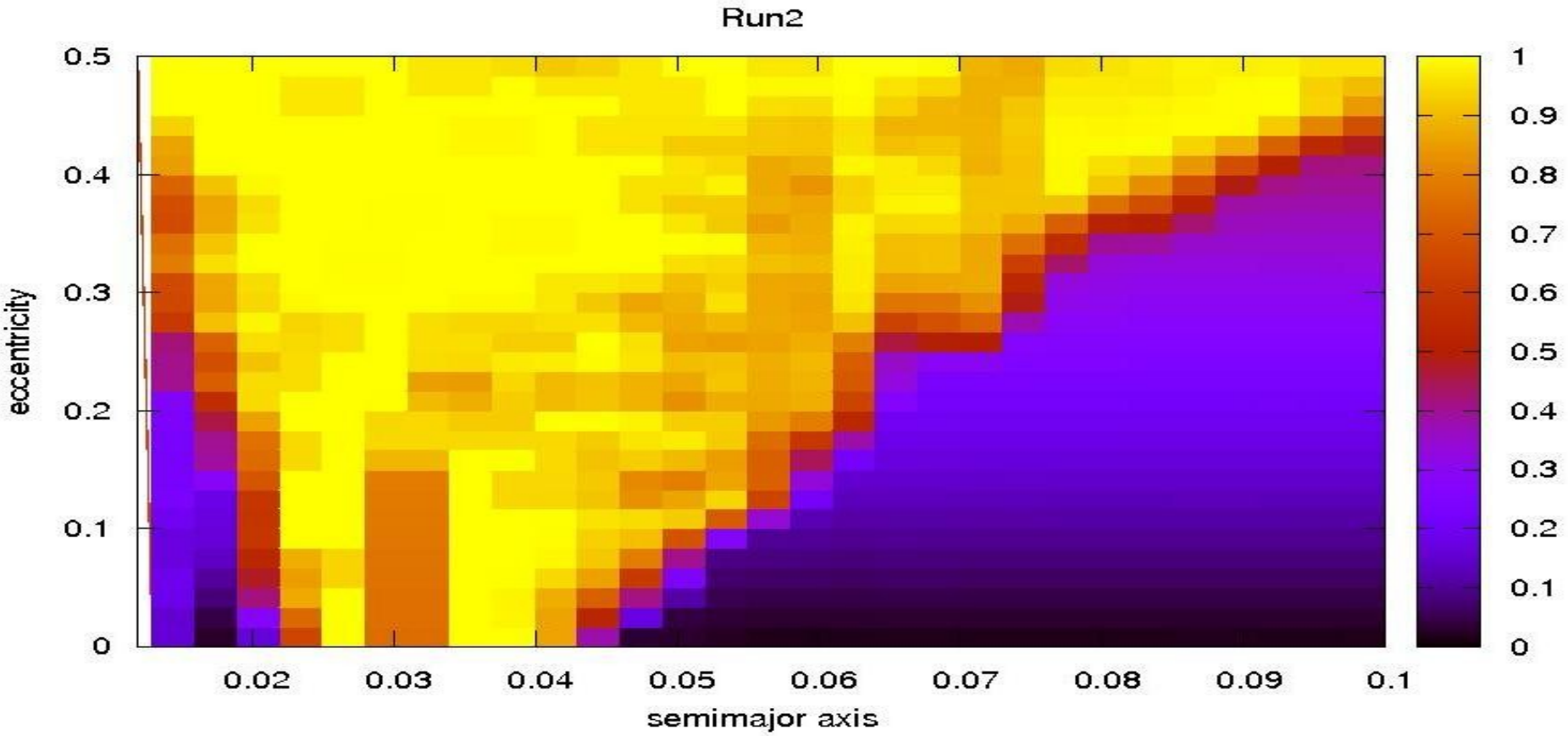
Dynamical Stability of the WASP-3 System



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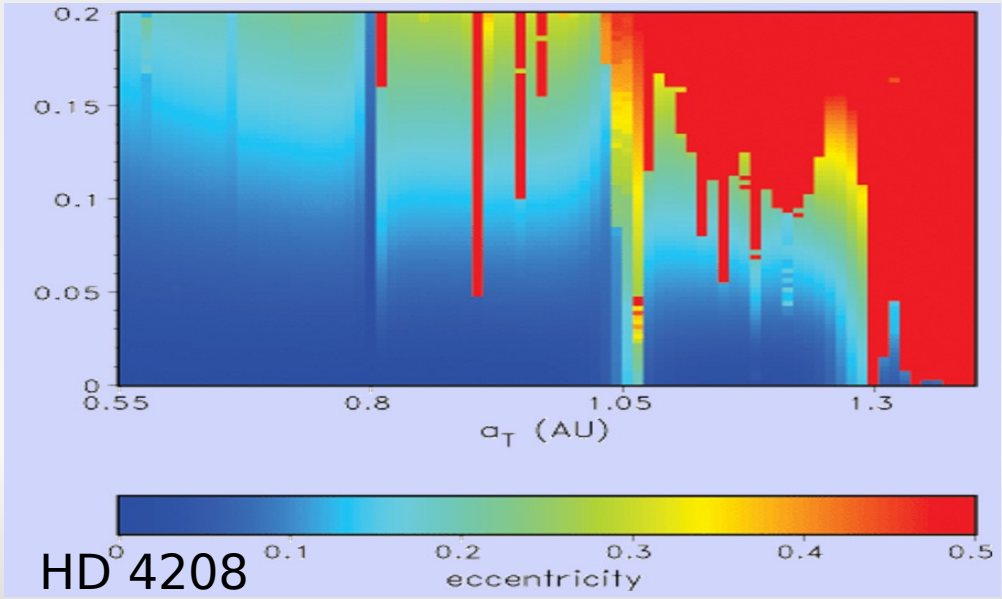
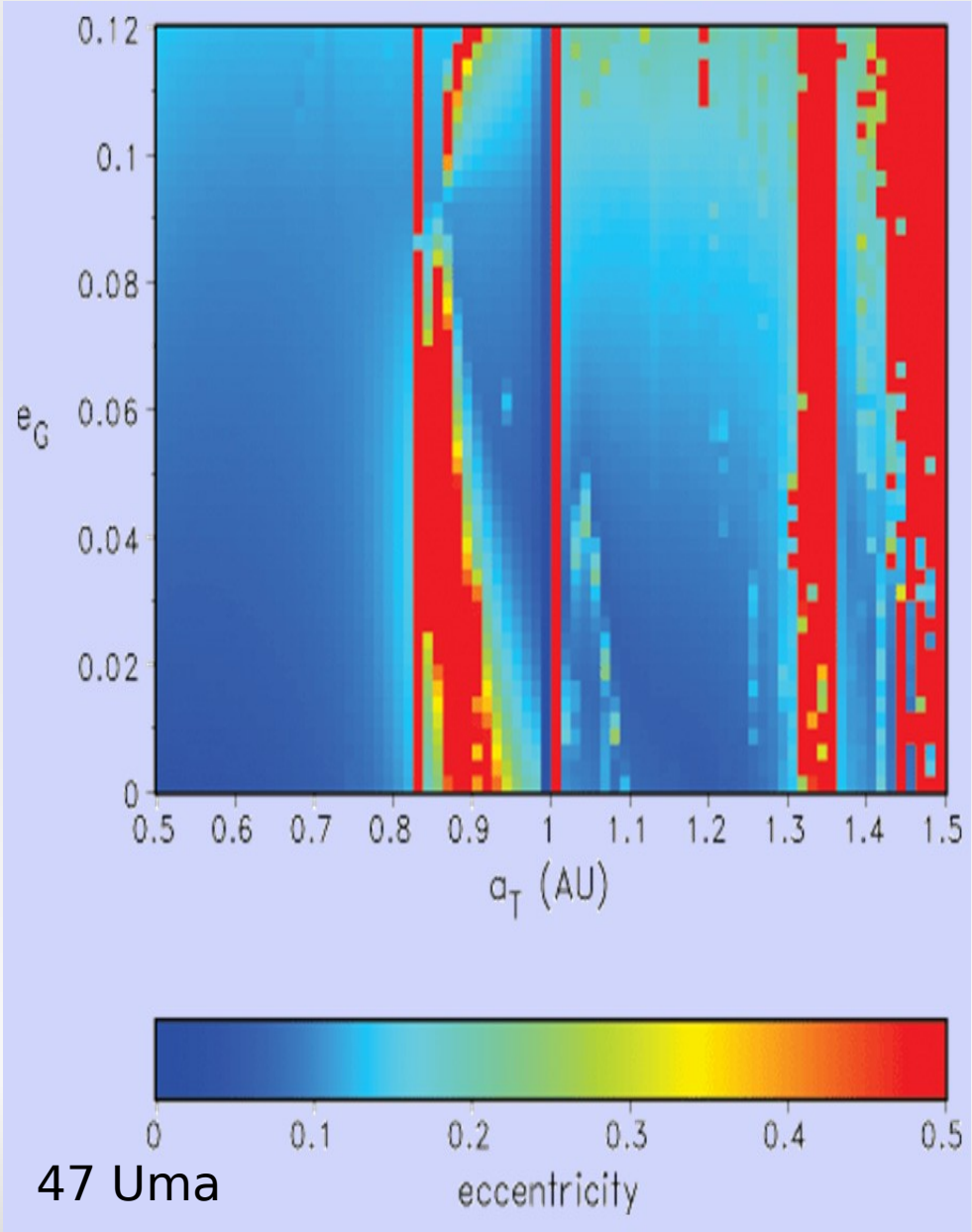
Transit Workshop Jena
16. November 2010

Observations vs. Simulations

- Observations can not give exact orbits
- Additional source of information to constrain observations or the possibility of additional objects
- → Dynamics
- Can numerical simulations help?



HD 4208



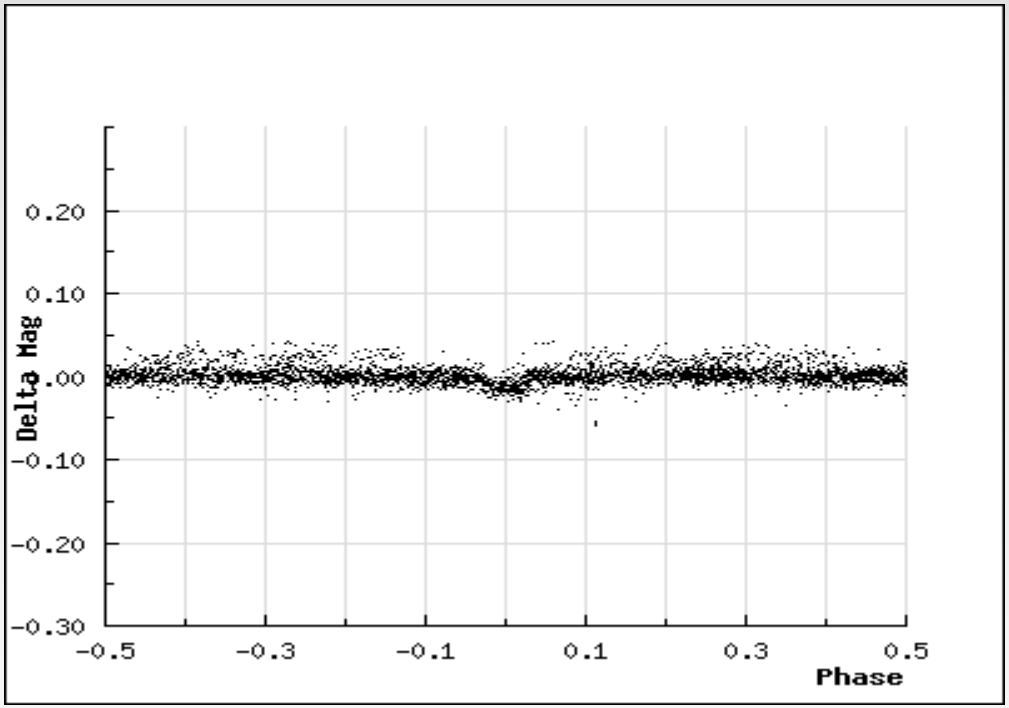
47 Uma

WASP-3

WASP-3: F7V star with 1.24 Msun

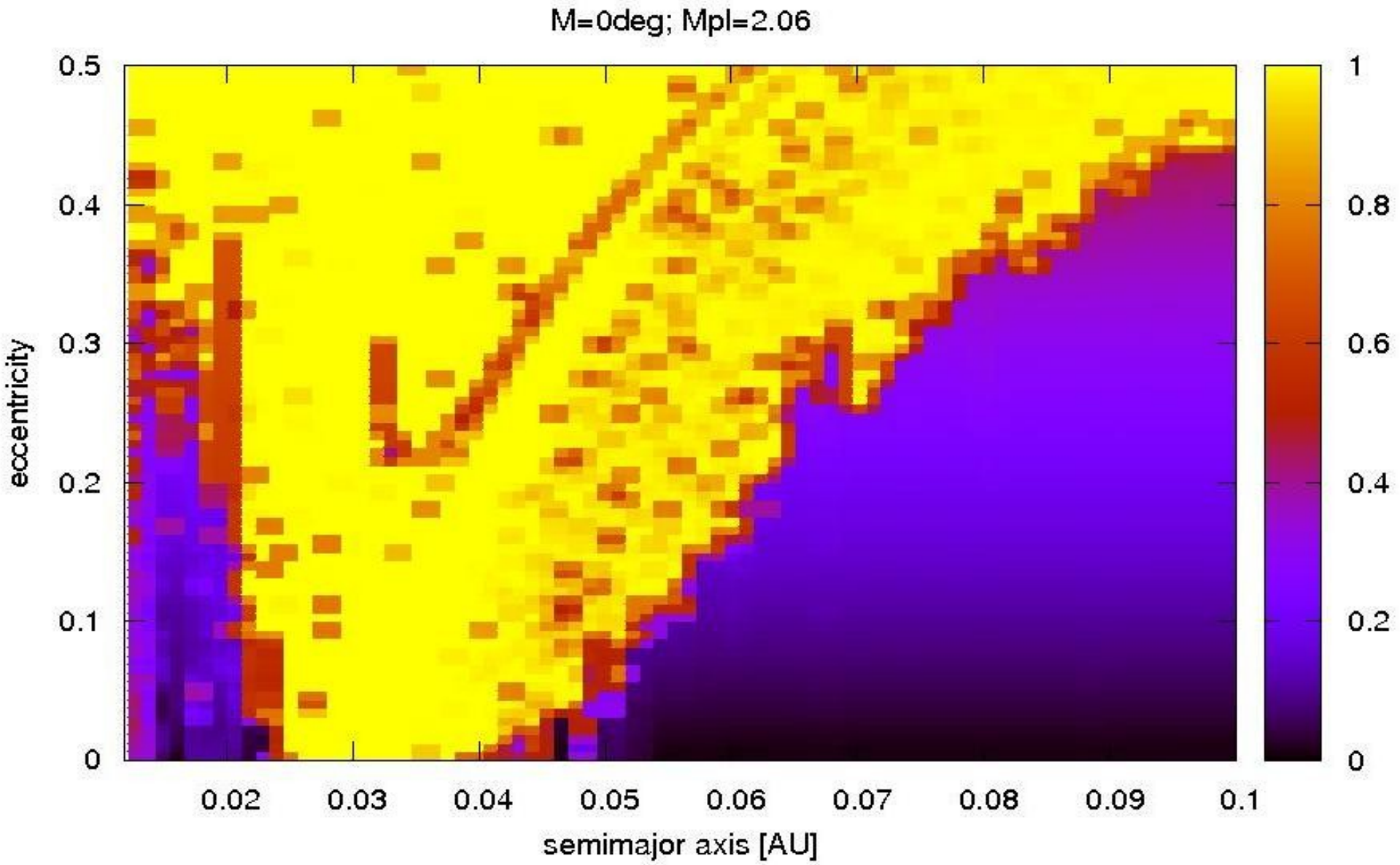
Planet, found in 2007:

- M=2.06 Mjup
- a=0.0317 AU
- e=0



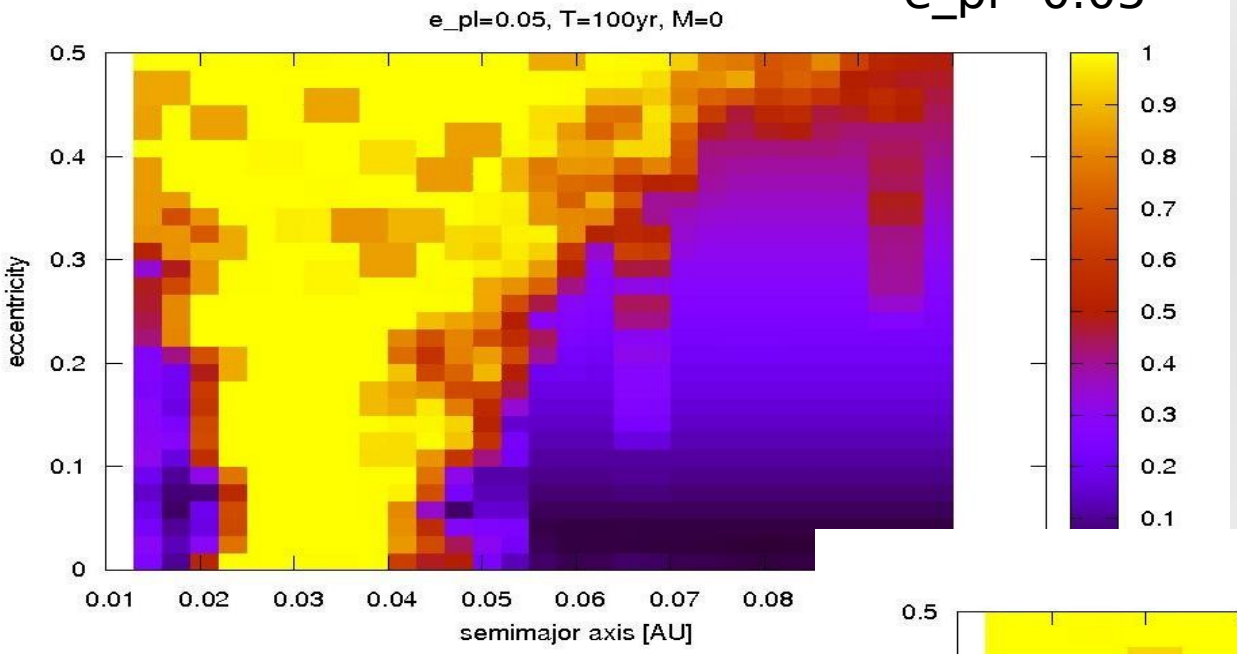
Numerical integration of the system in the region close to the star

Stability Diagram

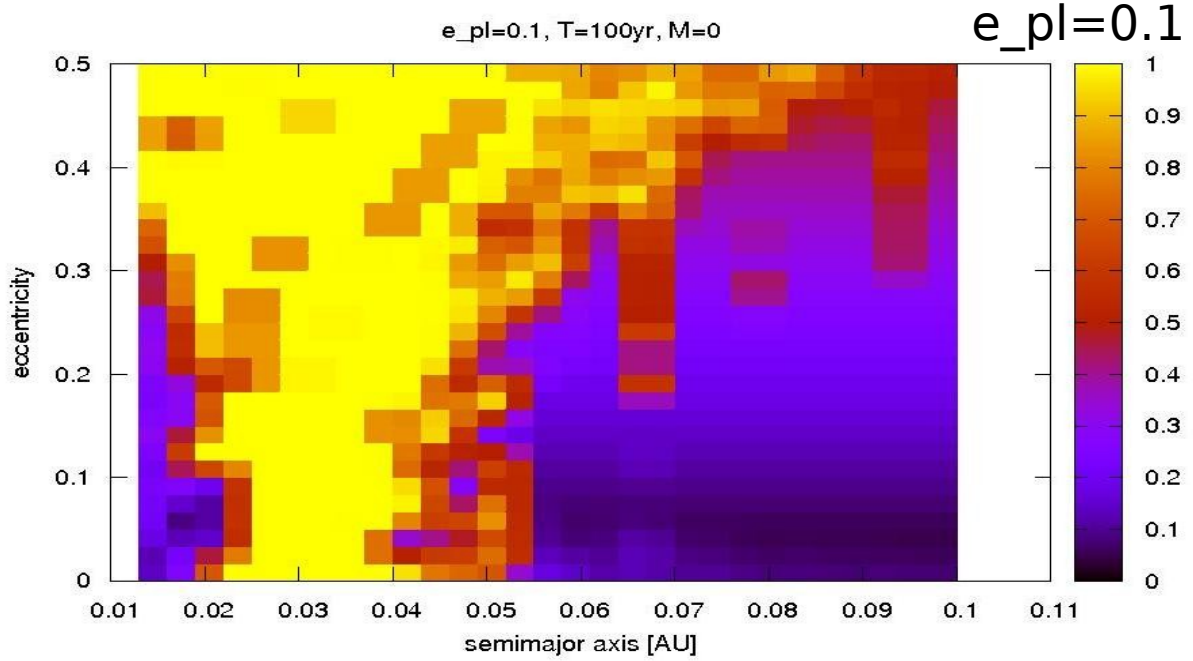


Stability Diagram:changing e_pl

e_pl=0.05

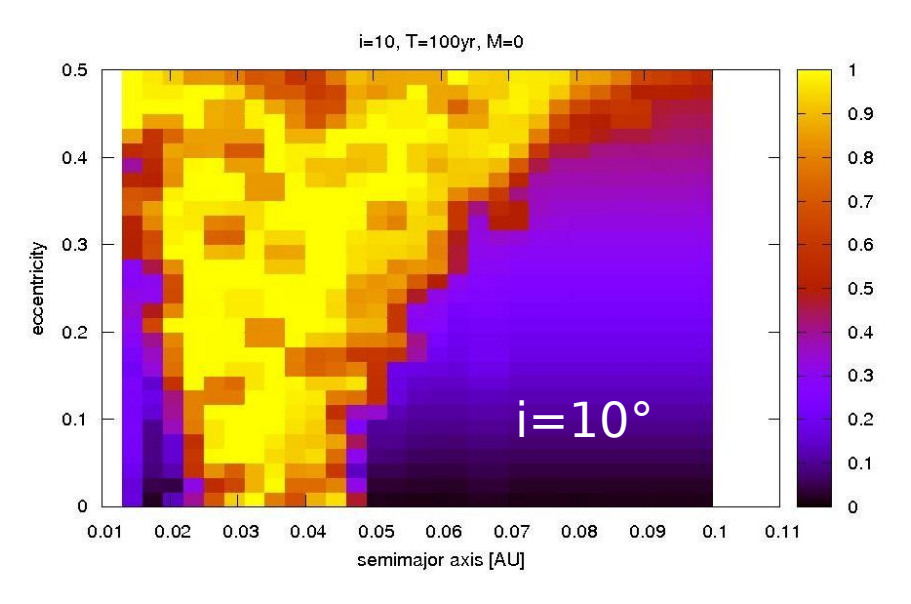


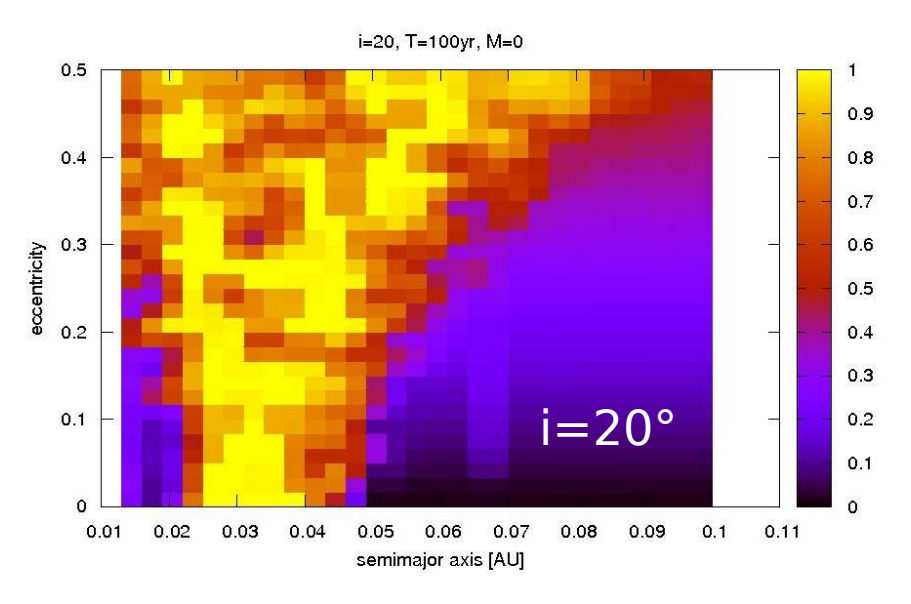
e_pl=0.1

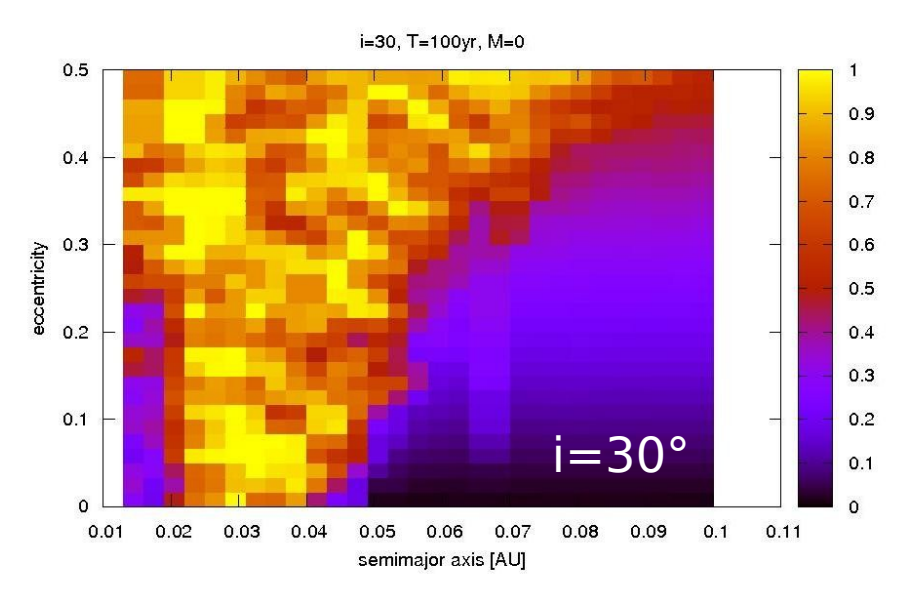


No big difference...

Stability Diagram:changing inclination





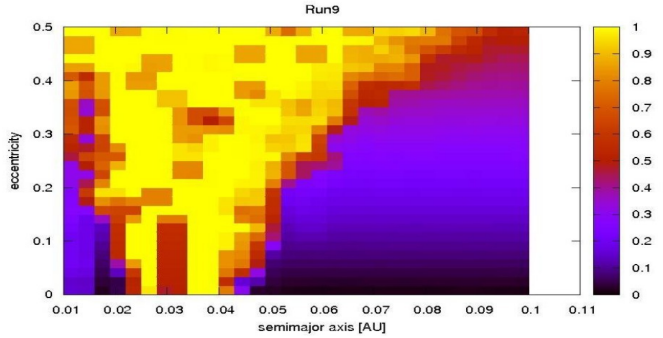


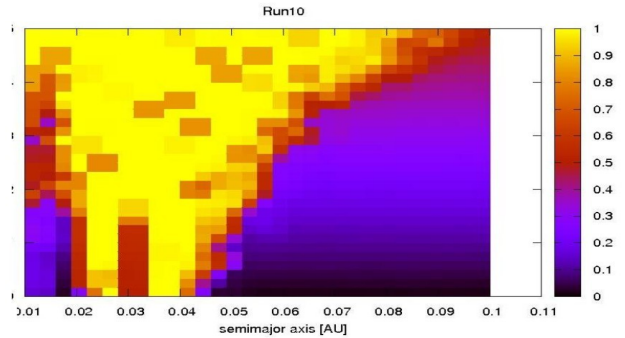
Region of instability dissolves

Stability Diagram:changing mass and eccentricity

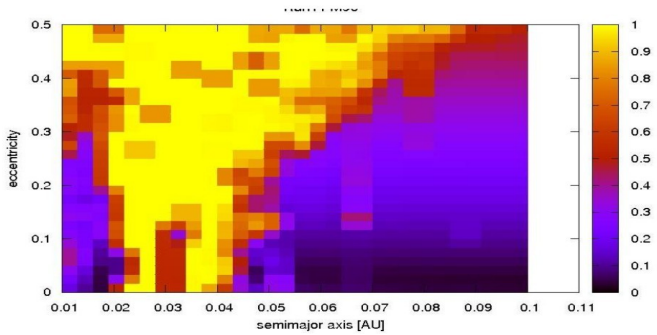
M=1.93 MJ

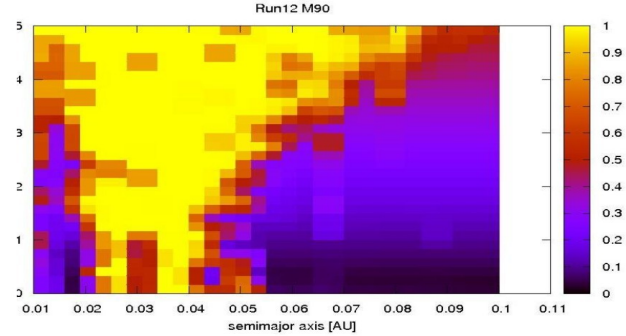
M=2.19 MJ



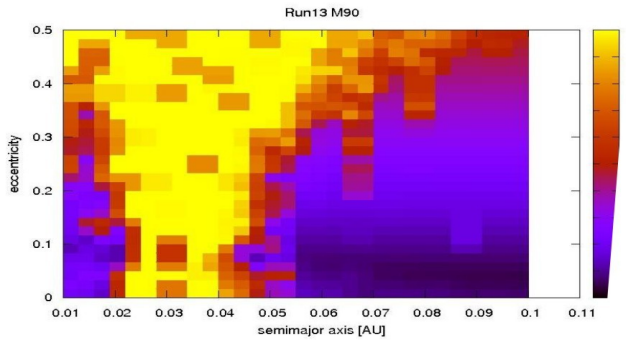


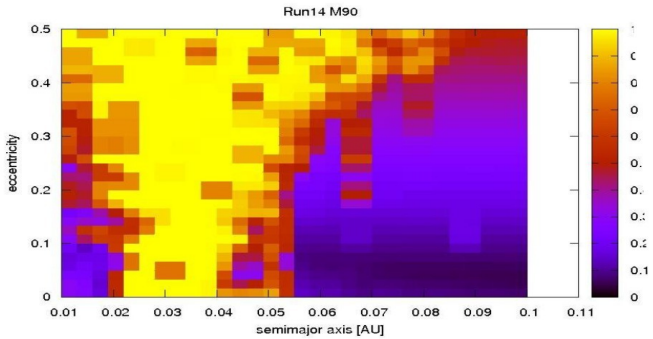
e=0.00





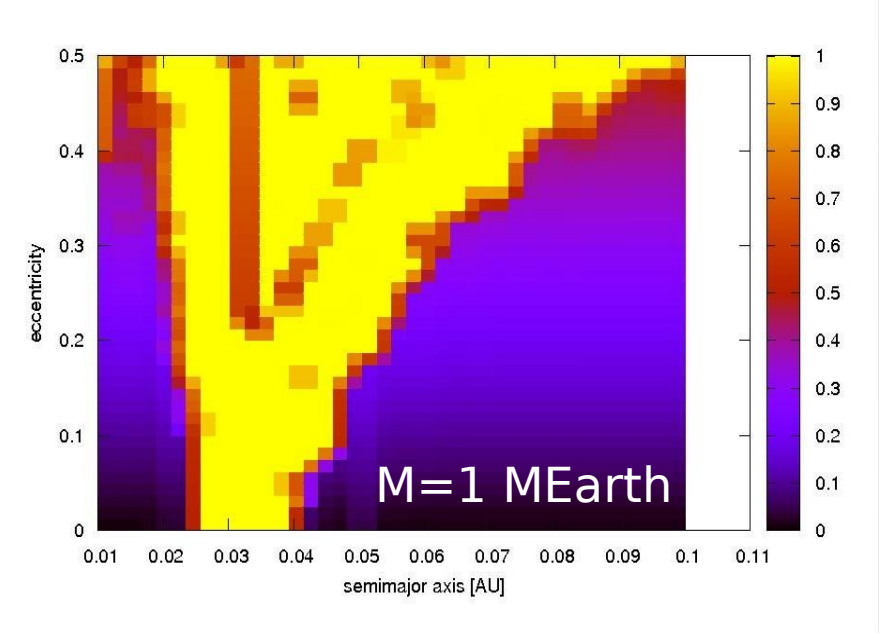
e=0.05

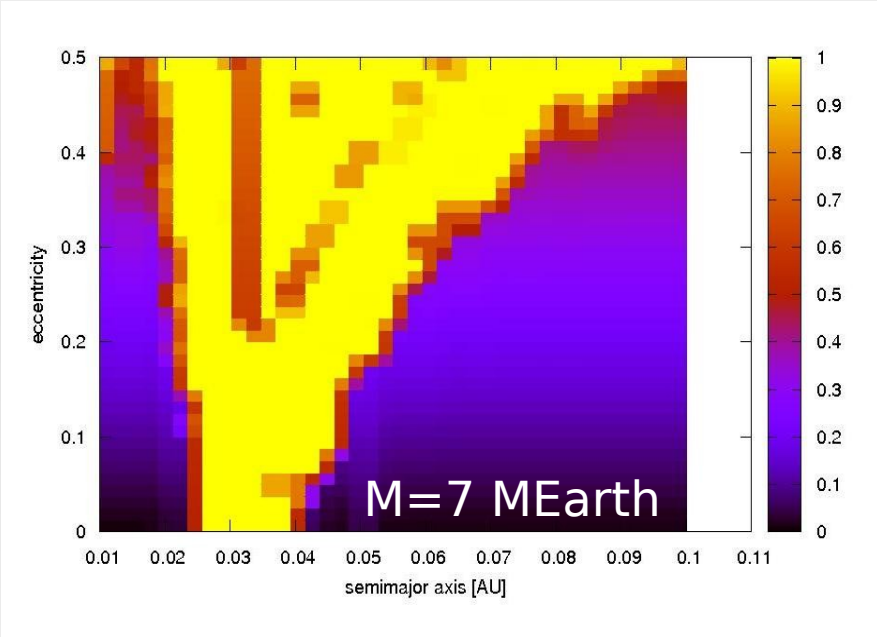


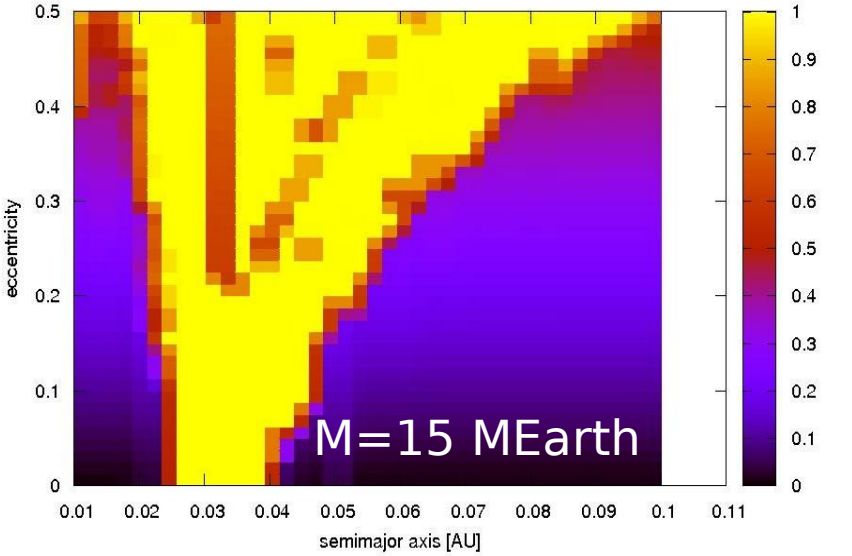


e=0.10

Stability Diagram:changing test particle mass





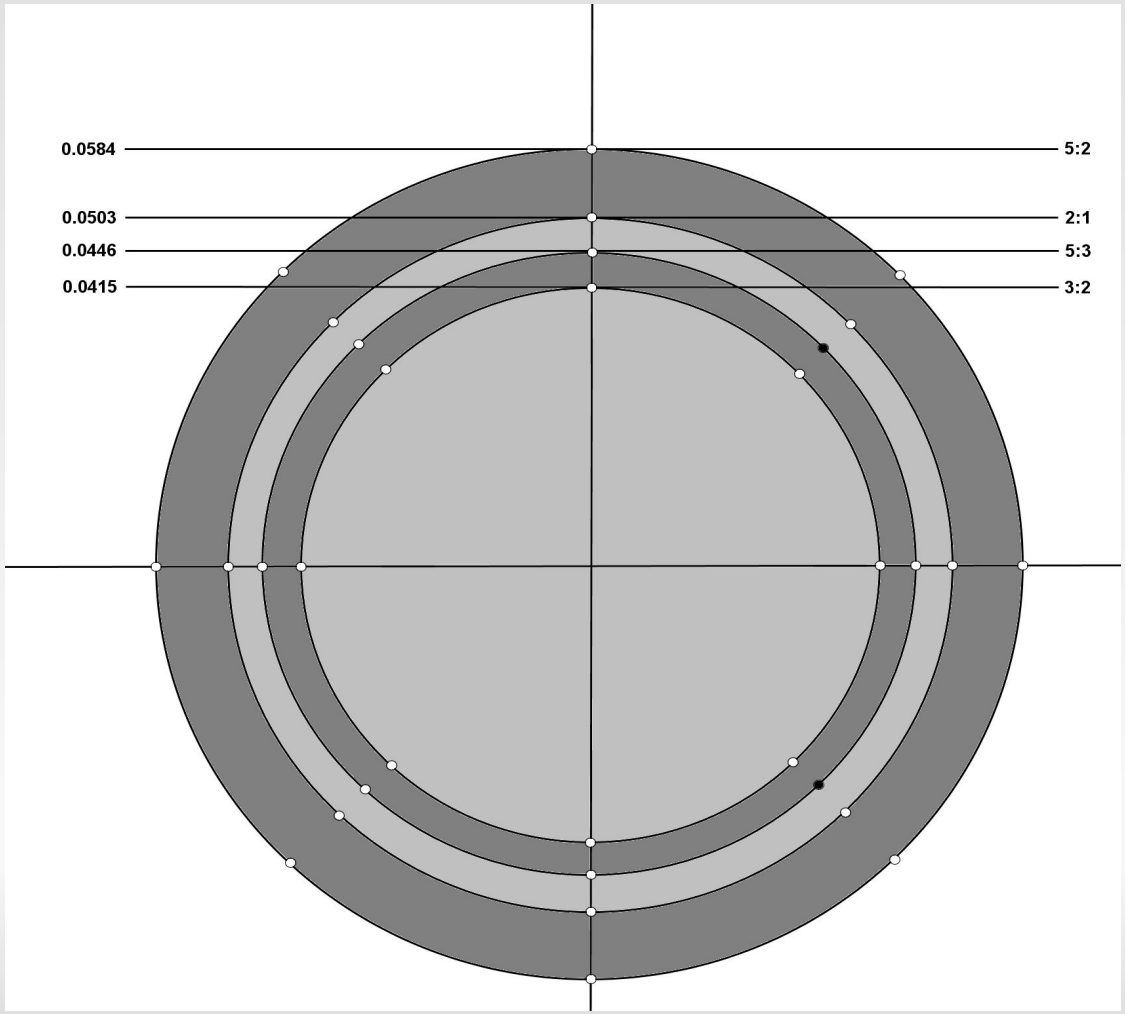


no big difference between 1, 7 and 15 Earthmasses

Conclusions

WASP-3c lies inside the stable region for all variations

Dynamical constraints on the region close to WASP-3b (and c) are not very strong



→ more detailed analysis
→ Resonances !

seem to be very stable
2 unstable positions for 5:3 resonance

The End