

# The Asteroid Belt as the Consequence of Resonance Density Convergence From Solar Velocity Around the Galaxy and Universal Dynamic Pressure

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## ABSTRACT

The velocity of the solar system around the galaxy as it moves through universal dynamic pressure of about 0.15 nPa results in a critical mass density of 1.5 protons per cc. Interplanetary measurements indicate this density occurs within the space occupied by asteroids. Quantitative evidence is offered that the matter in asteroid space failed to accrete into a planet because of the disruptive resonance between universal dynamic pressure and the velocity of the system. The model may accommodate the chemical characteristics of the different regions of the asteroid belt and the marked difference in planetary characteristics above (the inner planets) and below (the “gas giants”) the critical density. The energy accumulated within the functional toroidal space between Mars and Jupiter since the formation of the solar system is equivalent to the total mass of asteroids. If energy is still emerging within this region then the probability of non-traditional disruption of orbits for certain masses of asteroids may have significant impact. Specific frequencies that should show enhanced power based upon these calculations are derived.

**Keywords:** origin of asteroid belt; universal dynamic pressure; intrinsic frequencies; matter formation; solar system

## 1. INTRODUCTION

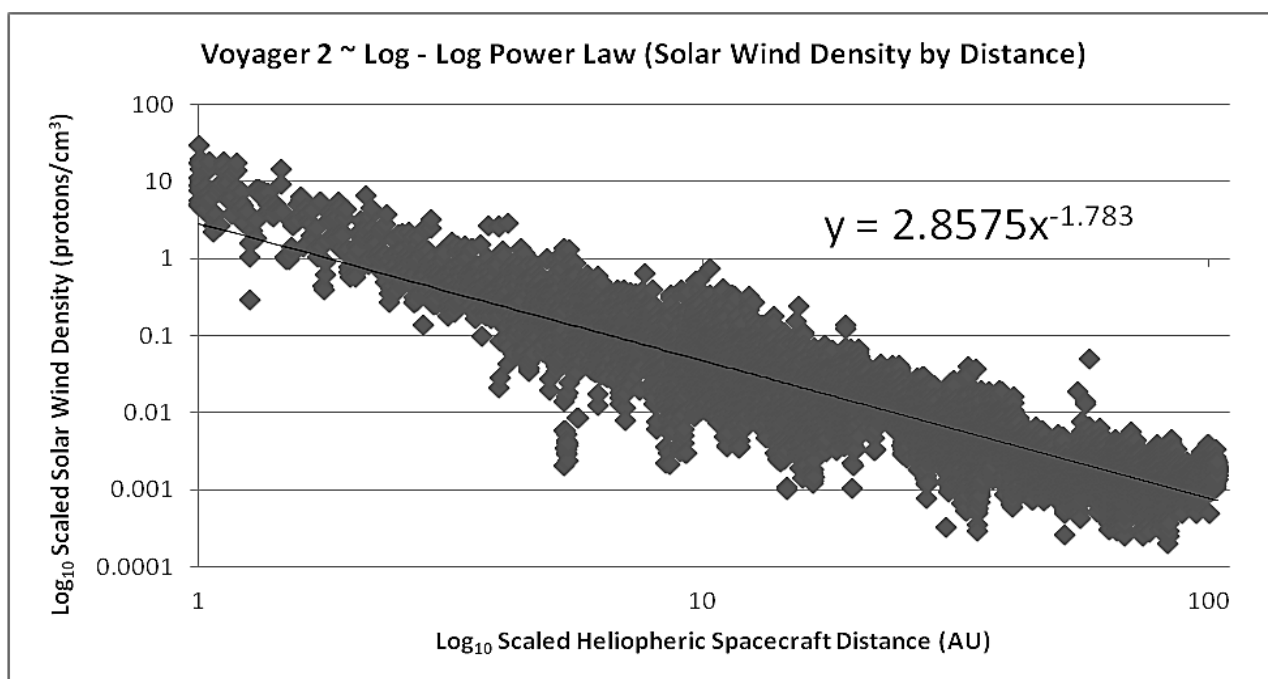
The range between the order of magnitude in which the fundamental units of matter are measured,  $\sim 10^{-15}$  m, and the smallest calculable length, Planck's value of  $\sim 10^{-35}$  m, suggests that space may have the potential to be structured in complex geometries that could affect the organization of matter. Recent calculations indicated that substantial energy may be represented or maintained within the geometric structure of space [1]. If this calculation is valid then potential changes in the geometric structure of sub-matter space could affect the organization and hence the expansion and contraction of matter within stars and planets as they move through space.

The solar system moves around the center of galaxy at  $\sim 242 \text{ km}\cdot\text{s}^{-1}$ . This movement through space should accommodate the effects of the intrinsic feature of space. Eddington's Number of  $10^{79}$  protons contained within the universe results in average value of about 1 proton per cubic meter ( $1.67\cdot 10^{-27} \text{ kg}\cdot\text{m}^{-3}$ ) if a volume of  $\sim 10^{79} \text{ m}^3$  is assumed based upon conservative estimates. This value results in a mass estimate of the universe to be  $\sim 10^{52} \text{ kg}$  [2] or an energy equivalence of  $\sim 10^{69}$  Joules. These values are convergent with estimated values from several different methods.

The "dynamic pressure" derived from the product of the average density of matter and the square of the velocity of light in a vacuum ( $v^2 = 9\cdot 10^{16} \text{ m}^2\cdot\text{s}^{-2}$ ) results in a value of  $1.5\cdot 10^{10} \text{ Pa}$  ( $\text{kg}\cdot\text{m}^{-1}\cdot\text{s}^{-2}$ ). When this value [2, 3] is divided by the square of the average velocity of solar system ( $5.86\cdot 10^{10} \text{ m}^2\cdot\text{s}^{-2}$ ), the resulting "critical density" is  $0.153\cdot 10^7$  protons per cubic meter or 1.53 protons per cc (cubic centimeter). This density is within the range of that measured within the solar wind and the interplanetary magnetic field. Here we present evidence that the distance at which this "critical density" occurs may provide an alternative explanation for the origin and maintenance of the asteroid belt.

## 2. COMPARISON OF DATA AND PREDICTIONS

The mean and standard deviation for the yearly average density of the solar wind between 1971 through 2013 at 1 AU ( $1.496\cdot 10^{11} \text{ m}$ ) was  $7.64 \text{ protons}\cdot\text{cm}^{-3}$  and  $1.72 \text{ protons}\cdot\text{cm}^{-3}$  respectively. The results of the plotted measurements from the Voyager spacecraft [4] that reflect the density of protons and alpha particles in the solar wind are shown in Figure 1.



**Figure 1.** Log<sub>10</sub> of the density of the solar wind as a function of distance (log<sub>10</sub>) from the Sun in Astronomical Units (AU).

The linear best fit equation of the log-log plot for density ( $\rho$ ) as a function of distance (d) was:

$$P = 2.858 d^{-1.783}, \quad (1)$$

where d is in AU. For distances of 100 AU as measured by Voyager 2, the density was  $2.18 \cdot 10^{-3}$  protons  $\cdot$  cm<sup>-3</sup>. When compared with the density values near the earth the former values confirmed the linear best fit equation. This is very similar result as Kolmogorov's 5/3 power law [5].

To discern the heliospheric distance where a density of 1.53 protons per cc would be prevalent, we entered the value as:

$$1.53 \text{ (protons} \cdot \text{cm}^{-3}) = [(7.64 \text{ protons} \cdot \text{cm}^{-3}) \cdot (d^{1.783})^{-1}] \quad (2)$$

This yields a value of 2.46 AU or  $3.68 \cdot 10^{11}$  m. This distance was also verified by raw data from Voyager 2 for solar wind densities where values of  $\sim 1.5$  protons  $\cdot$  cm<sup>-3</sup> were registered at 1.26, 2.25, 2.64, and 3.61 AU. The average heliospheric distance for these measures was  $2.44 \pm 0.84$  AU with an upper limit around 4.12 AU. This is equivalent to 3.65 to  $6.16 \cdot 10^{11}$  m which is within the range of centroid distance from the sun for the location of the asteroid belt which is about 2.5 AU [6].

### 3. RESONANT FREQUENCY ESTIMATES

Dimensional analysis indicates that pressure ( $\text{kg} \cdot \text{m}^{-1} \cdot \text{s}^{-2}$ ) divided by viscosity ( $\text{kg} \cdot \text{m}^{-1} \cdot \text{s}^{-1}$ ) reveals a frequency. According to Brandt [7], the viscosity ( $\eta$ ) of the solar wind involved with the Navier-Stokes equation for a compressible fluid in a steady state is:

$$\eta = 1.2 \cdot 10^{-17} T^{5/2} \text{ kg} \cdot \text{m}^{-1} \cdot \text{s}^{-1} \quad (3),$$

where T is temperature in degrees Kelvin.

According to classic plasma physics, the mean proton speed for a gas at temperature T is related to the distance from the sun in AUs. More formally,

$$T^2 = 2\Lambda\delta (10^{-9})^{-1} \quad (4),$$

where  $\Lambda$  = distance in AU and  $\delta$  is proton (particle) density per cc. Inserting  $\Lambda = 2.46$  and 1.53 protons per cc,  $T^2$  is  $7.53 \cdot 10^9$  or  $8.7 \cdot 10^4$  K. In comparison, near the earth T is about  $10^5$  K. When the critical temperature is inserted into (3), the viscosity would be:

$$(2.22 \cdot 10^{12}) \cdot (1.2 \cdot 10^{-17} \text{ kg} \cdot \text{m}^{-1} \cdot \text{s}^{-1}), \text{ or, } 2.66 \cdot 10^{-5} \text{ Pa} \cdot \text{s} \quad (5).$$

when the universal pressure ( $1.5 \cdot 10^{-10}$  Pa) is divided by (5), the frequency is about  $0.564 \cdot 10^7$  or  $5.64 \cdot 10^6$  Hz. Assuming the system's average velocity ( $2.42 \cdot 10^5 \text{ m} \cdot \text{s}^{-1}$ ) and the pressure/viscosity solution of  $5.64 \cdot 10^6$  Hz, the standing wavelength would be approximately

$4.5 \cdot 10^{10}$  m. This value is within the range of distance between the outer boundary of the asteroid belt and the orbit of Jupiter.

#### 4. APPLICATIONS TO THE PRESENT PERSPECTIVE

From this perspective the organization of matter defined as planets should be different at distances proximal and distal to the critical density occupied by the asteroid belt. Indeed the proximal (minor) planets (Mercury, Venus, Earth and Mars) are primarily composed of silicates, metals and their oxides. The distal planets are composed primarily of gases. Jupiter and Saturn are composed primarily of H and He while Uranus and Neptune are composed of combinations of oxygen, carbon and nitrogen.

Although there are other mechanisms and potential explanations, the smaller planets above the critical density and the large, less dense planets below the critical density would be consistent with the contribution from intrinsic features of solar space as it interacts with the universal dynamic pressure. The mean densities for the planets Mercury through Mars are between 3.9 to 5.5 gm per cc. The mean densities for Jupiter and Saturn are 1.3 gm per cc and 0.7 gm per cc, respectively. Uranus and Neptune display densities more similar to that of Jupiter.

The critical density of 1.5 protons or equivalents per cc discerned from our calculations which occurs primarily within the volume occupied by asteroids suggests this value is an inflection point. Above that value planetary bodies with heavier density and materials formed. Below that value, planetary bodies with lighter density but much larger volumes stabilized.

From the perspective of the present approach the recent observations from exploratory satellites that the distal giants all display “rings” of “dust” or matter would be consistent with an origin within the asteroid region. The solar wind, which exerts significant momentum from its velocity and density in combination with the added “viscosity” from embedded magnetic fields, would have facilitated the transport of these particles away from the asteroid belt. On the other hand the inner planets do not display these characteristics.

#### 5. LOW PROBABILITY CONSIDERATIONS

The estimate of the combined mass of asteroids is the order of  $3.0 \pm 0.2 \cdot 10^{21}$  kg; half of that value is accommodated by Ceres, 4 Vesta, 2 Pallas and 10 Hygiea. The multiplication of the universal dynamic pressure ( $1.5 \cdot 10^{-10}$  kg·m<sup>-1</sup>·s<sup>-2</sup>) to the functional volume of space occupied by the asteroid belt ( $\sim 1.2 \cdot 10^{33}$  m<sup>3</sup>) would be equivalent to  $\sim 1.8 \cdot 10^{23}$  J·s<sup>-1</sup>. Assuming the current age of the solar system as  $\sim 1.4 \cdot 10^{17}$  s, the total energy available within the volume of the solar system moving through space from the universal dynamic pressure would be  $\sim 2.5 \cdot 10^{40}$  J. The mass equivalent (by dividing by  $c^2$  or  $9 \cdot 10^{16}$  m<sup>2</sup>·s<sup>-2</sup>) is  $2.7 \cdot 10^{23}$  kg. This value is about a factor of 100 greater than the estimated mass of all matter that has been measured within the asteroid toroid.

The more salient conclusion is that the energy available from the movement of the solar system through the averaged dynamic pressure of the universe *produced the mass* that is now manifested as asteroid matter. Although one would expect a difference of a factor of 2 from the consideration of bands of dust particles within the order of a 100 μm, including the particles with  $\sim 80$  μm in diameter attributed to visible zodiacal light, the discrepancy is still large.

There are two explanations that might accommodate the discrepancy. The first would be the asteroid matter as measured today only began to emerge starting about 46 million years ago (one-hundredth of 4.6 billion years). The other is that actual volume within the asteroid toroid associated with the formation is  $\sim 2 \cdot 10^{31} \text{ m}^3$ . Here we assume that the vertical axis of this ellipsoid volume reflects that system's "flatness" and is  $6.6 \cdot 10^{-2}$  ( $\pm 6^\circ$  divided by  $180^\circ$ ). At the median distance of 2.46 AU or  $3.61 \cdot 10^{11} \text{ m}$ , this would involve a very narrow shell of space with a depth of about  $2 \cdot 10^8 \text{ m}$ .

This narrow shell would exhibit a standing resonance moving at  $\sim 2.4 \cdot 10^5 \text{ m} \cdot \text{s}^{-1}$ . The median frequency would be  $\sim 1.2 \text{ mHz}$  or a period of 833 s (about 14 to 15 min). The electromagnetic signature, assuming  $c$ , the velocity of light in a vacuum ( $3 \cdot 10^8 \text{ m} \cdot \text{s}^{-1}$ ) for this distance would a standing wave of about 1.5 Hz.

For comparison, this value,  $2 \cdot 10^8 \text{ m}$ , is within measurement error of the estimate for the width of the central core of the Sun. Within this constrained volume physical forces and temperatures approach values that are consistent with those that could distort the geometry of space-time. If the equivalence of the principle of inverse parity observed for the phenomena described as "excess correlations" in quantum contexts apply, one would expect a comparable volume to exist where there is coupled disorganization to the Sun's integration.

If the matter within the asteroid belt is consistently created by the transformation of dynamic pressure energy into the volume, then importance of Casimir forces [8], the Zero Point Potential, and Zero Point Fluctuations [9] become important. Changes in a boundary at the level of Planck's Length in the presence of a magnetic field mediate the potential to transform a virtual particle to a real particle [8]. Recently we [10] showed that the energy related to the conspicuous paucity of seismic events within the range of  $M = 3.5$  to  $M = 4.0$  was associated with a trough between  $M = 3.6$  to  $3.7$  whose energy converged with a potential coupling between Zero Point Fluctuation forces and quantum energies. We suggested that a conduit might exist between intrinsic features of Planck's space-time and processes within the solar system.

The possibility that the process within the proliferative zone affects the higher order organization of the transformation of virtual particles to real particles or influence the types of elements with their specific numbers of protons and electrons could be examined. There might be a potential mechanism to explain why carbon-endowed asteroids dominate the proximal asteroids, while silicate-rich regions are more often detected within the inner region (2.5 AU) and metal-containing (iron-nickel) asteroids peak around 2.7 AU.

The available energy of between  $10^{21}$  to  $10^{23} \text{ J} \cdot \text{s}^{-1}$  from the solar system velocity-dynamic pressure interaction would not necessarily produce the equivalent  $\sim 10^4$  to  $10^6 \text{ kg}$  of matter per s within the thin proliferative shell. However it would have the potential to supply punctate, sudden increases in energy to available masses that could displace their movements into even more eccentric shapes that could intercept the earth's orbit. Of the approximately  $10^4$  to  $10^5$  meteorites found to date on the earth's surface, more than 99% are assumed to have originated from the asteroid belt.

## **6. IMPLICATIONS FOR THE ORIGIN OF THE ASTEROID BELT**

The causes of the myriad objects that compose the asteroid belt between Mars and Jupiter have ranged from an intrinsic failure for the aggregation of matter to form a planet to the existence of a planet that was fragmented by unknown processes. The contemporary explanation is gravitational perturbations from the presence and movement of Jupiter induced

orbital energies within the original solar nebula that suppressed the formation of these protoplanets into a singular aggregate. On the other hand we suggest that the “critical density” due to the velocity of the solar system around the galaxy and the universal average “dynamic pressure” at the distance occupied by the asteroid belt prevented the processes that would have allowed the planetary accretion process.

The importance of Jupiter’s contribution to the spatial configuration of the asteroid system is not significantly altered by our explanation. The presence of the Kirkwood gaps produced by the removal of matter due to addition of orbital energy from the orbital resonance with Jupiter would be expected. Our explanation does not negate any of the attributions of orbital resonance from Jupiter within the millions of asteroids. Our model instead indicates why the matter within the asteroid toroid never formed into a mass with planet-like characteristics.

## **7. CONCLUSIONS**

The movement of mass through a “medium” such as space would be expected to produce a standing dynamic, or in statistical terms a kinetic-potential interaction. If this mass is a complex aggregate of matter within a contained space, such as the solar system, where the proportion of mass within the volumetric space occupied by the mass is very small, i.e., approximately 1 part per trillion, then there should be representations within that space where the standing interaction is dominant.

The critical density of matter for this standing interaction, defined as protons per cc, derived from the product of the universal dynamic pressure within the universe and the velocity of the solar system around the galaxy, occurs within the band of space occupied by the asteroids between Mars and Jupiter. The necessary persistence of this standing interaction because of the system velocity through the universal dynamic pressure, in a manner similar to resonant forces and energy within any aggregate of individual momentums, could have disrupted the required coherence of angular moment that would have allowed cumulative accretions. Consequently the origin and maintenance of the asteroid cluster at that solar distance may be considered support for an alternative explanation for these phenomena.

The existence of an interface in submatter space whose physical parameters are defined by the interaction between the velocity of the solar system around the galaxy and the universal dynamic pressure could suggest an unanticipated source of energy within this “closed system”. Although perhaps spurious the convergence of the total current asteroid mass and its equivalence to the total energy that would be available from this interaction suggests intermittent contributions to this band of space. These occurrences could disrupt the orbital stabilities of specific masses of asteroids. This source might be considered in estimations for probabilities for earth impacts.

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