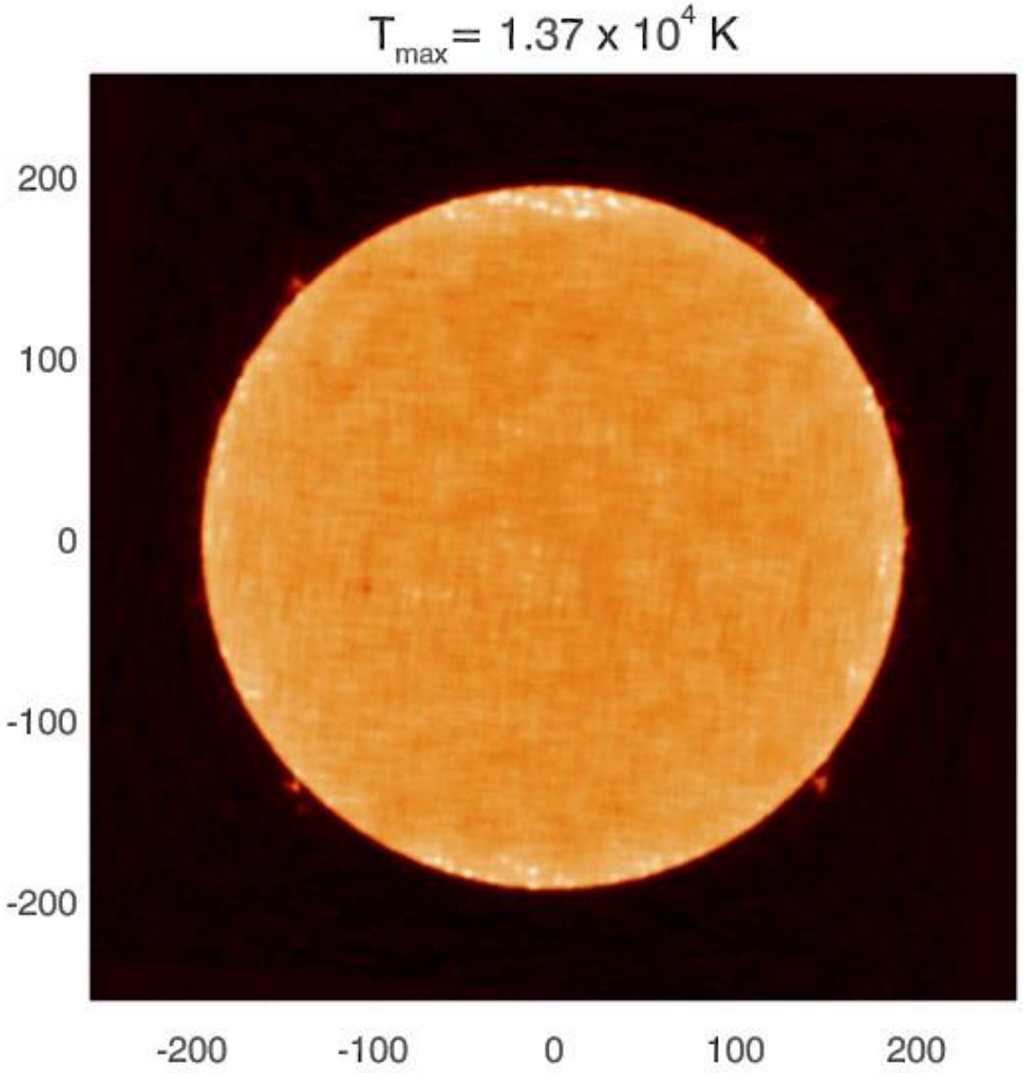
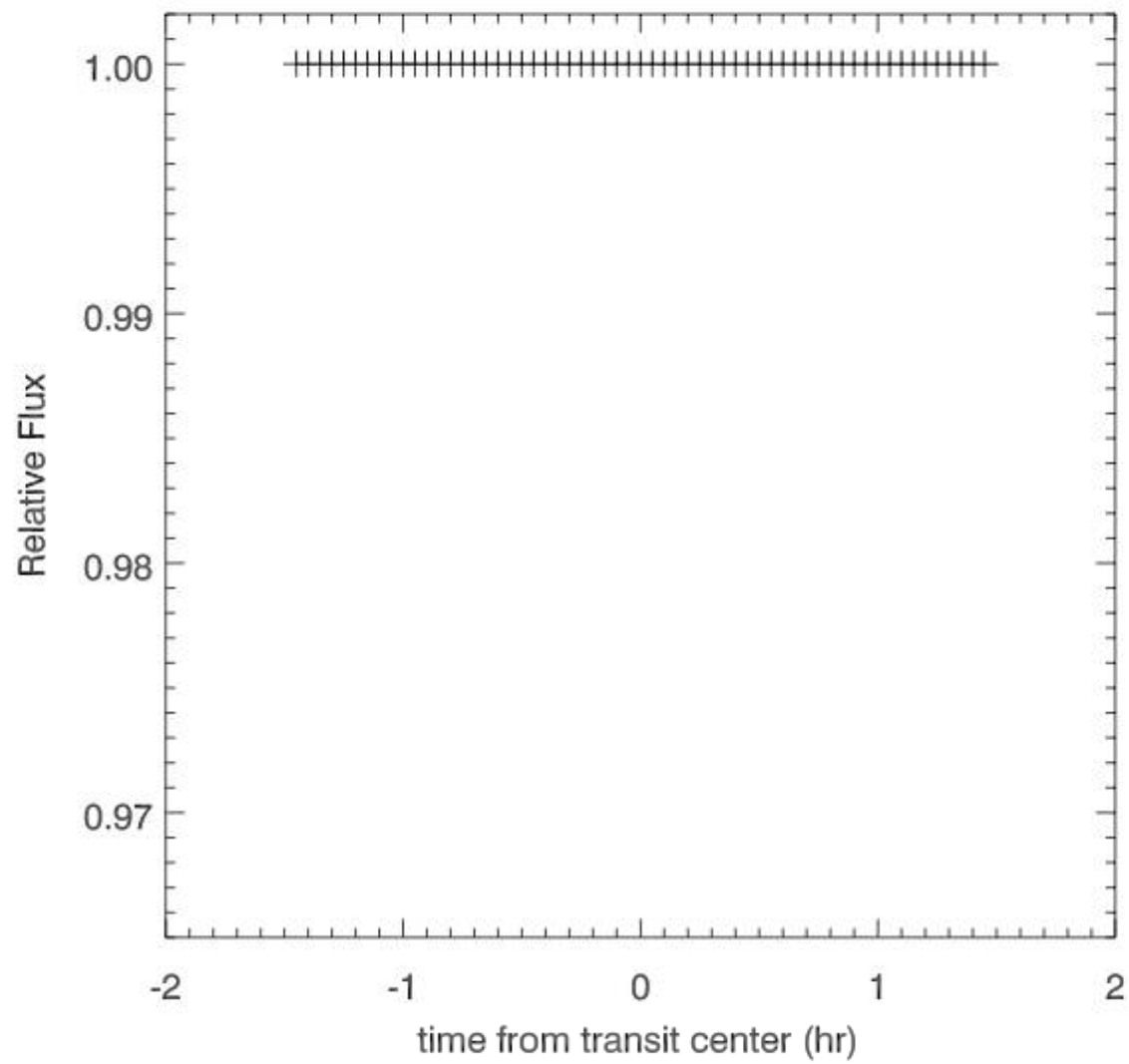
Simulations of planetary transits of solar like stars at radio wavelengths

Caius L. Selhorst

Simulations — Quiet Sun

— Bremsstrahlung emission
— Planet with opaque disk





Selhorst, Barbosa and Válio 2013

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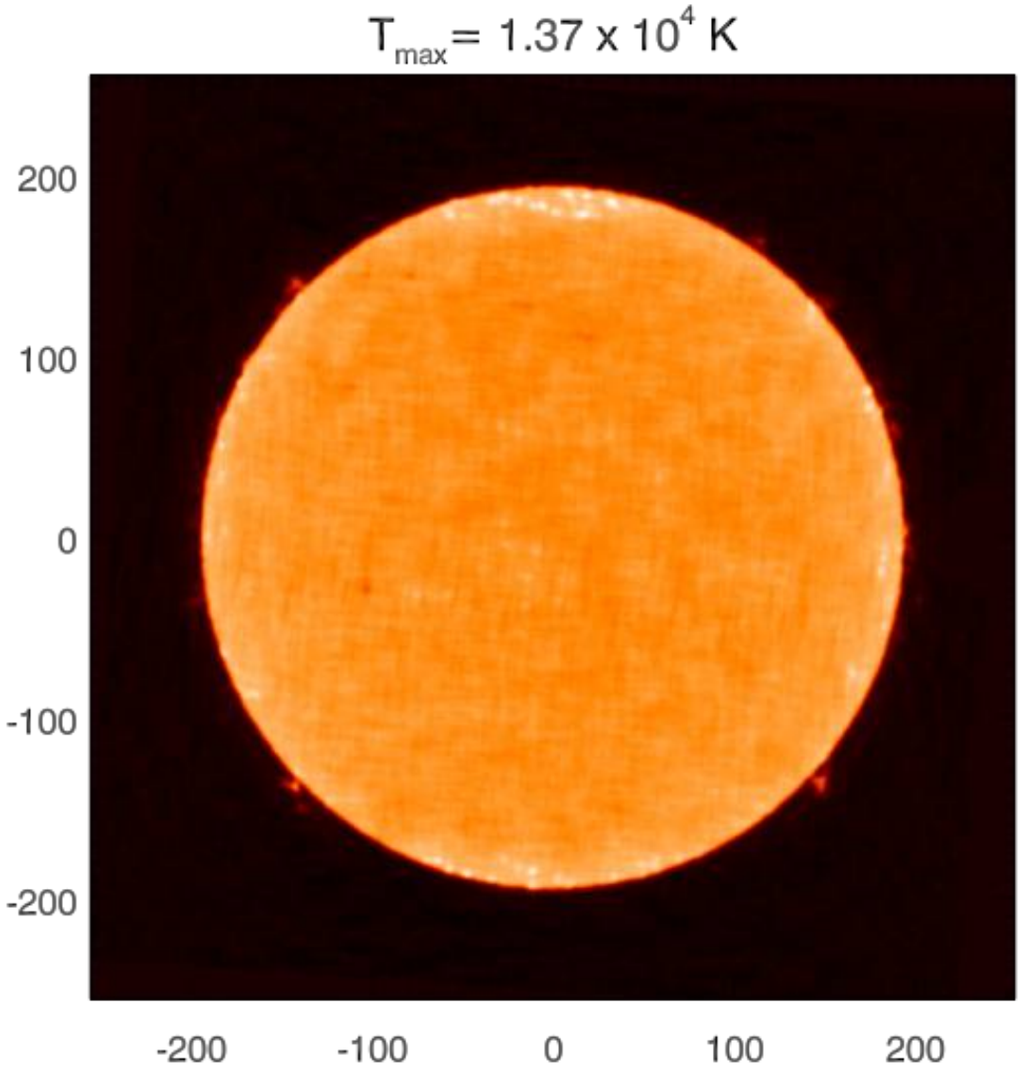

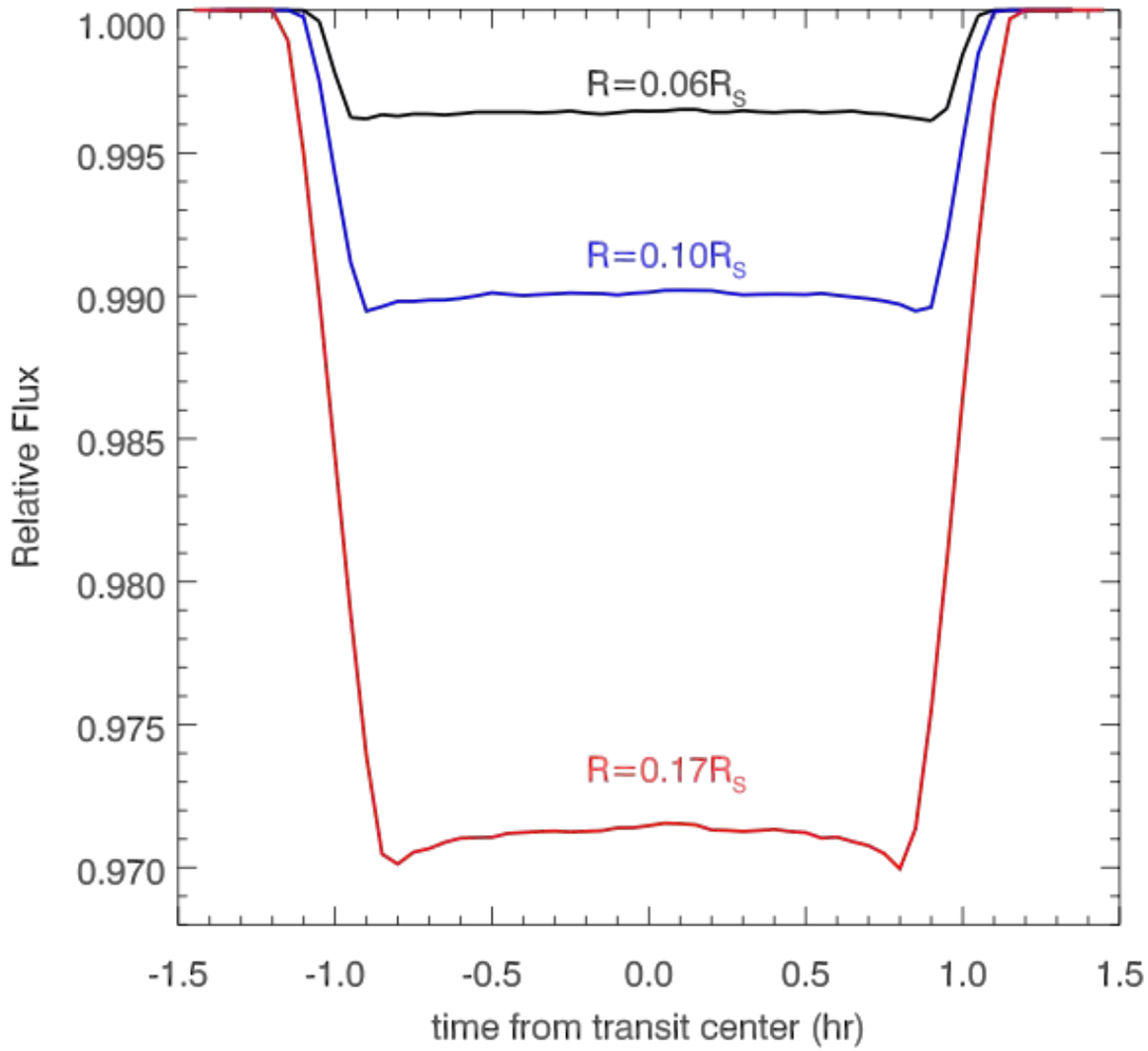

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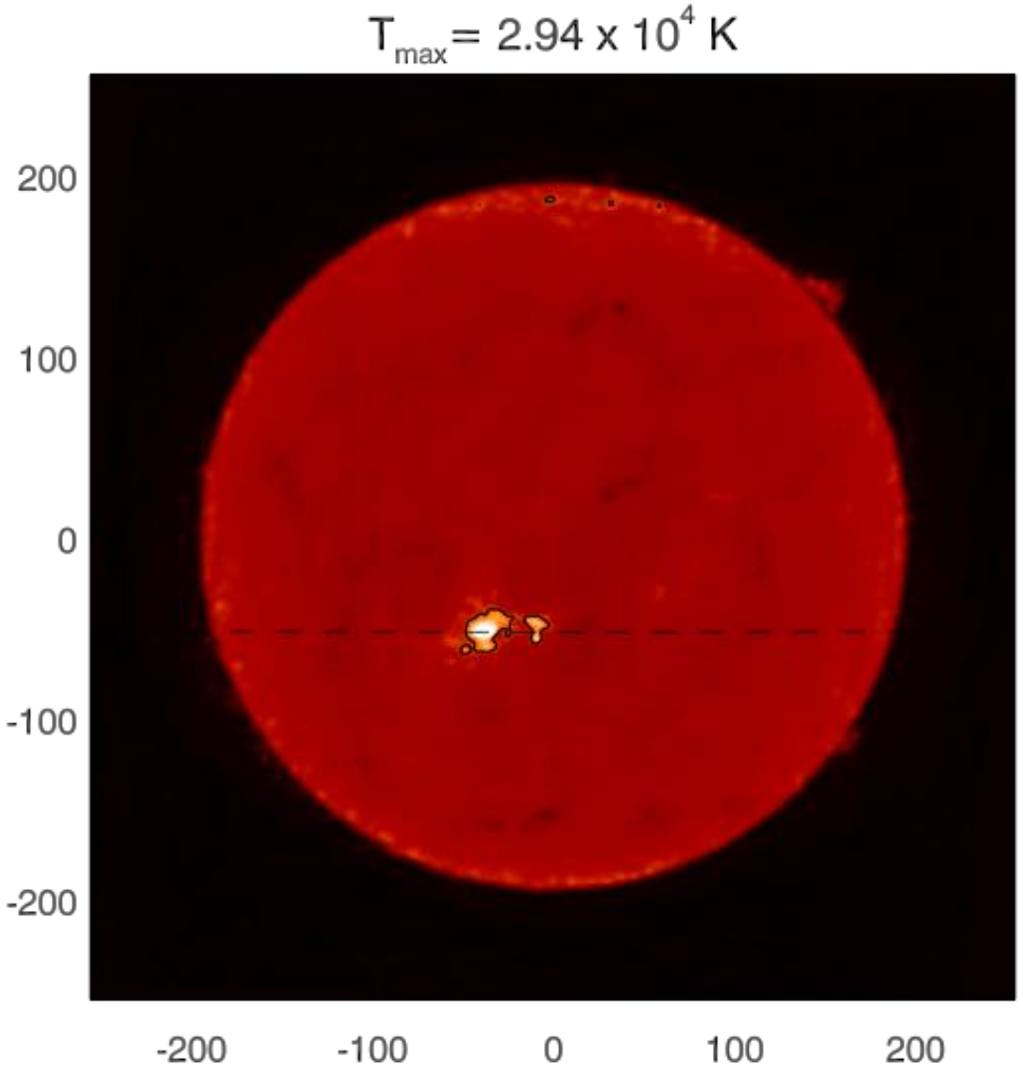
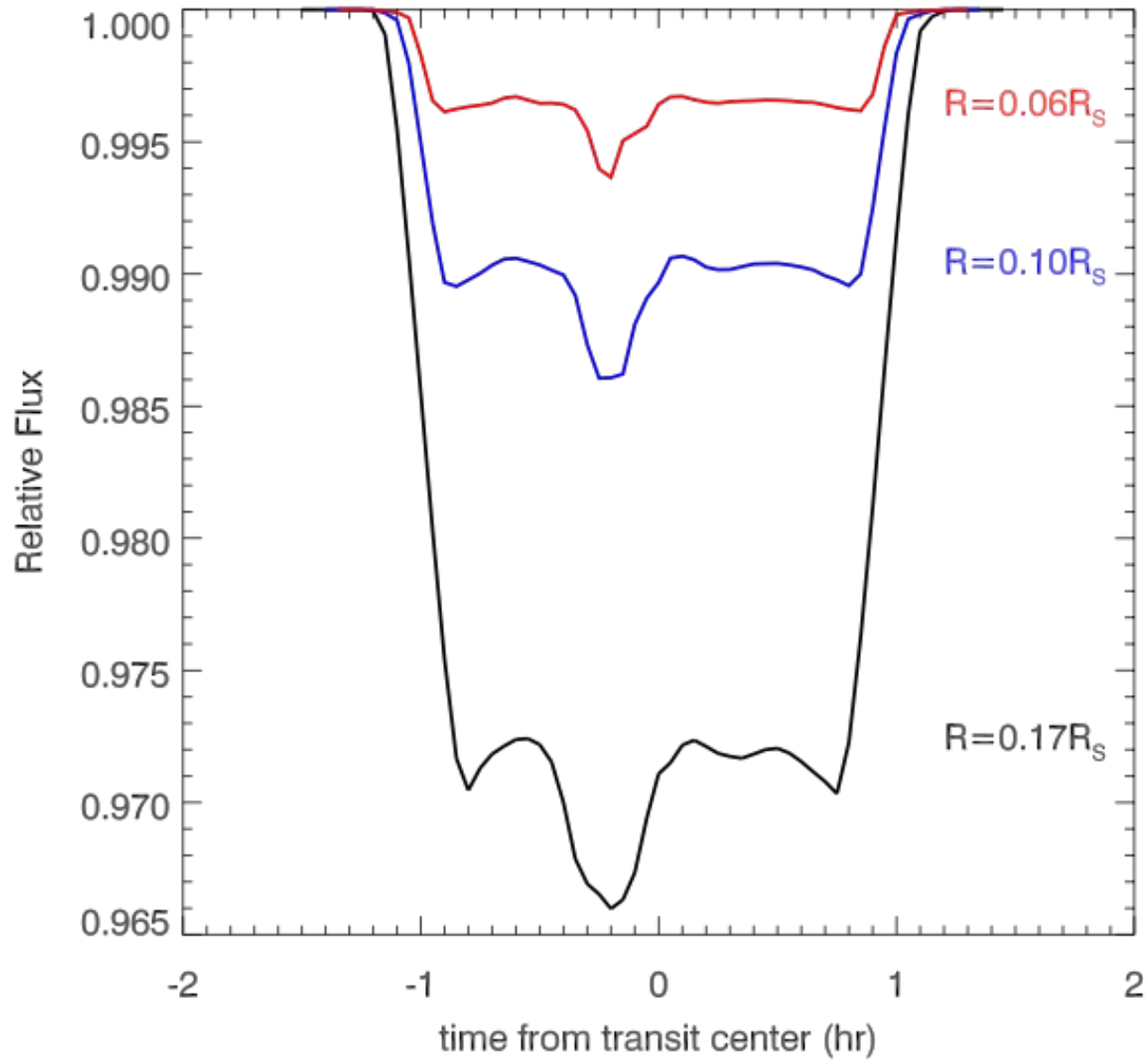
Simulations — Active Regions

— Active region emission: Bremsstrahlung





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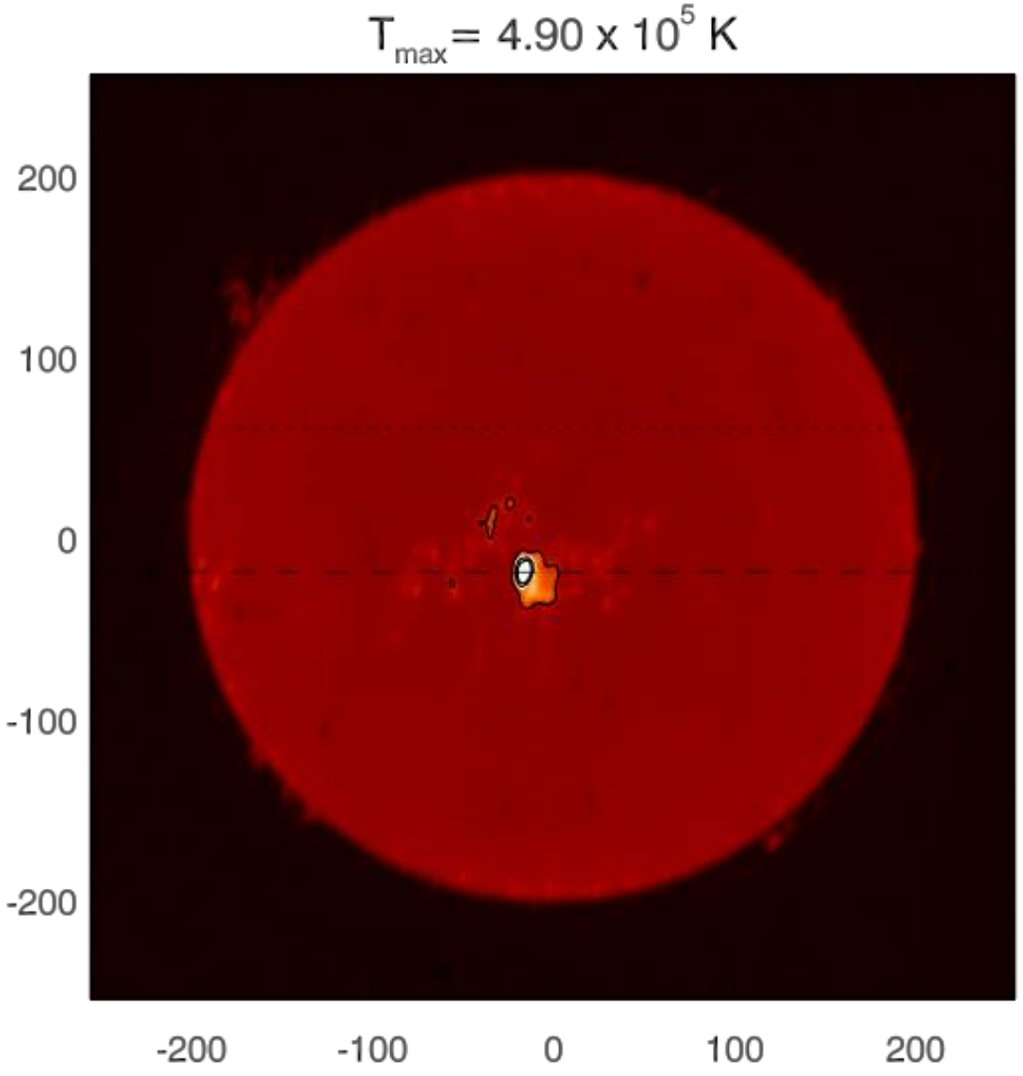
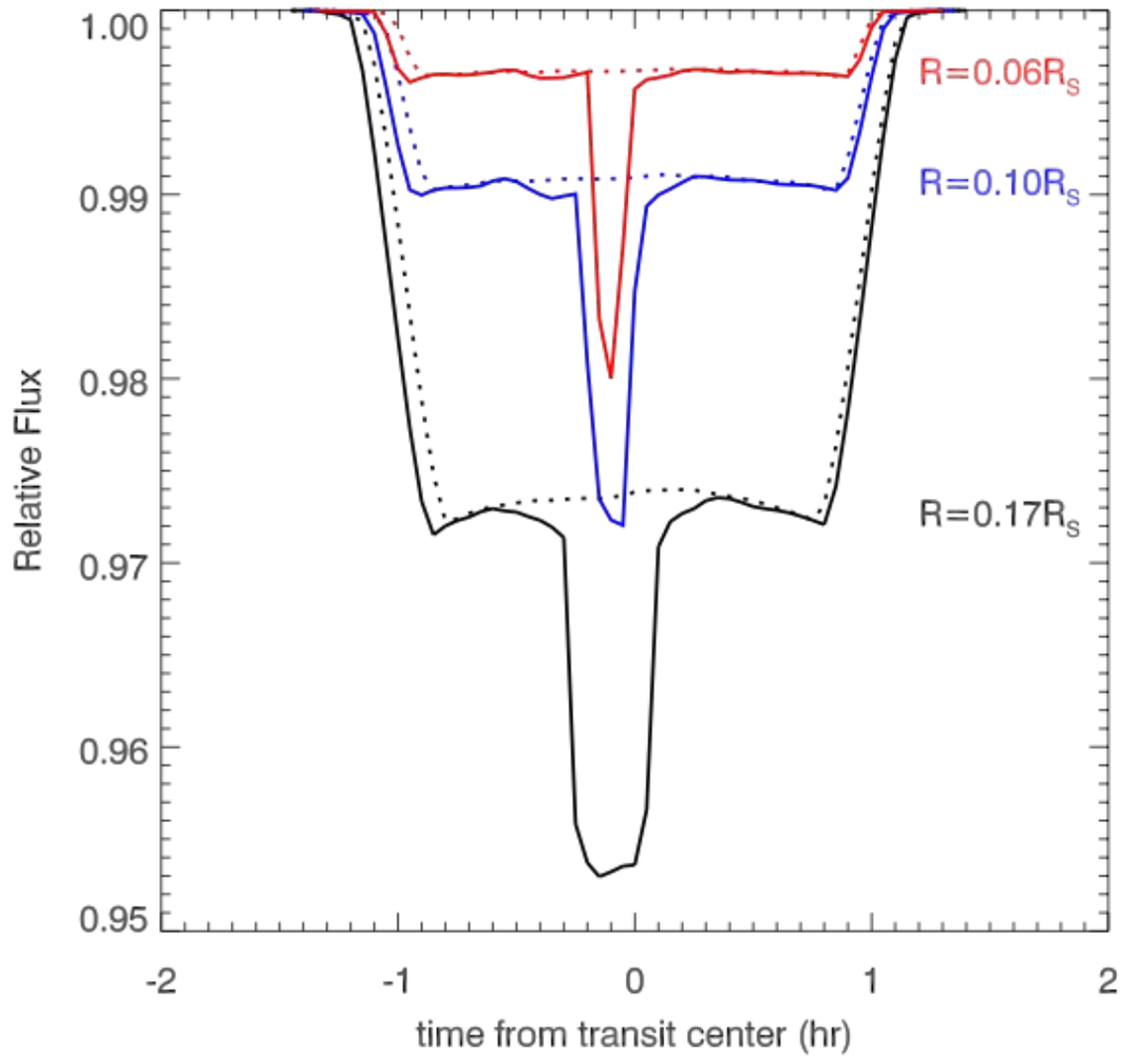
Simulations — Active Regions

— Active region emission: Bremsstrahlung + gyro-resonance





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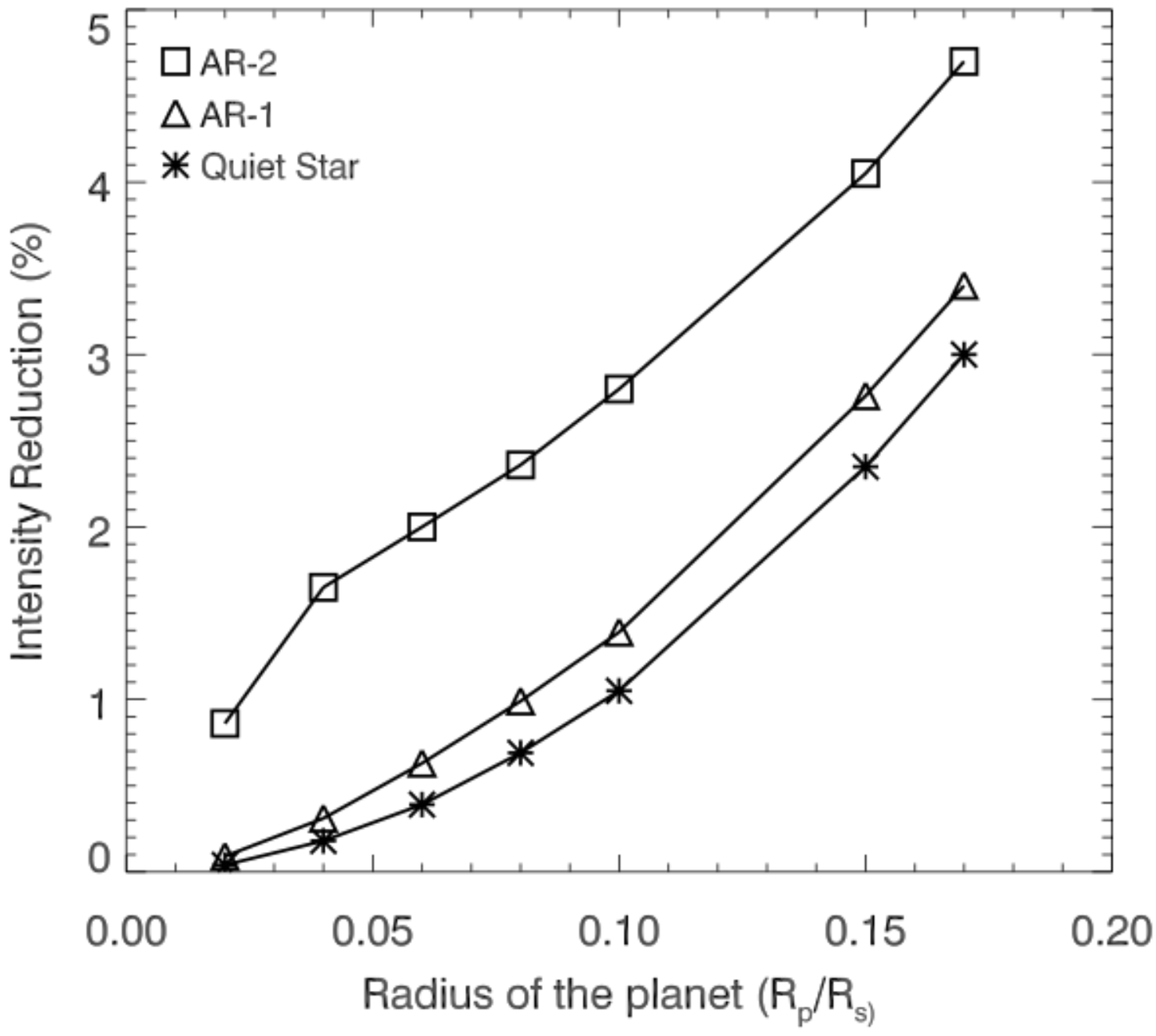
Intensity Reduction X Planet Size



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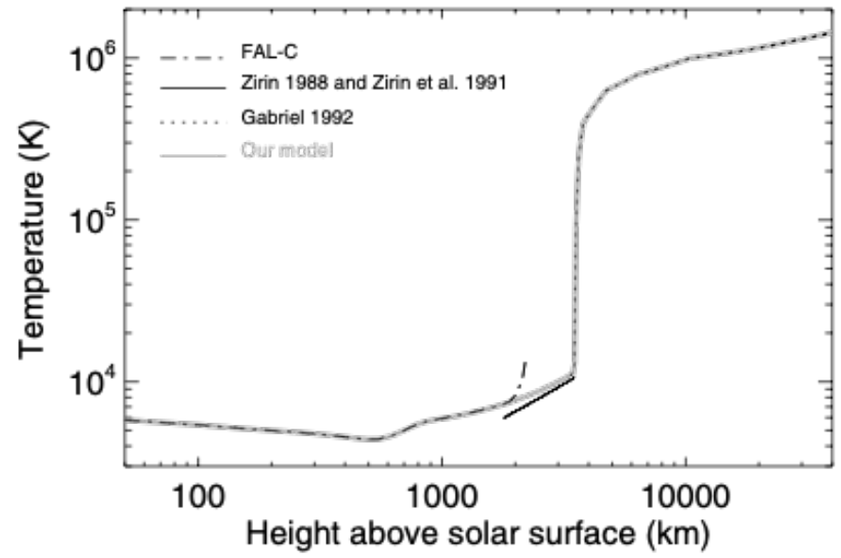
Simulations with Model— Quiet Sun

— Quiet Sun: Bremsstrahlung emission



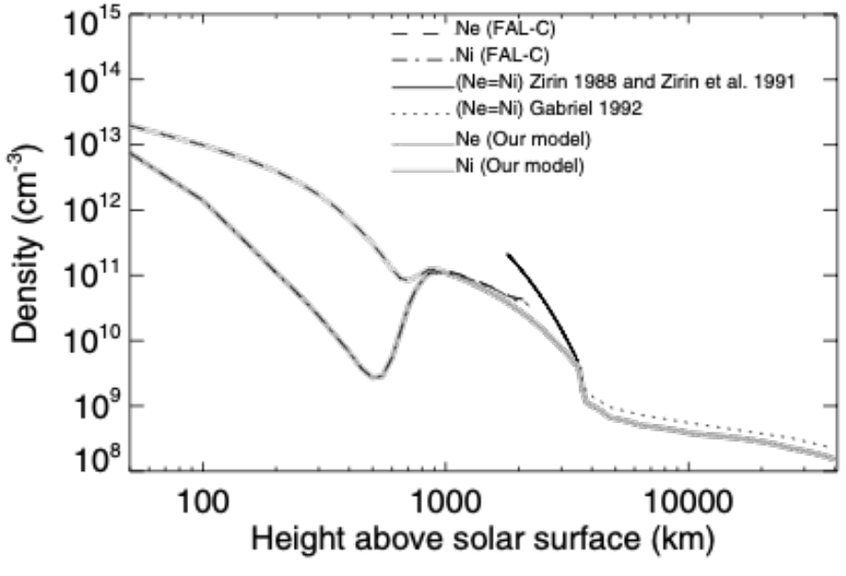


Fig. 2. Temperature (*top*) and density (*bottom*) distribution for the photosphere and chromosphere regions.

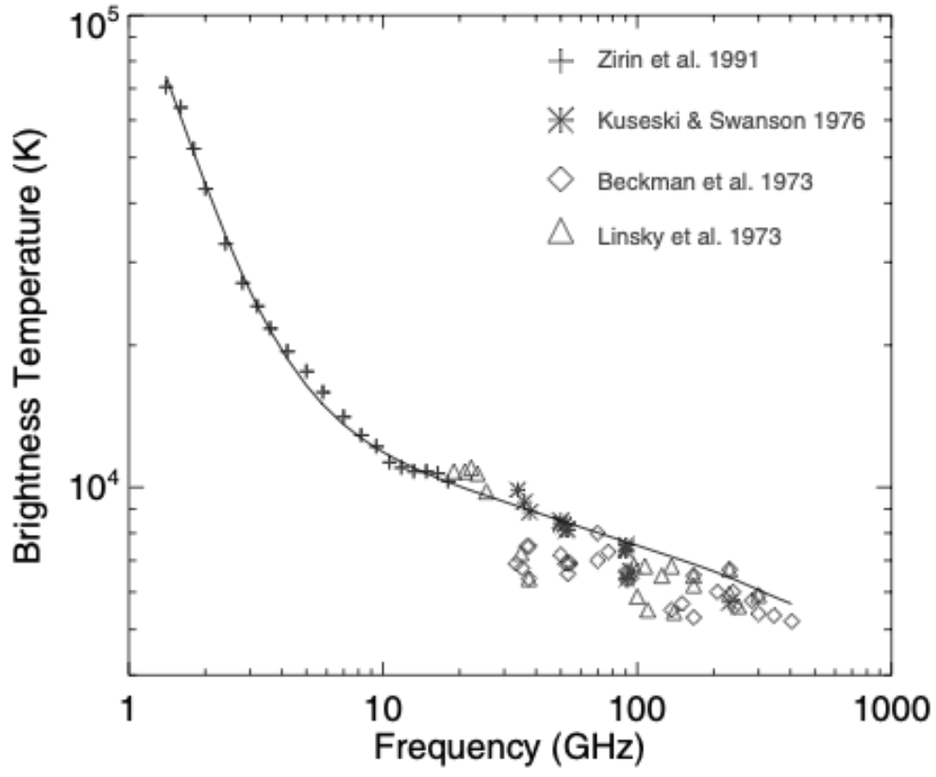
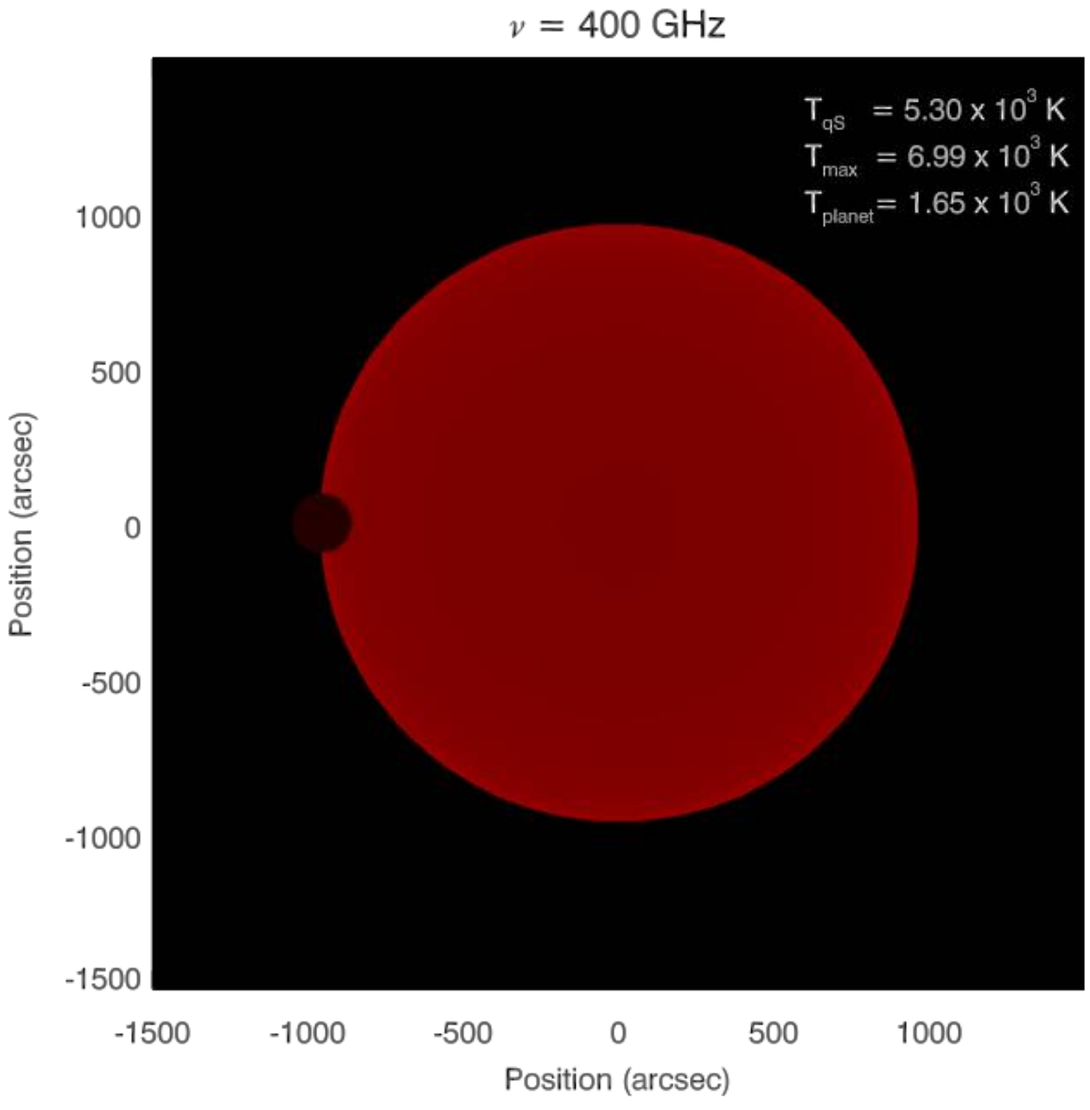


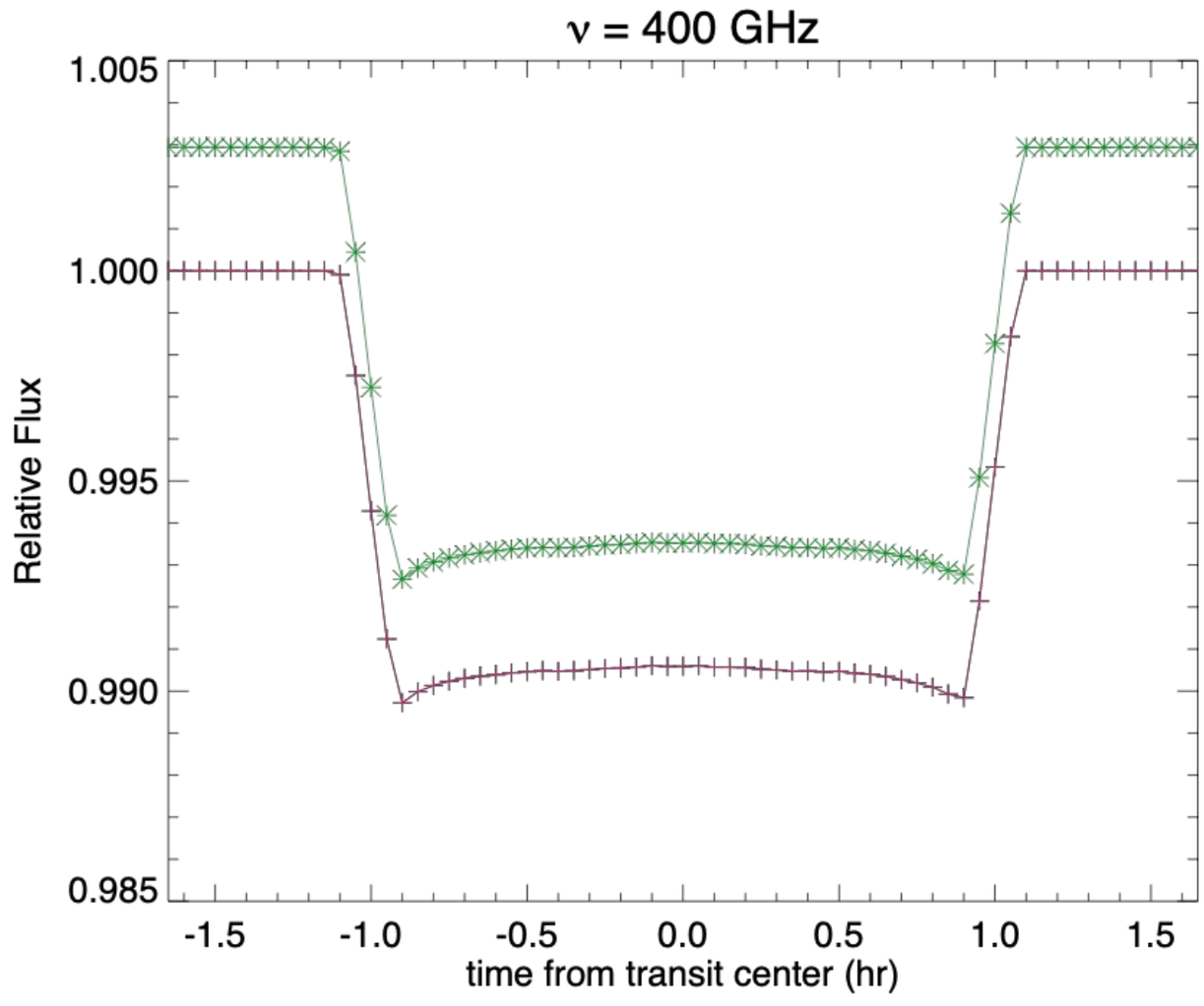
Fig. 3. Brightness temperature of the solar disk center at various frequencies from 1.4 to 405 GHz represented by symbols. The solid curve shows the result obtained from our model.

Selhorst et al. 2005

Simulations with Model — Quiet Sun

- Quiet Sun: Bremsstrahlung emission
- Planet: Black Body with T_B= 1650 K (~Kepler 17b temperature)





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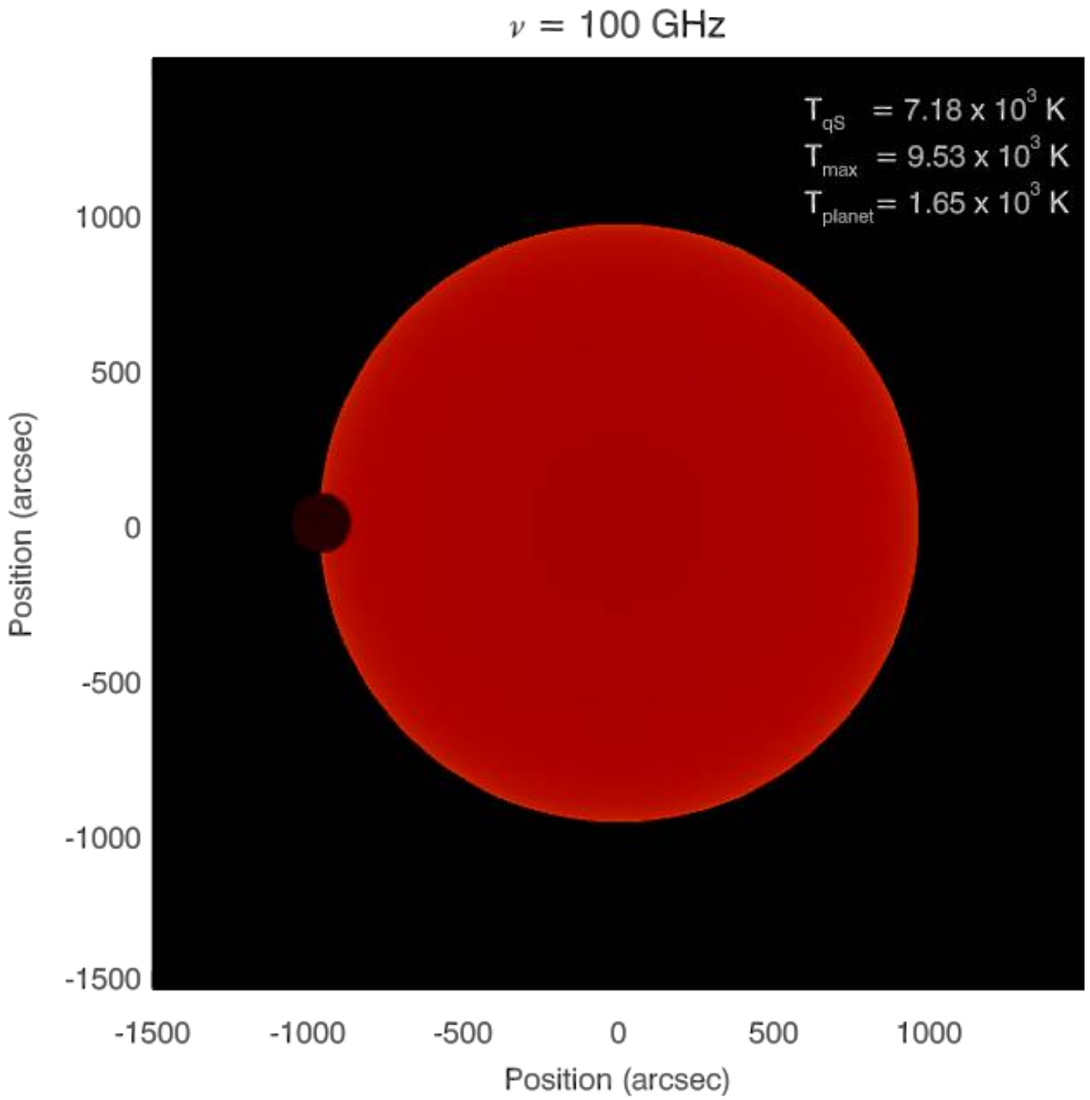

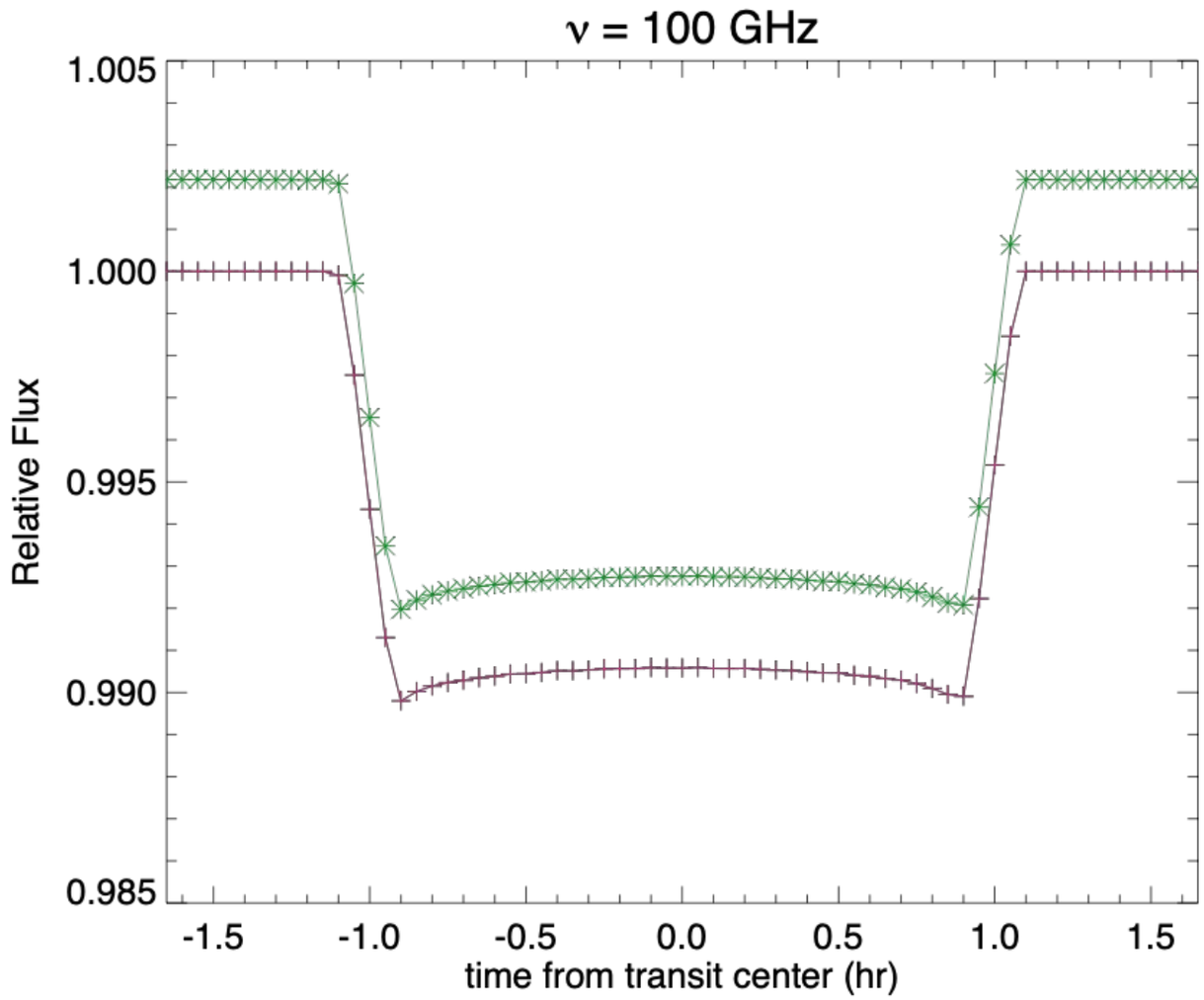

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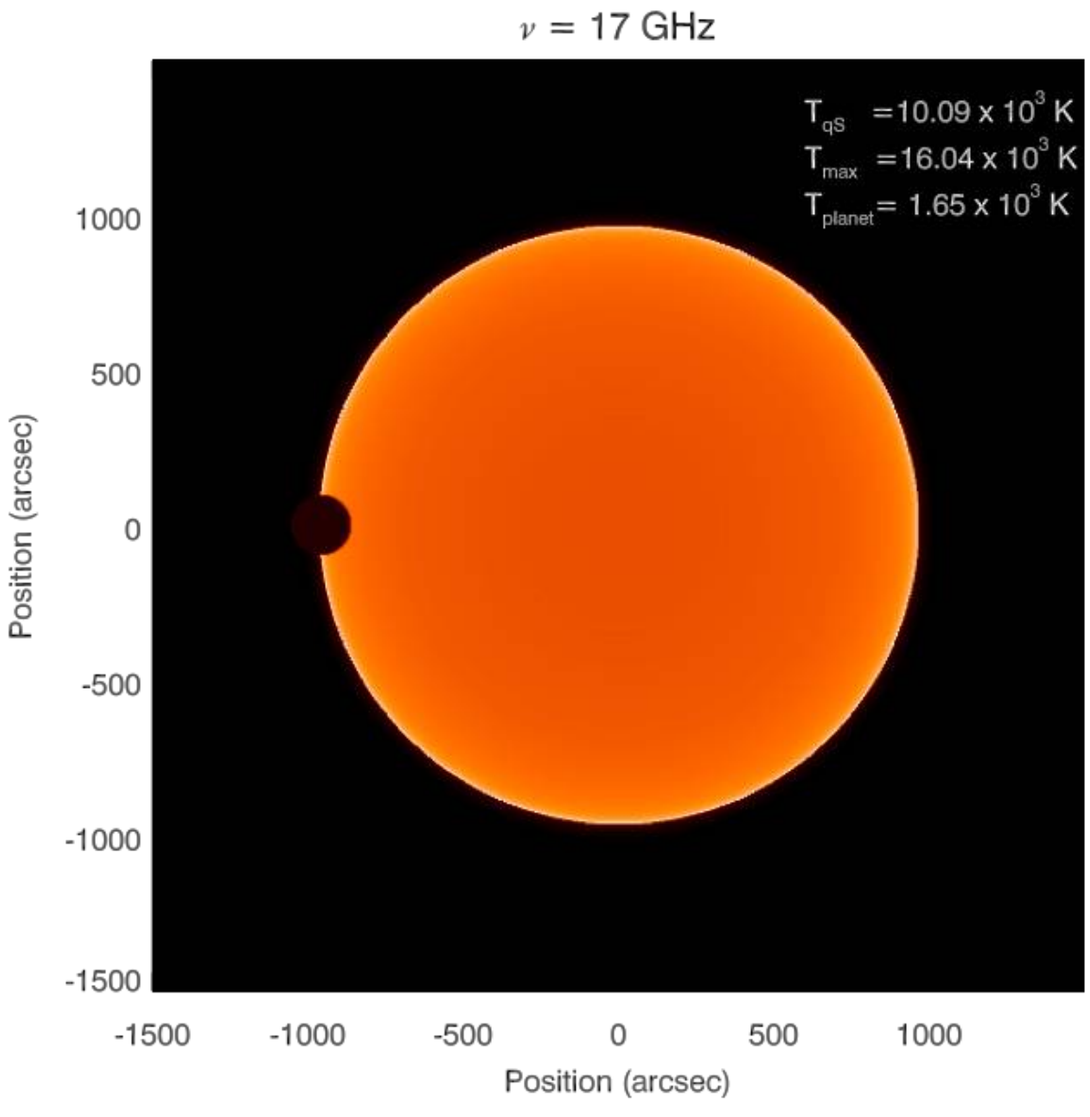

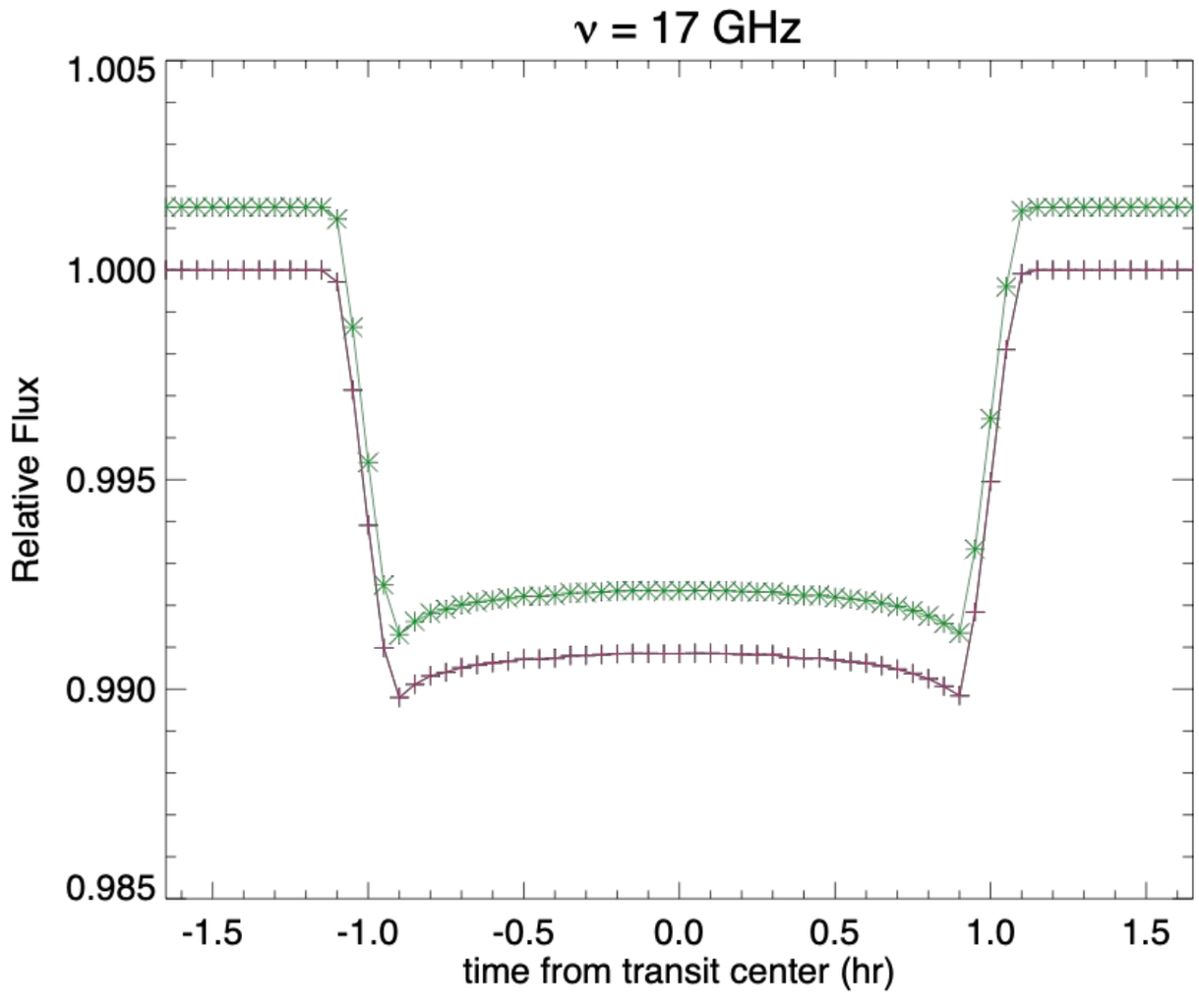

Hot Jupiter Transit at X-ray

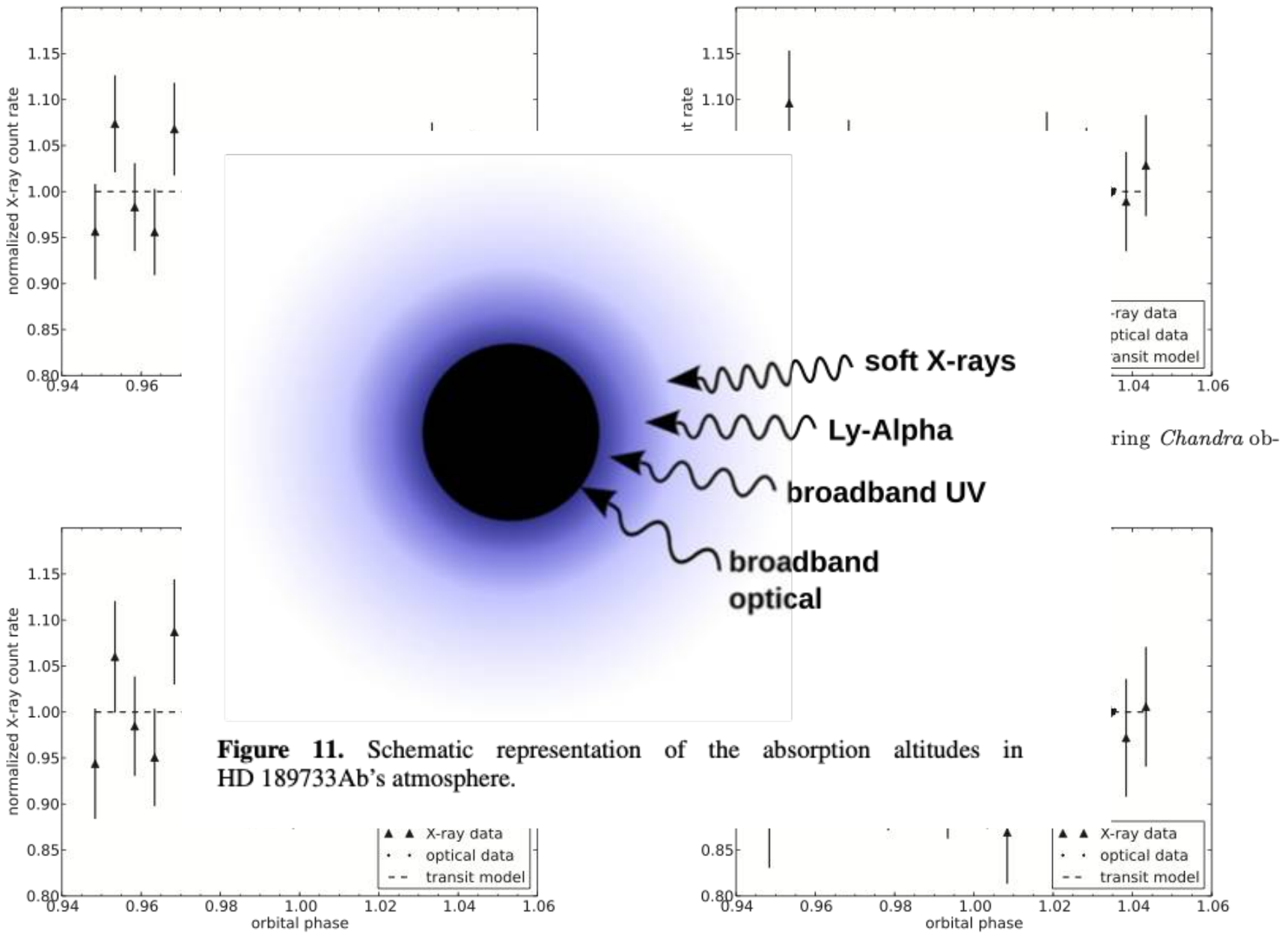

Figure 11. Schematic representation of the absorption altitudes in HD 189733Ab's atmosphere.

(c) Six data sets, excluding the potentially flaring *XMM-Newton* observation

(d) Five quiescent data sets, excluding both potentially flaring observations

Figure 8. X-ray transit in comparison with optical transit data from Winn et al. (2007); vertical bars denote 1σ error bars of the X-ray data, dashed lines show the best fit to a limb-brightened transit model from Schlawin et al. (2010). The X-ray data are rebinned to phase bins of 0.005. The individual figures show different data combinations.

Poppenhaeger et al. 2013

Simulations with Model — Quiet Sun

— Hot Jupiter Atmosphere: following Poppenhaeger et al. 2013
n_e=7x10^9 cm^{-3} at 1.75 R_J, with a scale height of 5000 km and $T_{const.}$= 15 x 10^3 K