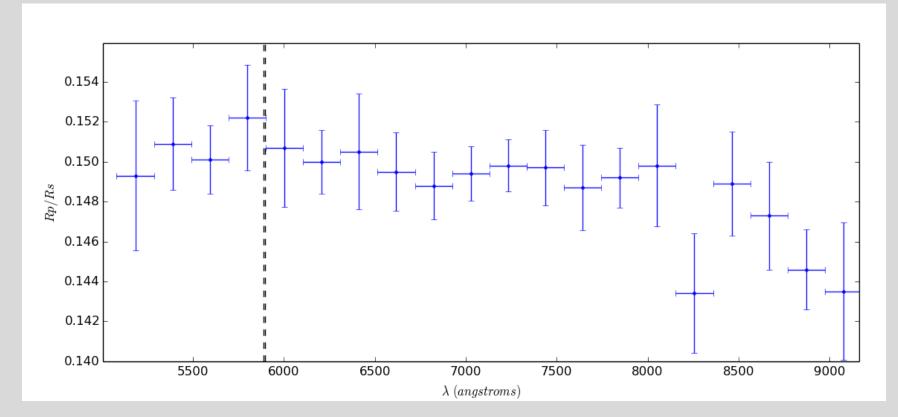
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# Qatar-1b transmission spectra (w/o red noise modelling)

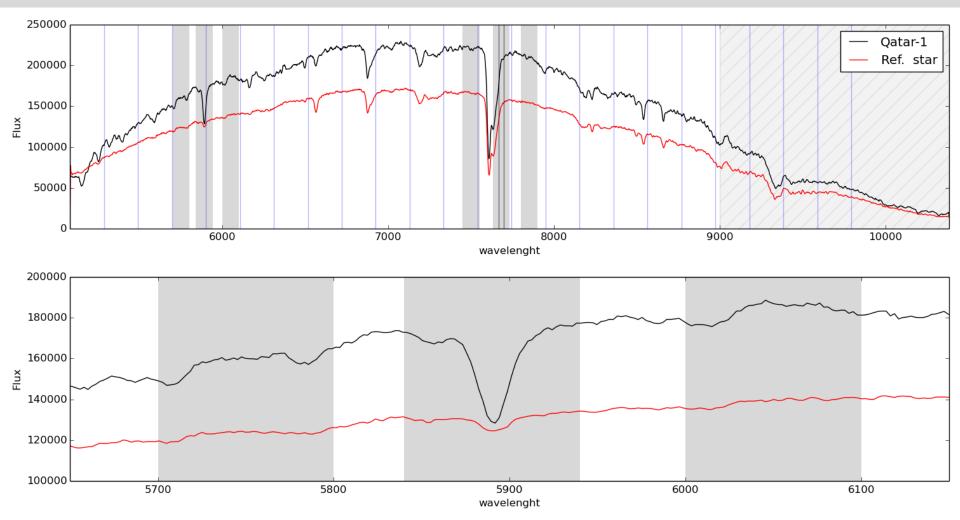


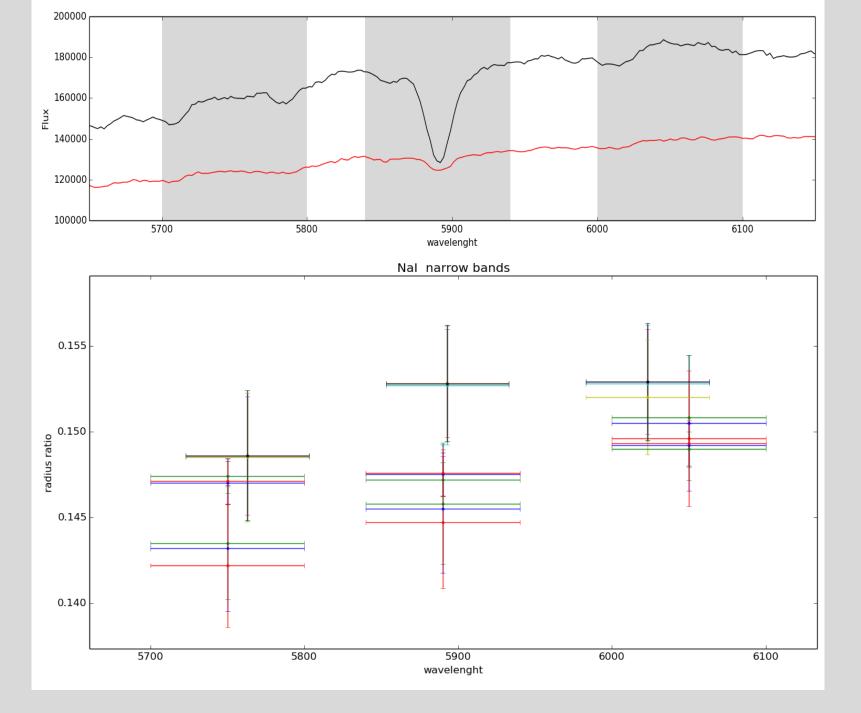
Sergio Hoyer - 3rd Science Workshop - CHEOPS - Madrid 2015

#### Taking red noise into account

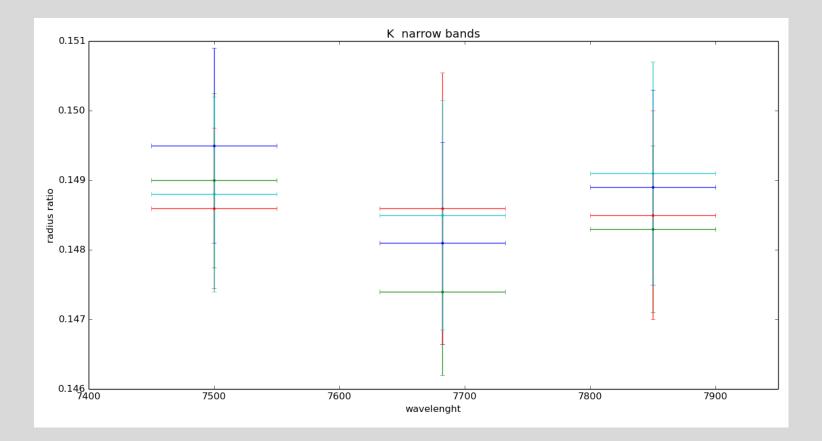


#### Nal analysis





## **K** narrow bands



# Summary

GTC is an excellent telescope for exoplanet science, in particular for atmospheric studies.

There is still room for improvement (upgrading pipelines, fine tuning of the complete process, semi-automatization of some steps in the process)

GTC new instrumentation+upgrades in the near future will expand the current capabilities for this type of studies (including near-IR)