Orbital, thermal and magnetic electrons

Brinley Patterson[1]

[1] *Email: brinpat@virginmedia.com*

This extract will analyse planetary electrons by grouping them into three distinct categories of orbital electrons, electrons causing thermal currents and electrons causing magnetic fields. From this a method of categorising planets is found with links to their surface gravitational acceleration. Proceeding from this, 2D and 3D models are formed representing electrons up to planets. These models utilise the idea of electron orbitals and the way they converge to circles with high frequencies and so in 3D, convergent spheres are formed.

INTRODUCTION

By constructing three electron groups orbital, magnetic and thermal it is possible to categorise planets of the solar system and provide estimations for their electron numbers. This provides potential insights into core activity as well as a possible way to analyse surface gravitational forces.

FINDING TOTAL NUMBER OF ELECTRONS

The number of electrons within a planet can be found with,

$$N_{electrons} = 0.49\frac{m_{planet}}{m_{proton}}, \tag{1}$$

where 0.49 in equation 1 is due to there being slightly less electrons compared to protons. From this it is possible to find estimations of the total electron numbers in any planet we know the mass of. For example, on Earth $m_{planet} = 5.972E24$kg and $m_{proton} = 1.6726E-27$kg thus using equation 1 we find $N_{electrons} = 1.75E51$ as seen in the second column in table I.

ORBITAL AND FREE ELECTRONS

From the total number of electrons $N_{electrons}$, it is possible to find estimations for the number of orbital $N_{orbital}$ and free electrons N_{free}. First we find the charge ratio Q_{ratio} between orbital electrons and total number of electrons,

$$Q_{ratio} = q_e\frac{N_{electrons}}{N_{orbital}}. \tag{2}$$

The acceleration due to this charge ratio in equation 2 can be found using $F = ma$ ($Force = mass \times acceleration$) [1] where q_e is electron charge as follows,

$$acceleration = \frac{F}{m} = \frac{EQ_{ratio}}{m}, \tag{3}$$

where electric field E becomes negligible as $Q_{ratio} >> E$ and so $EQ_{ratio} \approx Q_{ratio}$ hence equation 3 becomes,

$$acceleration = \frac{Q_{ratio}}{m}. \tag{4}$$

Note that,

$$\frac{N_{electrons}}{N_{orbital}} = \frac{N_{free} + N_{orbital}}{N_{orbital}}. \tag{5}$$

By applying equation 2 to equation 4 and then use equation 5 we find that for an electron with charge q_e and mass $m_e = m/N_{electrons}$,

$$acceleration = \frac{N_{free} + N_{orbital}}{N_{orbital}}\frac{q_e}{m_e}, \tag{6}$$

let a denote the resulting acceleration,

$$\frac{N_{free} + N_{orbital}}{N_{orbital}} = \frac{am_e}{q_e}, \tag{7}$$

as $N_{free} >> N_{orbital}$ then $N_{free} + N_{orbital} \approx N_{free}$ and so,

$$N_{ratio} = \frac{N_{free}}{N_{orbital}} = \frac{am_e}{q_e}, \tag{8}$$

In order to find the number of orbital electrons in a planet, we use the following variation of N_{ratio} from equation 8 and derive a ratio for the amount of electrons Ng_{ratio} causing gravitational acceleration a_g,

$$Ng_{ratio} = \frac{a_g m_e}{q_e}, \tag{9}$$

$$Norbital = N_{electrons}Ng_{ratio}, \tag{10}$$

After finding the number of orbital electrons in equation 10 we now find the number of free electrons,

$$N_{free} = N_{electrons} - N_{orbital}. \tag{11}$$

NUMBERS OF ORBITAL, THERMAL AND MAGNETIC ELECTRONS

Free electrons can be analysed further by splitting the numbers into two new groups of electrons causing thermal currents N_{TH} throughout the object as well as electrons causing a magnetic field N_{EM}.

The typical equation for a cylindrical coil of wire of length l is,

$$B_{surface} = \frac{N_{EM} u_0 u_r I}{l}, \tag{12}$$

where $B_{surface}$ is the magnetic field at the surface of the cylinder, I is the current in the wire [2], u_0 is relative permeability and u_r is relative permittivity. Long solenoid approximation arrives at,

$$B_{surface} = N_{EM} u_0 u_r I. \tag{13}$$

In order to change from a cylindrical surface $A_{cylinder}$ (with no top and bottom) to spherical volume V_{sphere} we must map equation using the same mapping relationship as follows using r as the radius of the cylinder or sphere,

$$A_{cylinder} \rightarrow V_{sphere}, \tag{14}$$

$$2\pi r^2 \rightarrow \frac{4}{3}\pi r^3, \tag{15}$$

$$r \rightarrow \frac{2}{3} r^{\frac{3}{2}}. \tag{16}$$

Here we have the number of magnetic electrons for a cylindrical area of current flow with the time period of a planetary day T_{day} in seconds,

$$N_{EM} = \frac{B_{surface}}{u_0 u_r I} = \frac{B_{surface} T_{day}}{u_0 u_r q_e} \tag{17}$$

to change to a magnetic spherical field B_{Volume} we apply the mapping from equation 16,

$$N_{EM} = \frac{2}{3}\left(\frac{B_{Volume}}{u_0 u_r I}\right)^{\frac{3}{2}} = \frac{2}{3}\left(\frac{B_{Volume} T_{day}}{u_0 u_r q_e}\right)^{\frac{3}{2}}. \tag{18}$$

We now have an equation which provides us estimations for the number of free magnetic electrons seen in table I.

We can adapt the thermal energy [2] equation E_{TH} with mass m, specific heat capacity c and temperature difference $\Delta\theta$,

$$E_{TH} = mc\Delta\theta, \tag{19}$$

to find an estimation for the number of electrons causing thermal currents by observing the difference between core and surface temperatures $\Delta\theta = \theta_{core} - \theta_{surface}$,

$$E_{TH} = N_{TH} m_e c(\theta_{core} - \theta_{surface}), \tag{20}$$

We can rearrange equation 20 with electron mass and electron numbers,

$$N_{TH} = \frac{E_{TH}}{m_e c(\theta_{core} - \theta_{surface})}, \tag{21}$$

which is used to find thermal electron numbers in table I.

The summation of thermal and magnetic electron numbers provides another equation, similar to equation 11 for the number of free electrons,

$$N_{free} = N_{TH} + N_{EM}, \tag{22}$$

and so we produce a final equation for the three electron categories within planets,

$$N_{electron} = N_{orbital} + N_{TH} + N_{EM}. \tag{23}$$

Planet	Total electron numbers	Orbital electron numbers	Free electron numbers	Free electrons causing thermal currents	Free electrons causing magnetic fields
Mercury	9.67E49	2.03E39	9.67E49	9.67E49	Negligible
Venus	1.43E51	7.14E40	1.43E51	1.43E51	Negligible
Earth	1.75E51	9.75E40	1.75E51	1.75E51	4.17E42
Mars	1.88E50	3.96E39	1.88E50	1.88E50	3.13E37
Jupiter	5.56E53	7.81E43	5.56E53	5.46E53	9.70E51
Saturn	1.66E53	9.94E42	1.66E53	1.60E53	6.21E51
Uranus	2.54E52	1.30E42	2.54E52	2.53E52	9.49E49
Neptune	3.00E52	2.00E42	3.00E52	3.00E52	9.35E41
Pluto	3.82E48	1.06E37	3.82E48	3.82E48	Negligible
Sun	5.83E56	9.71E47	5.83E56	5.81E56	1.23E54
Moon	2.15E49	1.98E38	2.15E49	2.15E49	9.30E39
Titan	3.94E49	3.03E38	3.94E49	3.94E49	Negligible

TABLE I. Electron number estimations.

PLANETARY CORE THEORY

Lets think about the Earth as a scaled-up spherical version of a cylindrical electromagnet. In the inner core of the Earth, the pressure is so great elements become ionised such as Iron which becomes positively charged and acts like a magnetised core.

The outer core is predominantly liquid iron with free electrons which rotate slightly quicker than both the Earth's surface rotation and the solid inner core. This rotation of free electrons produces a current which would potentially amplify the magnetic field of the inner core due to an electromagnetic effect. This acts like a spherical volume of numerous wire coils. Hence these free electrons in the core may be causing magnetic fields[3].

In the mantle, there are numerous electrons causing thermal convection currents. This is the main location for large quantities of thermal free electrons but not the only location. Thermal currents can propagate throughout layers of the Earth via conduction, convection and beta radiation[3]. Alpha and gamma radiation will also be involved in thermal activity and so they will cause a slight error in these calculations.

Any electron orbiting a proton is known as an orbital electron. These can be located all throughout the Earth but become more common towards the Earth's surface. This is due to the fact that thermal energy and pressure provide atoms with energy and increase the chance of particle interactions which may ionise the atoms causing the orbital electrons to become thermal electrons between outer core to the Earth's surface or magnetic electrons in the inner core.

CATEGORISING PLANETS

After conducting machine learning principal component analysis and using theoretically based ideas, a simple continuous model for categorising objects in space was found. This model in figure 1, observes the logarithmic relationship between thermal per orbital electrons and magnetic per orbital electrons.

For Pluto, Titan, Mercury and Venus their magnetic electron numbers were set to 1E24 which allows us to observe them in figure 1 while the value is low enough to be considered negligible.

This graph in figure 1 shows a negative correlation between planets gravitational acceleration g and their thermal to orbital electron ratio. Above the first dashed line at 1.28 thermal to orbital ratio, there are dwarf planets and moons. Pluto with $g = 0.49m^2s^{-2}$ has the largest logarithmic thermal per orbital electron ratio of around 1.32. Both Titan and Earth's Moon are natural satellites with $g = 1.4m^2s^{-2}$ and $g = 1.6m^2s^{-2}$ respectively. These have a thermal orbital ratio of around 1.29 suggesting their core as well as Pluto's, has a greater amount of thermal activity for the amount of orbital electrons.

Between the dashed lines, at 1.26 and 1.28 thermal to orbital ratio, there are rock-based (typically Silicon-based) planets with no atmosphere and very few weather factors. Hence their surfaces remain very settled as seen

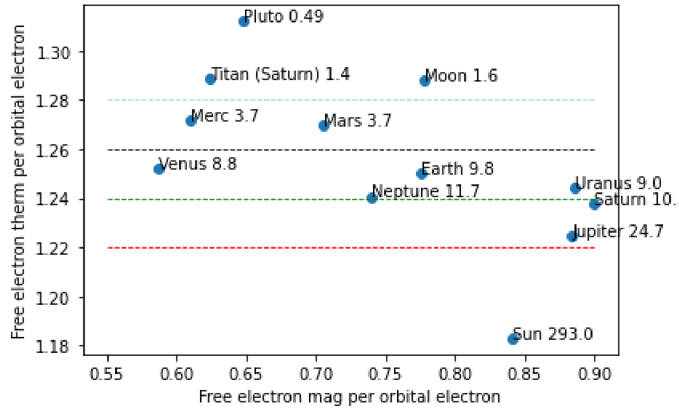

FIG. 1. Categorise planets of the solar system with logarithmic electron numbers. Note thhat the number next to the planets name is its surface gravitational acceleration.

on Mercury and Mars.

For 1.22 and 1.26 thermal to orbital ratio, atmospheric planets can be found. Note that planets with very small magnetic fields such as Venus have a low magnetic to orbital electron ratio. Earth and Neptune are located close by and both have iron cores and moderately strong magnetic fields with magnetic to orbital ratio between 0.73 and 0.78. Saturn has the largest magnetic to orbital electron ratio of 0.9, close by are the other gas giants Jupiter and Uranus. Note that Jupiter has a much lower thermal to orbital ratio of around 1.22 compared to all the other planets.

The Sun is found to have thermal to orbital ratio of 1.18 while its gravitational acceleration is $g = 293m^2s^{-2}$. Its thermal to orbital ratio is significantly lower than all the planets and moons in the solar system suggesting that considering changes in size between planetary objects (related to number of orbital electrons), thermal activity and gravitational acceleration does not change as quickly.

MODELLING PLANETS WITH ELECTRON WAVES AND ELECTRON DISTRIBUTIONS

In figure 2, we can observe how an electron wave function can be estimated by multiple periodic distributions, where each distribution represents the possible locations of electrons. This case represents an electron with an amplitude of 1.78 with 4 mean positions.

In order to model planets in 3D, we begin by creating electron wave polar orbitals on a 2D plane seen in figure 3. Note that the summation of two identical waves or two identical distributions produce the same wave or distribution with double the amplitude (constructive interference). Thus it is possible to simplify models containing large quantities of electrons by setting a unit of frequency

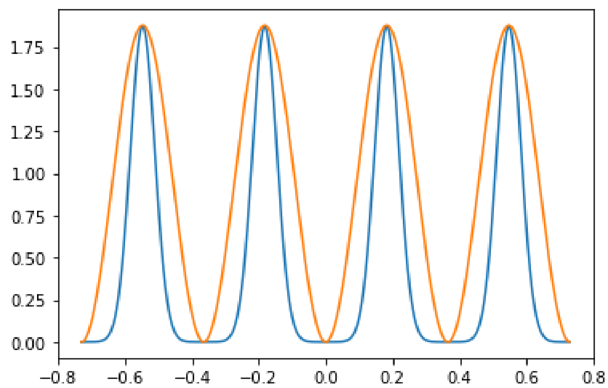

FIG. 2. Comparison of squared modulus sine wave to sequentially summed distributions for modelling electron orbitals.

equal to distributions of electrons otherwise described as a wave of electrons.

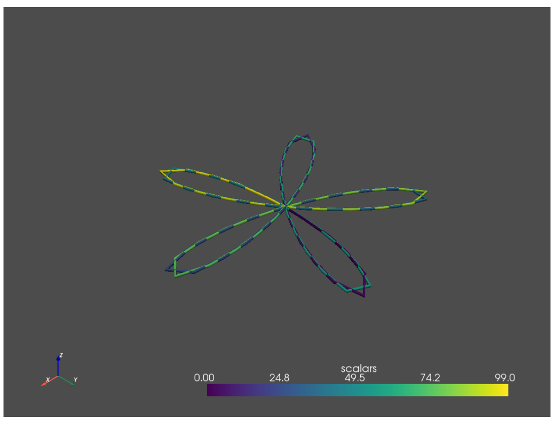

FIG. 3. 2D plane electron orbitals.

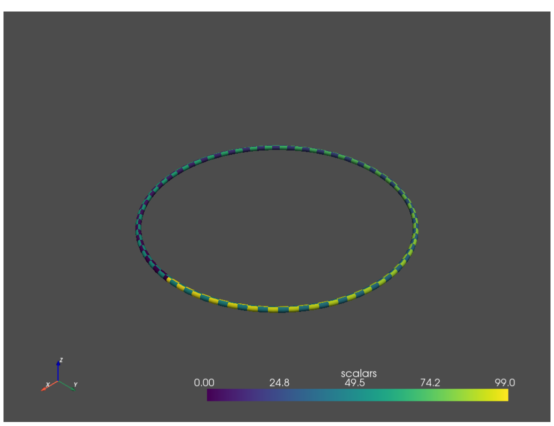

FIG. 4. Electron orbital converges to a circle as the frequency tends to infinity.

For figures 3, 4 and 5, we have gone from constructing electron orbitals in 2D to two perpendicular rings constructed by increasing electron orbital frequencies. This

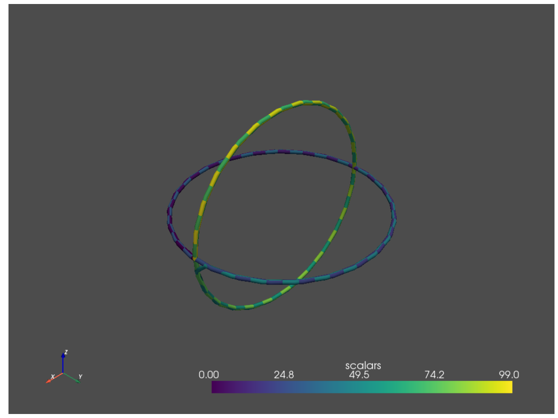

FIG. 5. Perpendicular rings constructed from electron orbitals.

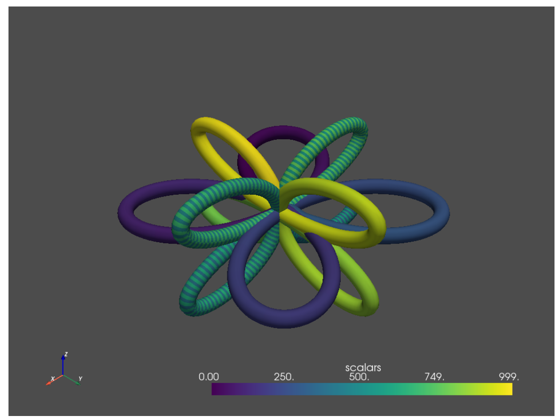

FIG. 6. Electron orbitals in 3D, frequency of 2.

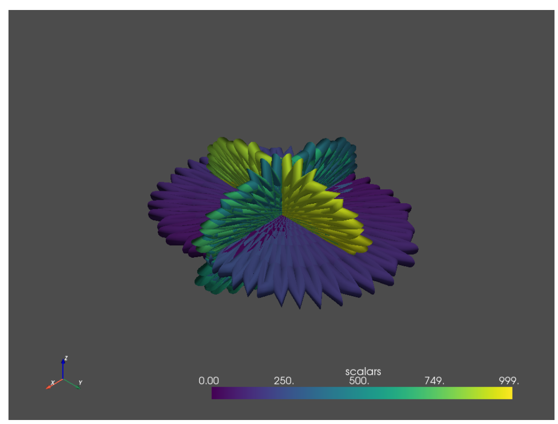

FIG. 7. Electron orbitals in 3D, frequency of 50.

is essentially resembling large numbers of electrons uniformly spread out and so many small electron orbitals combine to form a circular orbital.

Observing figures 6, 7 and 8, we find that as the orbital frequency is increased from 2 to 99, the models 3D spherical polar waves represent the number of electrons increasing. The model converges to a sphere at frequency

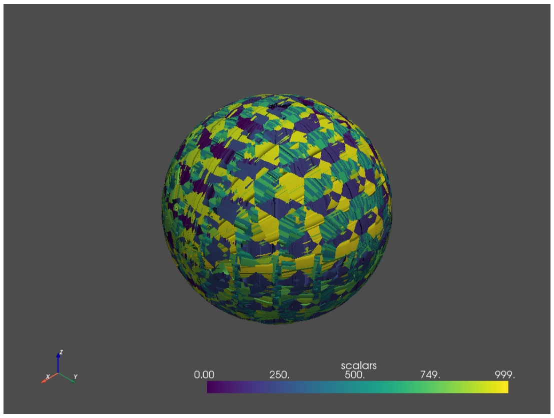

FIG. 8. Sphere constructed from electron orbitals, frequency of 99.

99 which is similar to the previous 2D finding in figure 5. Here we find a possible way to model large spherical quantities of electrons (possibilities for planetary electron models) via electron waves and electron distributions.

MODELLING PLANETARY CORES

In figures 9, 10 and 11, we observe a model of planet Earth utilising orbital, magnetic and thermal electron numbers from table I to determine frequencies of 3 joined models from figure 6. The amplitude W of the electron spherical polar waves, greatly affects the perceived model. By increasing the amplitude from 0.01 to 0.5 we observe the model morph from a sphere into different sections representing thermal, magnetic and orbital electrons.

The outer blue horizontal and green vertical rings in figure 10 represent the thermal electrons, as expected as they have more energy so can propagate further from the centre of Earth. The purple middle horizontal ring represents the orbital electrons relating to Earth's mass and volume. The magnetic electrons in the yellow centre, represents the highly magnetised core.

By increasing W from 1 to 20 in figures 12, 13, 14, 15 and 16, we observe different perceptions of our universe depending on how the observer perceives the amplitudes of waves.

Initially with W as 0.01 Earth is perceived as a volume sphere which is what we are used to. However, as the amplitude is increased the perception changes to volume waves at W = 0.5. For W = 1, the waves become thinner reaching a type of string perception at W = 2. At W = 5 continuity ceases as the strings separate into discrete particles as the amplitudes no longer interfere with one another. Increasing the amplitudes to 20 and 50 cause the particles width to diminish and so they begin to be perceived as being invisible. Note that all of these use the same equations and that only the amplitude is changed.

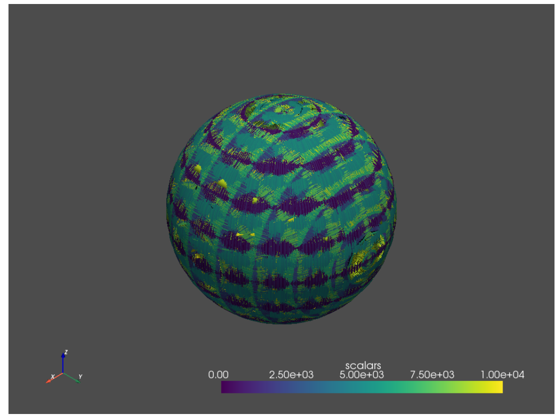

FIG. 9. Spherical volume core, W = 0.01

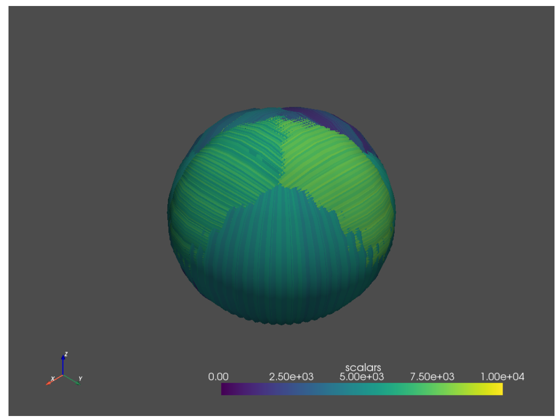

FIG. 10. Bumpy spherical volume core, W = 0.1

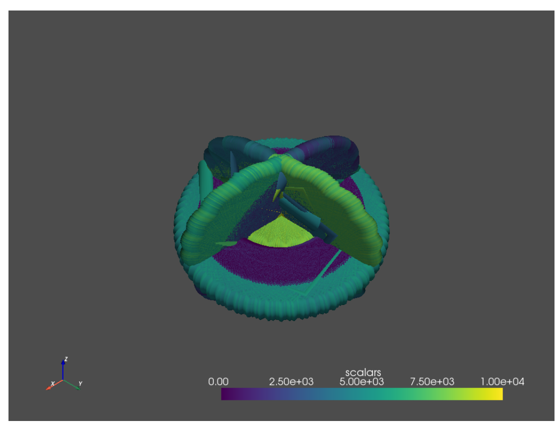

FIG. 11. Volume core, W = 0.5

SURFACE GRAVITATION ANALYSIS

In figure 3 there is a general correlation between planetary surface gravitational acceleration and thermal to orbital electron number ratio. We explore this correlation in figure 17.

Without the logarithmic values, the graph produces

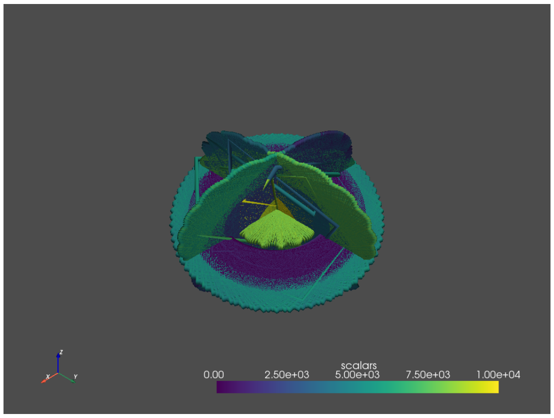

FIG. 12. Waves core, W = 1

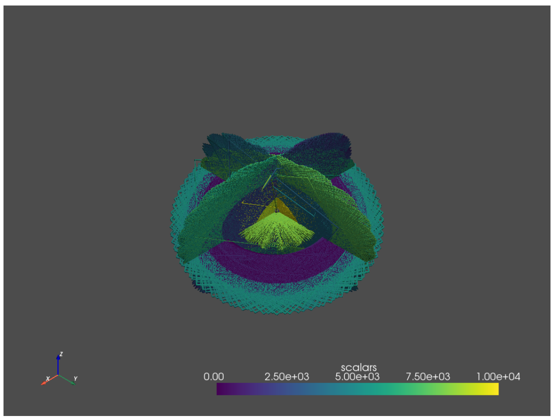

FIG. 13. Strings core, W = 2

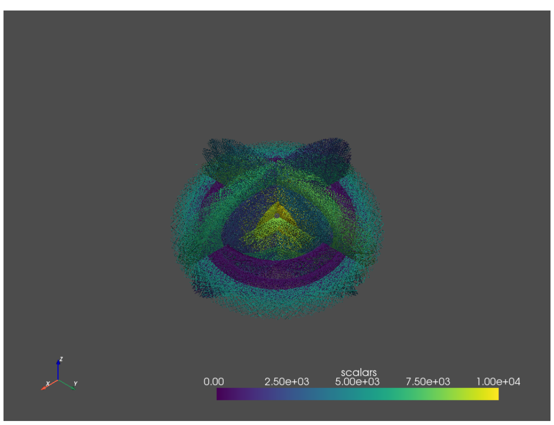

FIG. 14. Particles core, W = 5

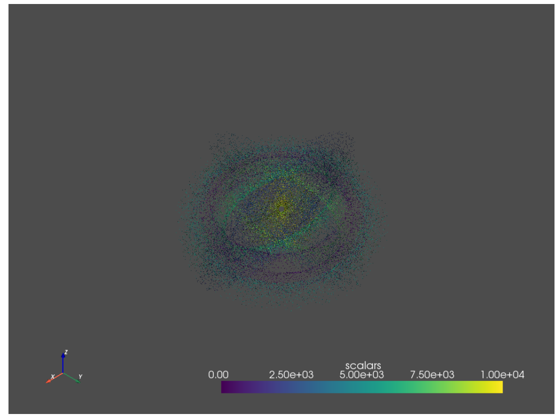

FIG. 15. Diffused particles core, W = 20

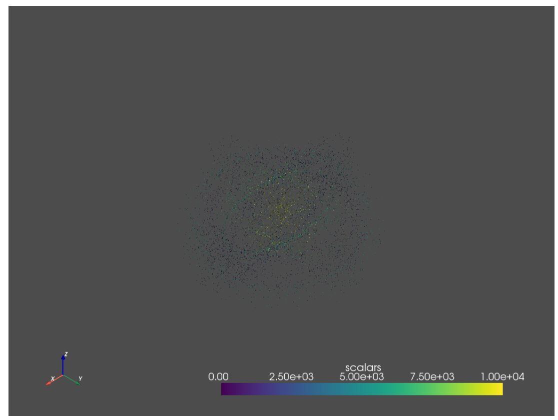

FIG. 16. Disappearing particles core, W = 50

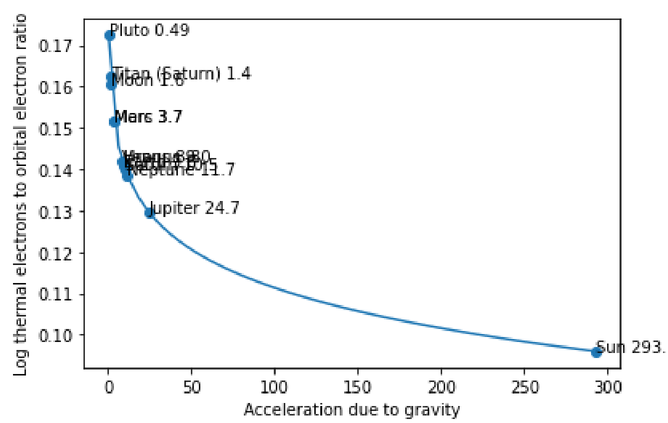

FIG. 17. Inverse exponential relationship between thermal to orbital electron number ratio and acceleration due to gravity.

an exponential of the form $y = \frac{k}{x}$ where $k = 1.76E11$ a constant relating ratio of thermal and orbital electrons to gravitational acceleration. From figure 17 we can now estimate the force per electron causing gravitational acceleration as seen in figure 18.

We find a linear relationship between the force per electron causing gravity and the ratio of orbital to thermal electrons within planets. This linearity has been found to continue up to the Sun and so seems to be a reasonable estimate for our solar systematic bodies at the very least.

After further analysis, the constant was found to be the same as the charge of an electron per electron mass,

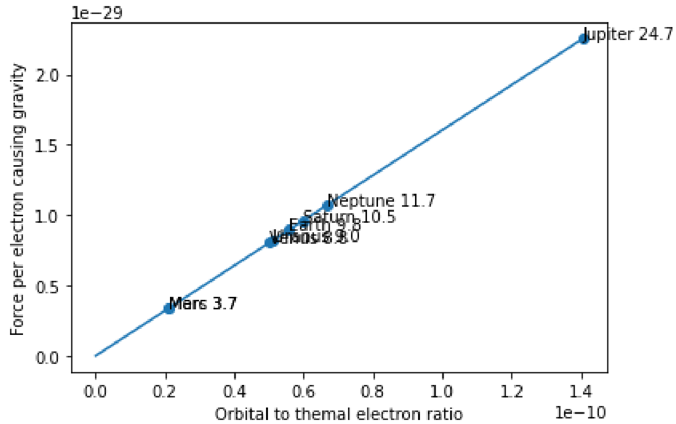

FIG. 18. Directly proportional relationship between force per electron causing gravity and orbital to thermal electron ratio.

$$\frac{q_e}{m_e} = 1.76E11Ckg^{-1}. \tag{24}$$

By applying the new findings from equation 24 and figure 17 we find the following,

$$\frac{N_{TH}}{N_o} = \frac{q_e}{m_e a_g}, \tag{25}$$

$$a_g = \frac{q_e}{m_e}\frac{N_o}{N_{TH}}, \tag{26}$$

where a_g is acceleration due to gravity. Using the results from table I with equation 28, it is possible to calculate the gravitational acceleration at the surface of solar systematic bodies. For example for Earth,

$$a_g = 1.76E11\frac{9.75E40}{1.75E51} = 9.81ms^{-2}, \tag{27}$$

and the Sun,

$$a_g = 1.76E11\frac{9.71E47}{5.83E56} = 293ms^{-2}. \tag{28}$$

Note that the number of orbital electrons is also partially related to the number of protons as electrons require protons to become orbital.

CONCLUSION

The results and findings from this extract seem to suggest that the gravitational acceleration on the surface of solar systematic bodies may be related to the numbers of orbital electrons and electrons causing thermal currents.

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[3] A.P. Vanden Berg, D.A. Yuen, G. Beebe, M.D. Christiansen. *The dynamical impact of electronic thermal conductivity on deep mantle convection of exosolar planets.* (2010). Elsevier.