KEPLER 36B:A TRANSITING SUPER-EARTH WITH AN EARTH-LIKE INTERIOR STRUCTURE.

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Introduction: Launched on 6th March in,2009,NASA's Kepler mission searches the terrestrial exoplanets in size ranging from similar to Earth to super-Earths. Kepler-36 is a subgiant which is about 1534 light-years from Earth and is located in Cygnus-constellation.The star is surrounded by two known planets signed Kepler-b and c,which orbit relatively close to its star with average orbital periods of 13.84 (b) and 16.23 (c) days.The central star is approximately 1,071 times larger in mass and 1,626 times larger in radius than our Sun,furthermore,this is 2-3 billion years older than that of the our star.The stellar and planetary parameters are represented in Carter et al. [1].

The smaller planet is thought to be terrestrial one with radius of 1.486 $R_\oplus$,and mass of 4.45 $M_\oplus$.The large-sized planet named c differs from b in mass and radius: M= 8.08 $M_\oplus$ and R= 3.679 $R_\oplus$.Their average densities are calculated to have 0.89 and 7.46 gcm^{-3} differing by a factor of 8.Consequently, planet c is a volatile-rich one including substantially H/He atmosphere and thus it can be similar to Neptune.The two planets have closest approach about every 97 days within 0,013 AU and they show significant tidal forces.The enormous gravitational tides raise reasonably great stretch in both planets causing more powerful geological activity in case of the planet b, thus its surface is partially covered by lava.

In this study,I present a possible composition of the planet Kepler 36b,that model has been approached using simple methods taking into account the average density.

Interior structure model for Kepler-36b: Supposing an Earth-like composition for Kepler-36b,I suggest a plausible scenario based on the observed parameters.Owing to its high internal temperature,this planet is expected to have a liquid outer core and has a solid inner core of mainly Fe content that corresponds to that of Earth.In this model,the lower mantle mostly composed of silicate-post-perovskite and of silicate-perovskite [(Mg,Fe) SiO_3 +(Mg, Fe) O] in smaller mass fraction (post-silicate-perovskite is the high-pressure phase of silicate perovskite)[2].The upper mantle consists of wadsleyite and ringwoodite.Moreover,the uppermost layer of the mantle is built up by olivine [$(Mg, Fe)_2$ SiO_4].Vinet equation of state [3,4] is used to create basic physical parameters for the planetary interior.The zero pressure densities of main compounds have been utilized for calculations:8.3 g/cm^{-3} (iron), 3,22g/cm^{-3} (silicate-perovskite) , 4.26 g/cm^{-3} (post-silicate-perovskite).

Results: Calculating the internal structural ratios,I find that the Kepler-36b may has medium sized metallic-core with radius 0.796 $R_\oplus$ computed, which is shown in Figure 1.Thus,the internal structure of this planet is inferred to be Earth-like with CMF which is approximately 32.26 % of the total mass.Moreover,the core of Kepler-36 b is less with 0.3 percent in radius than if the core radius would correspond to a theoretically calculated Earth-like core mass fraction.

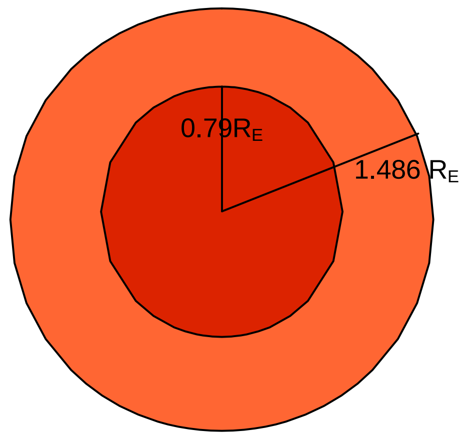

Figure 1. The interior structure of Kepler-36 b with an approximately Earth-like core/mantle mass ratio.

Summary: In the few last years,the search of low-mass exoplanets with precise observational techniques resulted more confirmed rocky planets.Such type planets as Kepler-36b might be particularly interesting objects in which the tidal forces yield more intensive geodinamics.

References:[1] Carter,J.A. et al.(2012) *Science* **337.**556-559.[2] Litaka, T., Hirose, K., Kawamura, K., Murakami, M.(2004) *Nature* **430,**442-445. [3] Vinet P. et al.1987.*J.Geophysical Research*,**92,**9319 [4] Vinet P.et al.1989.*J.Phys.Cond.Matter*,**1,**1941