STATES OF MATTER
defined from
The Speed of Light

Jouni Jokela
jouni@jokela-turbine.ch

ABSTRACT

In this Paper, I develop the idea of massless physics further. I continue showing how the Speed of light defines also the various States of Matter; the Phase transition points of Condenses-Gas and Gas-Plasma. In this paper the concept of how the Planck constant can be calculated from the Speed of light, will thus become clearer, as the already developed idea that molecules have a universal diameter; $d = 3.3x10^{-9}m$ is more clearly presented.

This concept is broadened with a universal time; $t = 3.3x10^{-9}s$ As these ideas are supported by the observations in Atmosphere's, also the fundamental physical reason for the Existence of the various boundaries in Atmosphere is explained; Tropopause, Mesopause and Stratopause. Amazingly a new kind of matter is found, it's named "Electric Matter", and it's transition point is also defined to be $t = 5.776x10^{-5}s$. Based on this three new atmospheric concepts are laid; Groundsphere, Electrosphere and Electropause.

Content;

Abstract
Introduction,

1. Phases of matter, state of matter.
1.1 Condensed matter
1.2 Kinetic matter –idea.
1.3 Electric matter –idea.

2. The Units. (Avogadro's number, Gas constant and Boltzmann constant)
2.1 The Units on Condensed-Kinetic (Gas) Transition; 1/c [m]
2.2 The Units on Kinetic (Gas)-Electric (Plasma) Transition; 1/c [s] and it's explanation.
2.3 Conclusion.

3 The atmosphere of Earth.
3.1. Earth's surface, Troposphere, Planetary Boundary layer.
3.2 Tropopause
3.3 Stratosphere
3.4 Stratopause
3.5 Mesosphere
3.6 Mesopause
3.7 Turbopause
3.8 Electropause (New)
3.9 Thermosphere, Thermopause
3.10 Exosphere
3.11 Geocorona
3.12 Various interesting details.
3.12.1 Noctilucent clouds
3.12.2 Aurora's, (Polar lights, Northern lights)
3.12.3 Magnetosphere, Magnetopause
3.12.4 Geostationary Orbit
3.12.5 Ionosphere

4. Electrosphere, The Space.
4.1 Electropause and it's the mathematical consequences.

5 Other Planets
5.1 Condensed-Kinetic
**5.1 Kinetic-Plasma**
5.2. Plasma-Electric

6. Turbulence

7. Gravity.

8 Conclusions

INTRODUCTION

This paper is based on my previous papers and can't be fully understood without it. This paper further focuses on *"Calculating the consequences"* which follows from the conceptual ideas presented before. The guiding light here is Richard Feynman's Messenger Lection, where he clearly defined *"The Key to Science"*;

1. Theory / Physical Law	→	2. Calculating the consequences	→	3. Comparing to Observations
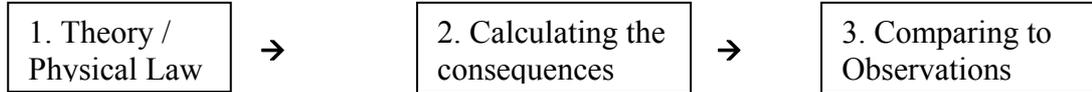
The main Flaw of my prev. papers is that the units are still quite messed up, cannot really explain the Natural constants. The way to this, goes through states of matter. Thus, with this paper I partially repeat my paper 07.10.2016- "The Math", as the Condensed-"Gas" transition was already well presented there. And there after the given theme is completed by presenting the fundamental reason for "Gas"-"Plasma" transition.

1. Phases of matter, state of matter.

I want to start with asking the very fundamental question. How many phases of matter there is? The most common answer is "Three"; Solid-Liquid-Gas. Then some of us have more advanced understanding and answer "Four", because of Plasma, so their answer basically describes the Classical elements from Ancient Greece; "Earth, Water, Air, Fire" or "Solid, Liquid, Gas, Plasma" respectively. Now the people, who have studied quantum mechanics, may answer "Five", and name additionally the Einstein-Bose-condensate. This actually opens a Pandora's box. Thus, these are already called a "state of matter" to separate it from the Phases of matter. Indeed, there is a lot of them. There is for example 17 known solid crystalline phases of water depending on the Pressure and Temperature.

This means that the phase's (or states) of Matter are not defined universally. If you ask exact definition between solid and liquid, you don't get any answer. Studying the chemical element's, shows, that there are cases, where these phases do not exist, in any temperature & pressure combination. Helium is never solid, and Carbon is "never" liquid, because it's triple point is at 10.8 ± 0.2 MPa and $4,600 \pm 300$ K. All material has such a triple points, meaning, that with certain pressure/temperature combination they are only solid or gas. –Or in the case of Helium liquid or Gas. Even Helium has such a "triple-point", it is called "Lambda-point". Thus, liquid and solid, are only various states of CONDENSED matter, without being fundamental phases. Previously I thought that also Gas/Plasma are similarly only different aspects of the same fundamental phase, but the latest discovery has shown, that they are both independent fundamental phases having an exact character which defines the difference precisely. Thus, I now conclude that there is three fundamental phases of matter.

1. A state where atoms are bound together. Solid, liquid, BEC, various chrystals, I name them all as <u>Condensed-matter.</u>
2. A state where atoms are not bound together, but they are interacting so closely, that they share same temperature and electric potential, which produces homogenous mixture. This is almost same as gas, but as gas/condensed mixtures can create viscous (condensed), but gas-alike interactions, for the sake of clarity, I name this as <u>Kinetic-matter.</u>
3. A state where the interactions are totally free. Knowing all physical properties of any single particle doesn't give any reliable prediction for the next particle beside. This is almost the same, as Plasma, but again as this is not exactly the same, for clarity, it's named as <u>Electric-matter.</u>

1.1 Condensed matter
The definition of the condensed matter is the answer on the question; Is the particle completely surrounded by another particles with permanent electromagnetic interaction, including attraction. Only Condensed matter has stresses and tensions and viscosity. The molecules are able to pull each other.

1.2 Kinetic matter –idea.
This might be simplified to a; "Can the Kinetic theory of gases be applied?" -> Yes. This question asks practically, if the particles are colliding as a single molecule, or if they are forming an object, considered a single unit of many molecules. This is the ultimate limit for attract and repel, and thus the size of a molecule. In Kinetic matter there is no attraction. Yet, it should be noted, that this definition does not make it very easy to observe this limit; in the nature we have mixtures and dynamic. The definition of Turbulence (see my paper 11/2015 Turbulence) brings this problem visible. Viscous fluids (Condensed-matter) can be spitted to so small objects, which behave like Kinetic matter, though it's condensed, Similarly like bedrock and sand are both clearly solids, though sand can behave like a fluid, particularly when it's mixed with small amount of fluid. Thus this condensed-kinetic phase transition point in Earth can actually rather be seen at the bottom of the Cumulus clouds than in the sea surface. At minimum it is said to be in 550 m height above the Sea level. The fluids below that level can become quite "Condensed" without turbulence, at calm nights in Polar-regions. This can be noted, when the voice suddenly is transferred over abnormal distances, because Condenced-matter can transfer tensions.

1.3 Electric matter –idea.
The definition for Electric matter is the answer on the question; "Are all the particles around able to share the similar Temperature (and electric potential)." -> No. This question is drawn from the fact that kinetic energy of a molecule can be calculated from the Temperature. This means that the particles are interacting so far from each other, that their temperatures can't be homogenised. This means that Electric-plasma can maintain particles with completely different velocity and charge, in plasma these differences are not approaching equilibrium. The differences are amplified or reduced randomly.

2. The Units. (Avogadro's number, Gas constant and Boltzmann constant)
My claim is that everything is light, and thus all physical constants can be found from the physical properties of light. Thus, these constants of the Kinetic theory of gases cannot be an exception. This idea came originally from the observation, that "each liter of gas at a pressure of one atmosphere and temperature of 0°C contains roughly 27.000 billion billion (27×10^{21}) molecules" [2] The exact calculation is;

$$\frac{PVN_A}{RT} = \frac{101325Pa \times 1m^3 \times 6.02214x10^{23}1/mol}{8.31446J/molK \times 273.15K} = 2.68678x10^{25} molecules/m^3$$

Which is approxaimately the same value as the speed of light to the third power; $c^3 = 2.694400x10^{25} m^3/s^3$ The difference is only 0.28%. This gives me an idea, that a single molecule has a diameter of $1/c = 3.33564x10^{-9}m$, when it is in Condenced-Kinetic transition point, commonly known as Vapor-liquid equilibrium. ("VLE")

2.1 The Units on Condensed-Kinetic (Gas) Transition; 1/c [m]
Thus this is explained with a simple picture.
At the picture is shown how red object is travelling with velocity V, and how it's passing objects which have size L. If we know that the
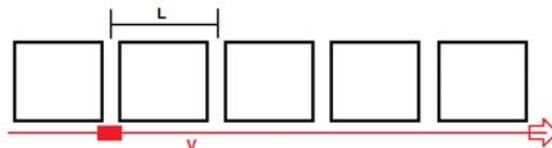
object passes N=5 objects in certain time, t= 1 hour, and the velocity v=10 km / hour we can calculate the size of a single object; $L = \dfrac{v \times t}{N} = \dfrac{10km/h \times 1h}{5object} = 2km/object$.

The size of a molecule is same. If one <u>cubic</u> meter of volume has $2.694400x10^{25}\, particles$ then a 1 m long <u>row</u> of these particles has

$$N = \sqrt[3]{2.694400x10^{25}\, particles} = 299792458\, particles$$

and if this 1m long row of particles is passed by with a velocity of $v = c = 299792458\, m/s$

The time is simply the length dived with velocity;

$$t = \frac{l}{v} = \frac{1m}{299792458 m/s} = \frac{1}{299792458}s$$

So finally, we can calculate that the size of a one particle is;

th time; $t = 299792458\, m/s$ 1/ seconds, as one Light-second is $299792458 m$ So we can calculate the size of a single particle.

The amount of particles was "c"
The distance which was travelled was 1 m.
The time was 1 m /Light-second seconds, and the velocity was c, so;

$$L = \frac{v \times t}{N} = \frac{299792458\, m/s \times 1/\,299792458s}{299792458\, particles} = \frac{1}{299792458}m$$

And as a reminder to those, who consinder this as only a circular reasoning, this is exactly that. The only which is shown here, is that the unit is correct; numeric value is 1/c but the unit is [m] (/particle).

**2.2 The Units on Kinetic (Gas)-Electric (Plasma) Transition; 1/c [s] and it's explanation.**
This whole concept is new, and I haven't even introduced it before. So starting with an explaining picture is surely helpful. To fully understand this, the Quantum-effects or probability amplitudes must be taken into account. These provide the idea that there are different probabilities for the collision depending how the particles are synchronized.
The 1/c [s] time limit is the point, where this game changes radically. Exactly at this distance, it's first time possible, that two colliding protons, which may have been other vice interacting, might not collide at all! They might continue to travel as in free space without any interaction. This prevents the plasma from reaching equilibrium, and because of this behaviour, the velocities can also be amplified.
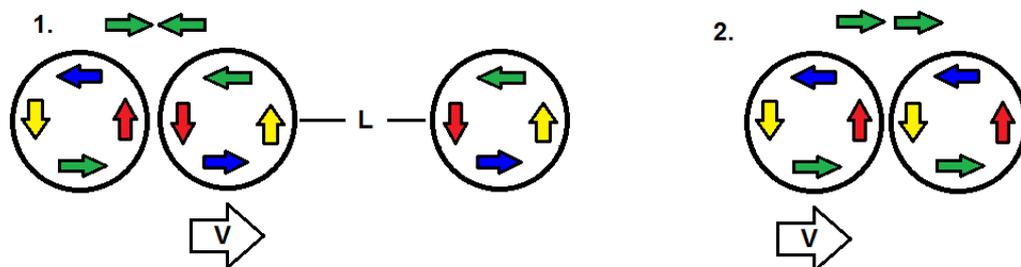
This Picture above explains what is meant. At first (1. position) two particles (circle) are colliding and their same Quantum properties are interacting to produce a perfect elastic

collision. (Green arrows) Thus the other particle starts to move with Velocity V towards another particle which happens to be in perfectly same quantum state. When they collide after distance L, which happens to be exactly 1/c seconds (position 2.), their Quantum states and location are perfectly synchronized, and they don't interact at all. Or they interact, but as a net result, this interaction is zero. Pls. note that in the picture there is actually two particles in different locations. In the reality we would only see one particle at that point. So this is only to show that there really are two particles in same position. The only difference is that these particle are most probably not travelling on same direction. Thus following question arises: (See picture below;)
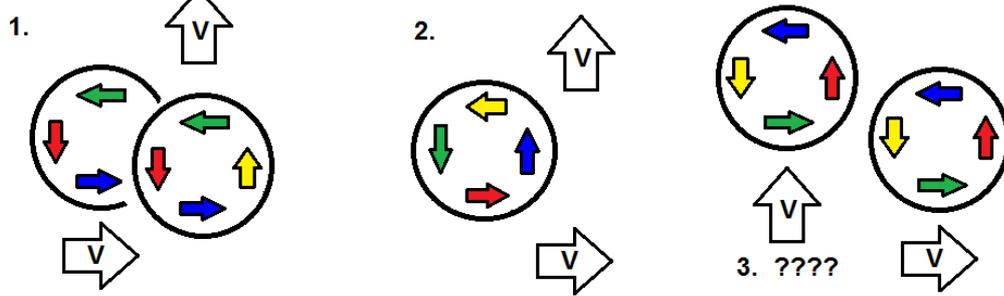
Here at position 1. it can be seen how the particles are "grinding" each other. This way they already might exchange some kinetic energy and interact to each other. At Position 2. is now shown how the are identically overlapped. There are yet 4 quantum states, so there might remain a rule, which makes such an overlapping generally forbidden.

The question arises from Position 3. "what actually happens". Maybe the particles are creating a "high-energy-cosmic-ray-proton, maybe the fusion and produce a Deuterium. But in this paper this issue is not discussed further.

The main idea is the show how Kinetic-Electric transition point can be defined:

The Velocity v_{rms} [m/s] is particle velocity calculated from temperature; $v_{rms} = \sqrt{\dfrac{3k_BT}{m_p}}$

Boltzmann constant, k_B; $1.38x10^{-23} J / K$

Temperature, T, i.e. in 55 km height is $T = 257.9K$ 257.9 K

m_p; mass of the single particle [kg] i.e. Di-Nitrogen N_2; $4.65x10^{-26} kg$

Gives; $v_{rms} = \sqrt{\dfrac{3 \times 1.38x10^{-23} \times 257.9}{4.56x10^{-26}}} = 483.9 m/s$

And the l is the Mean- free-Path; $l = \dfrac{k_BT}{\sqrt{2}\pi d^2 p}$ and as $p = \rho \times R_d \times T$ thus

$l = \dfrac{k_B}{\sqrt{2}\pi d^2 \rho R_d}$ can be calculated from density.

Diameter of the particle; $d = 1/c = 0.3336x10^{-9} m$

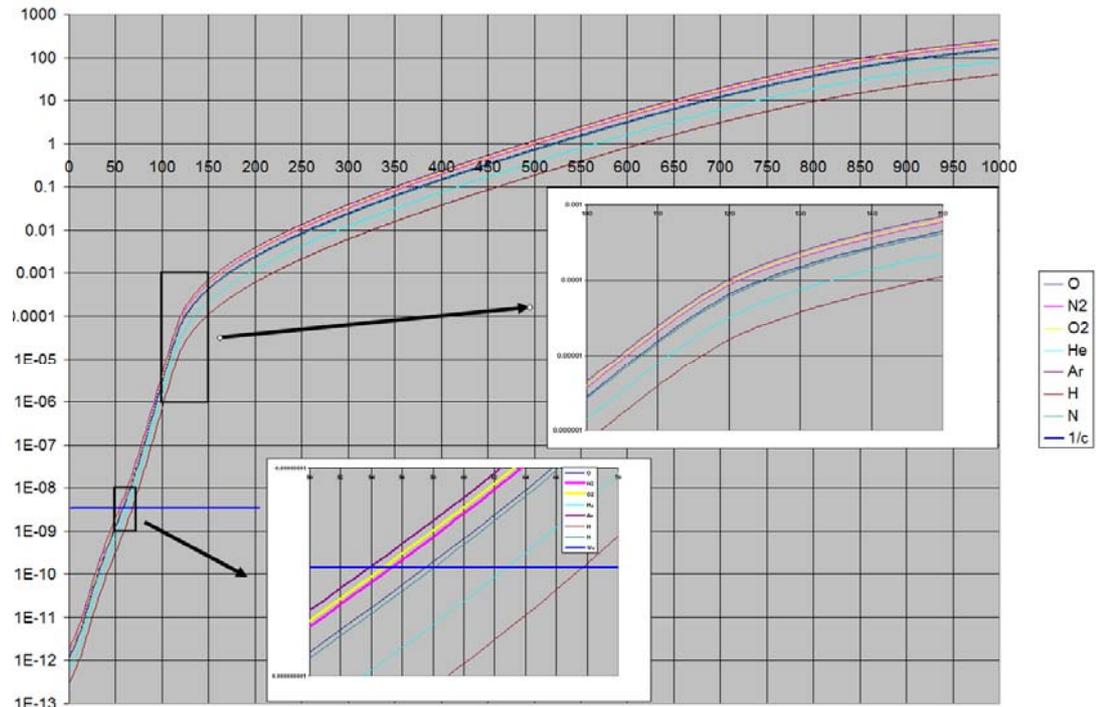Density, ρ at 55 km height, 0.0006134 kg/ m^3

R_d is 287.058 J/K

Gives;

$l = \dfrac{k_B}{\sqrt{2}\pi d^2 \rho R_d} = \dfrac{1,38x10^{-23} J / K}{\sqrt{2}\pi(0.3336x10^{-9} m)^2 \times 0.0006134 kg / m^3 \times 287.058 J / kgK}$

$= 0.000001585m$, dividing this with v gives $\dfrac{0.000001585m}{483.9m/s} = 3.2763x10^{-9}s$

which is almost exactly the $1/c = 3.33564x10^{-9}s$

Analyzing the atmospheric data more precisely gives the following diagram;

This "mean-free-path-time"-diagram shows that minor variations are not going to make any big difference, the atmospheric gas-plasma Transition happens very precisely at 53-56 km height. This is exactly in the very top of the Stratosphere, at Stratopause.

Very interestingly this logarithmic diagram shows a clear turning point at 120-125 km height. This issue is discussed later in this paper at Chapter 3.6 Elektropause.

2.3 Conclusion.

The Explanation of phase transitions, At first it sounded bit amazing event to me, how the Solid-gas transition could be defined independently from Temperature or pressure. But this is actually not the case. Now, as also the second transition point has been found, the rules are more complete. Obviously the 1/c [m] particle diameter is also not directly the diameter, of a not moving particle, but rather the space, where in the particle can move, without loosing the attraction to other particles. This way the Pressure and Temperature are defining what is the "Water"-molecule of each planet. And this molecule is then component, which works and cycles under the heat of the sun. Ie. in Venus this "water" seems to be CO_2. This "Water"-molecule then behaves exactly same way, independent what is it's exact chemical composition. It defines the thickness of the atmosphere, and it's "sea" is transparent. Other molecules in planet are always highly soluble to this "water". This way, every planet can have very similar structure, independently from their exact pressure and temperature. The Pressure and temperature are much rather defined and held approximately constant through this "water". Hurricanes must be the extreme actions to correct possible imbalances.

3 The atmosphere of Earth.

The fundamental reasons for various layers in atmosphere can be defined. These are from bottom to top as follows;

3.1. Earth's surface, Troposphere, Planetary Boundary layer.

The average solid/liquid surface of the Earth is at the straight bottom line seen in Cumulus clouds. This level is theoretically at 350-650 m, but due to the water cycle, and simply because the average land (solid) surface lies at 841 m, this surface is as cyclic as the sea surface on storm. Already the height of the cumulus cloud base can rise up to 6100 m, but actually the whole cloud is forming while the water is filling the voids of air up to a condensation point. Thus this condensed surface can be in anywhere in lower half of the Troposphere. At the Upper half of the Troposphere, all these condensations are ripped in parts.

Because there are condensations in troposphere, it's optically decreasing the speed of light, and thus it's seen red from space. (Red-shift analogy.)

3.2 Tropopause

Above Tropopause the atmosphere is always gas. No condensations. This is the coldest point, because the heat can escape freely by radiation on every direction, but is received mainly through conduction. At polar regions, The Troposphere is hotter, -45 °C compared to over -75 °C in equator, simply because the distance for conduction is shorter at poles, 10 km compared to 17 km at equator. The height/temperature difference is linear -45 x 1.7 = -76.5, as thermal conductivity in solids generally is. The small variance is caused by the height difference of the cumulus cloud base.

3.3 Stratosphere

Stratosphere is the purest example of the states of Matter. It's purely Kinetic-matter and Ideal gas. This makes it homogenous and stratified according to temperature. Here the all the gas theories are completely valid. Vertical convection does not exist, but sudden stratospheric warming (SSW) can occur, according to the Ideal Gas law. Increased pressure causes a Temperature rise. Such a change in pressure can be only caused be the oscillating Troposphere. (Ie. Rossby waves)

The Ideal gas character of Stratosphere comes clearly visible also in the optical character of it. It's completely neutral to the wavelengths of light. Thus it's seen white, when observed from space.

3.4 Stratopause

Kinetic-Electric phase Transition happens here. Up to this point, The Homogenity is hold, and after this point the plasma Phenomenon's starts to increase. Though the exact Theoretical place of Stratopause depends on the molecule-weight and density, the difference is yet only few km. The difference between poles and Equator is already greater, it can easily be 5 km lower in Northpole (52 km) than in Southpole (57.5 km), While equator being an average (55 km). The Hottest point is 4-8 km below this theoretical limit. If the surface of Earth should be defined by the most spherical and stabile character, then Stratopause, defined as here, would be the answer. The diagram on right shows this

Relative Temperatures, 0.220 km

Sun position
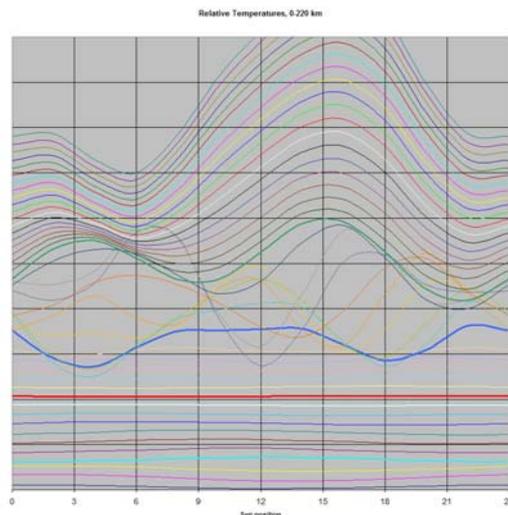
clearly. There is the relative temperatures shown stacked to present the heights in 5 km steps.. The Red straight line is on 50 km height, and is approximately the Stratopause. The Thick blue line is on 80 km height, and the highest line is at 220 km in Thermosphere. Because of its fundamental character, every planet and moon with some kind of atmosphere has a Stratopause.

3.5 Mesosphere
This leyer is similar to Troposphere. Here the mixed phases are the Kinetic and Electric. Also this layer is very active, waves and huge variations in Temperature occure. It should by noted, that these waves are not connected to the waves below Stratopause. The causes for these waves comes outside, from Thermosphere. This comes clearly visible from the data.

3.6 Mesopause
This is said to be a Temperature Minimum between Mesosphere and Thermosphere. Yet, the height of this minimum varies continuously. Few variations are shown in the diagram.
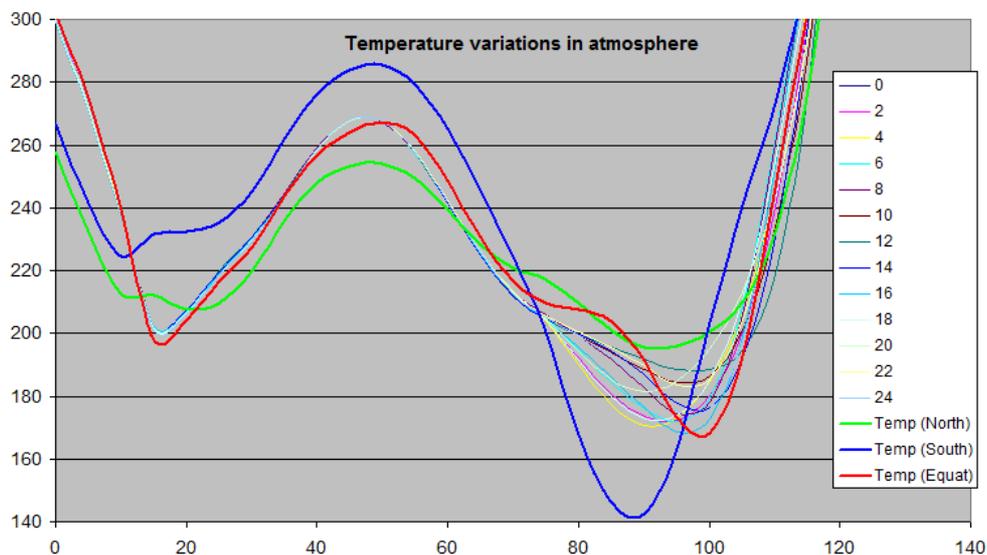

Though the present variation is physically clear, it doesn't describe any particulary stabile location in Atmosphere.

3.7 Turbopause
This is said to be marking the altitude, which divides the Turbulent mixed homogenous region (below, homosphere), and region where molecular diffusion dominates. (above, heterosphere) It's said to be roughly at an altitude 100 km. Yet, it's obvious, that molecular diffusion starts already at Stratopause. This definition is completely in practical and without any reasonable basis. Yet, it can be noted from the Picture [Relat temp] that ther is two clearly different regions; which are dived with a mixed region between the green line at 125 km and Blue line at 80. Thus a new definition must be laid.

3.8 Electropause (New)
This is related to ionosphere. Ionosphere is ionized part of of Atmosphere, which has also various layers, with high cyclic variations even between day and night. There is a "E-layer", which is the middle layer 90-150 km above the the surface of the Earth, and in the bottom of this layer the Free Electron amount drops to Zero at least in Night. This drop to zero,
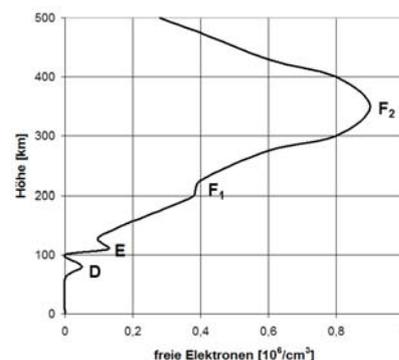
seems to start at ~122 km height, Exactly at this point, there is also the bend in Diagram. [xx] If this diagram is studied more carefully, it can be seen that the Exponential growth on Mean-free-path-time follows some clear mathematical rules.
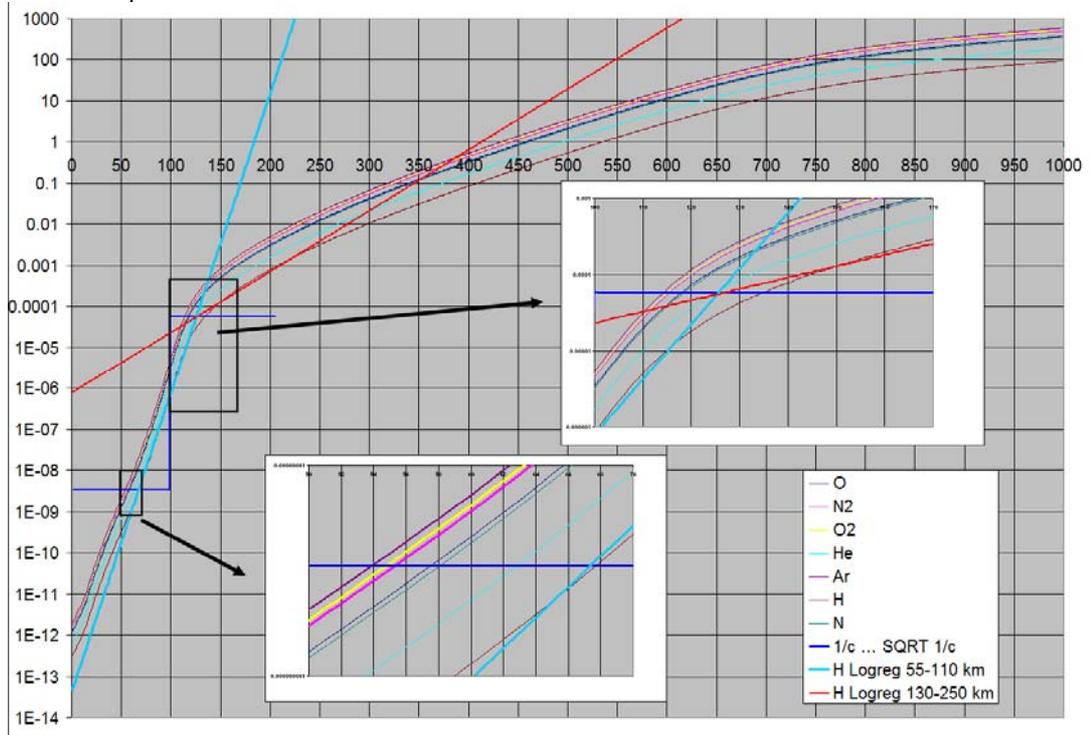
At this diagram are shown few possibilities. The Blue Horizontal line shows the values of Mean-free-path-time $1/c$ as before, and $\sqrt{1/c} = 5.7755x10^{-5} s$.

The "H Logreg 55-110 km" Streight Cyan line come's from equation $y = b \times m^x$ This is solved with the LOGEST-function (LOGREG in Fi) with Hydrogen values on 55-110 km. The "H Logreg 130-250 km" Streight Red line come's similarily.

The Coefficient of Determination for the straight line for values between 0-110 km is 0.997, independent form the sample range For Values 130-1000 km it varies in range 0.988 … 0.993, depending the Length of the sample. If the whole data form 0-1000 is used, the determination Coefficient falls to 0.91. This verifies clearly, that in the height of approx 123 km, there is some fundamental change happening in the Atmosphere. This Change is related with the growth of a free electron amount, and at this point the Particle mean path time is approximately $\sqrt{1/c}$ seconds. The data which I have examined shows how this definition gives very constant values in other vice highly variable conditions. If defined with I.e. N_2 the Height is very constantly at approx 117-118 km high, as shown in the Diagrams below with the Blue vertical line in Left. The Right blue line is The Stratopause.
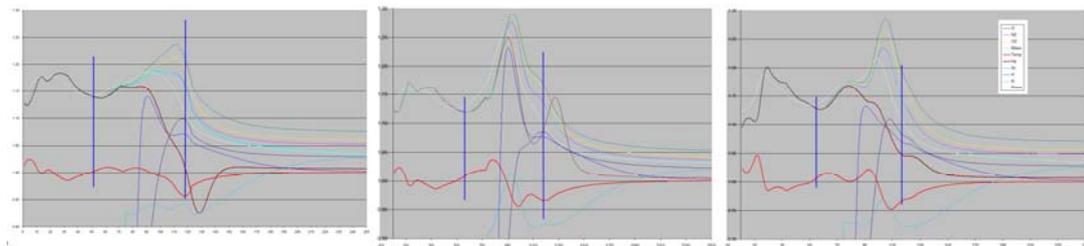
In these pictures is also clearly seen, how the homogenity starts to break already at 60 km height.

The mathematical explanation to this $\sqrt{1/c}$ second, mean free path –time, is also very logical. Velocity is a function of time; $v = \dfrac{l}{t}$, and placing the time in root, $v = \dfrac{l}{\sqrt{t}}$ is mathematically same, as function; $v^2 = \dfrac{l^2}{t}$. Only problem is that units are wrong. This all must be understood, that it's a matter of the travelling time of two particles, Positive ion and Electron, and as they are both in same temperature, they share the same kinetic energy level, even though their masses are very different. This means that the equation should be written $v_+ v_- = \dfrac{l_+ l_-}{t}$, Here the subscript means the different electric charge of the particle,

Which means that on electric matter the mean Free Path of both particles must be multiplied together, "squared" while the time remains the same. Thus, when this time is calculated from just a single particle, it must be place on root, just to make that equation correct; $\sqrt{1/c}$ second is therefore a very plausible explanation. This came also in my mind, when I was seeking the meaning of Planck-constant. My first interpretation to it, was "Volume" x "Area-velocity", and this "Area Velocity" seems to be very fundamental to electricity, as it even defines the new state of matter. The discussion from the Planck-constant is left out from this paper, yet it can be also named as "mass" x "Area-velocity", which concludes, that this concept of "Area-velocity" is independently valid, no matter how the Gravity is interpreted. This issue is discussed later in this paper with more detailed calculations.

3.9 Thermosphere, Thermopause
The Thermosphere is defined to begin from Mesopause, which is about 85 km height, and to extend up to Thermopause, somewhere between 500 and 1000 km high. Interestingly the current definition for Thermopause, is already made through mean free path, it's just defined that this should be an "scale height" which in the case of Earth is 7640 m in average. The Other definition for Thermopause is the lack of Temperature variations. As at these heights, the most Common molecule is O, single oxygen atom. The location of Thermopause could be also defined by the mean free path of Oxygen being 1 second. This definition is yet completely without any fundamental physical basis, Because the 1 second, does't have any fundamental basis. If some data is compared, this definition would change the location of Thermopause/Exobase from ie. 564 km to 458 km height. It's yet questionable, if these definitions have any practical use.

3.10 Exosphere
The Exosphere extends to outer space. It's upper limit is seen to be the level where Solar radiation pressure and Earth's gravitational pull are in balance. This is somewhere 200 000 km away from the Earth.

3.11 Geocorona
The term "geocorona" refers to the solar far-ultraviolet light that is reflected off the cloud of neutral hydrogen atoms that surrounds the Earth. Solar far-ultraviolet photons scattered by exospheric hydrogen have been observed out to a distance of approximately 100,000 km (~15.5 Earth radii) from Earth.
[http://pluto.space.swri.edu/IMAGE/glossary/geocorona.html]

3.12 Various interesting details.
3.12.1 Noctilucent clouds
- Hydrogen depletion in 85 km height.
- Connection to Solar cycle
- Mostly in Polar regions.

3.12.2 Aurora's, (Polar lights, Northern lights)
The Interesting thing in Thermosphere is Auroras, and

3.12.3 Magnetosphere, Magnetopause
Th

3.12.4 Geostationary Orbit
Th

3.12.5 Ionosphere
Th

4. Electrosphere, The Space.
This concept can be best understood from it's opposites;
Electrically Neutral vs. Electrically Active region. Planets, or Condenced matter generally, is Electric neutral. They share the same potential. "Grounded" is very describing word indeed for the neural reference point in electrical circuit. Thus the regions on the opposite site of Electropause, could very logically named as a "Groundsphere" (Planet, i.e. Earth) and "Elektrosphere" (Space).

4.1 Electropause and it's the mathematical consequences.
As shown in Chapter xxx , well describing exponentially growing equations in form $y = b \times m^x$ can be solved from the data, when these are defined separately for

- Groundsphere (0-110 km height),
- Electrosphere (130 -> km height)
The interest must be focused on m-values;
- Groundsphere; $m_G = 1.157\ldots1.182$
- Electrosphere; $m_E = 1.029\ldots1.059$
This depends how the example is chosen.
For the whole data range (0-1000 km) gives m= 1.10015, but as said, then the curve doesn't quite fit. Thus, also this following math, must be considered only as preliminary. The most presentative values seems to be $m_G = 1.160$, which was achieved with 0-108 km data, and for the m_E = 1.05 m, which is produced with 130-160 km height data. As $1.05^3 = 1.157$ or $\sqrt[3]{1.16} = 1.051$, it seems that there is some 3rd –power mathematical connection between these two values. Or maybe simply a factor $1.16/1.05 =\sim 1.105$
This numerology doesn't seem to offer any immediately acceptable solutions. There seems to be immediate parallels to the physical laws of electromagnetism. But I avoid to use, them as they are not enough familiar for me. I rather try to make a comprehensive picture, what it practically means, when this kind of change occurs.There is a simple thumb-rule for any Exponential-growth from Albert Bartlett; the doubling time is given by 70 / divided with the growth-%. And this is very describing.
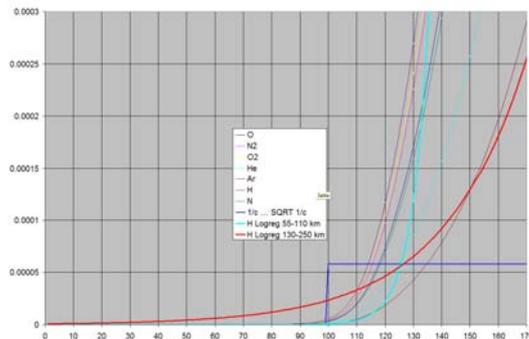
The exact math is $\dfrac{\ln(2)}{m-1}$,

this gives for m_G a "doubling time" of $\dfrac{\ln(2)}{m_G-1} = \dfrac{\ln(2)}{1.16-1} = 4.33$

and for m_E a "doubling time" of $\dfrac{\ln(2)}{m_E-1} = \dfrac{\ln(2)}{1.05-1} = 13.86$

Their ratio, is of course directly $\dfrac{0.16}{0.05} = \dfrac{13.86}{4.33} = 3.2$

but as the values are not exact, it's more safe to state, that the factor is approximately ~3. But what does this mean? The Picture xxxx above shows, that it's about the growth rate of Mean-free-path. This simply means, that the particle amount which is needed to create the current atmospheric pressure, is suddenly only 1/3, on the Electrosphere compared to Groundsphere. Or that the Electric particles are 3 times more powerful transmitters than normal kinetic particles. The Electric-plasma theory (Compared to Kinetic-gas theory) should therefore be written as follows.

Electric plasma	Kinetic gas theory
Force; $F = \dfrac{Nmv^2}{L}$	Force; $F = \dfrac{Nmv^2}{3L}$
Pressure; $P = \dfrac{Nmv^2}{V}$	Pressure; $P = \dfrac{Nmv^2}{3V}$
or $PV = Nmv^2$ or $k_B T = mv^2$	or $PV = \dfrac{Nmv^2}{3}$ or $k_B T = \dfrac{mv^2}{3}$

Somehow this doesn't make any sense. If the logic from Kinetic-gas theory is followed, this number 3 comes to the Equations from the 3-Dimensions. Therefore the plain interpretation of this would be that the Electrosphere, or Space is only 1-Dimensional. Though, there are these 1-Dimensional Structures on sight. It just sounds too simple that the galaxies and solar-systems would be reduced to a simple rotating disk through so simple mechanism.

Maybe I try to solve this through Turbine theories;
The true meaning of the "time squared" is also rather difficult to impress in classical physics, as there is no Acceleration, Force, Power or Energy units which could be derived

from "Area-velocity". It would mean that Area velocity was written as a $v^2 = \dfrac{l^2}{t}$,

But as this is not mathematically correct, because velocity doesn't have a unit [m²/s], thus I use "y" to describe area-velocity, as Y from Euler's Turbine equations can directly be used for Area-acceleration [m²/s²].

These equation would be then correctly written $y = \dfrac{l^2}{t}$, and $Y = \dfrac{y}{t} = \dfrac{l^2}{t^2}$, yet I can't see

any way to build the theory further through these. Thus I start to seek this from the speed of light idea.

The Mean free path was calculated with $l = \dfrac{k_B T}{\sqrt{2}\pi d^2 p} = \dfrac{k_B}{\sqrt{2}\pi d^2 \rho R_d}$

and the velocity with $v_{rms} = \sqrt{\dfrac{3k_B T}{m_p}}$

and the time with $t = \dfrac{l}{v_{rms}} = \dfrac{k_B T}{\sqrt{2}\pi d^2 p} \times \sqrt{\dfrac{m_p}{3k_B T}} = \dfrac{k_B T \sqrt{m_p}}{\sqrt{2}\pi d^2 p \sqrt{3k_B T}} = \dfrac{\sqrt{k_B T m_p}}{\sqrt{6}\pi d^2 p}$,

which in the Kinetic-Plasma limit was $t = 1/c$ [s], while the diameter was $l = 1/c$ [m],

thus $1/c = \dfrac{\sqrt{k_B T m_p}}{\sqrt{6}\pi d^2 p}$

Yet if the diameter, at Condensate/Kinetic limit is $l = 1/c = d$,
then the mean-free-path should be calculated as

$1/c = l = \dfrac{k_B T}{\sqrt{2}\pi d^2 p} = \dfrac{k_B T}{\sqrt{2}\pi (1/c)^2 p} \Rightarrow 1/c^3 = \dfrac{k_B T}{\sqrt{2}\pi p} \Rightarrow \dfrac{\sqrt{2}\pi}{c^3} = \dfrac{k_B T}{p}$,

again, with the wider definition of p, pressure, we get $\dfrac{\sqrt{2}\pi}{c^3} = \dfrac{k_B T}{p} = \dfrac{k_B T}{\rho R_d T} = \dfrac{k_B}{\rho R_d}$,

and while, $R_d = \dfrac{k_B}{m}$, here "m" being the <u>molecular mass</u> of the gas, we can write

$\dfrac{\sqrt{2}\pi}{c^3} = \dfrac{k_B}{\rho R_d} = \dfrac{k_B m}{\rho k_B} = \dfrac{m}{\rho} \Rightarrow \rho = \dfrac{mc^3}{\sqrt{2}\pi}$, and while $\rho = \dfrac{m}{V}$, thus it can be written;

$\rho = \dfrac{mc^3}{\sqrt{2}\pi} \dfrac{\sqrt{2}\pi}{c^3} = \dfrac{mV}{m} = V$, Numerical value $V = 4.44\ \dfrac{1}{c^3} = 1.65 \times 10^{-25} [m^3]$

The volume of a sphere with a radius of 1/c [m], would be $V_S = \dfrac{4\pi}{3c^3}$, thus from here can

be following factors be calculated for Sphere;

$\dfrac{\dfrac{\sqrt{2}\pi}{1}}{\dfrac{4\pi}{3}} = 1.06066$,

and value might actually even be the searched m_E. If this IS the case, then the data supports the idea of $(1-m_G) = 3 \times (1-m_E)$, as this gives quite exactly the value $m_G = 1.182$, yet the difference to $m_G = m_E^3 = 1.193$ is not so big either. To show how variable the data actually is, a diagram was created. Here the is solved own value for every hight-km, from 4 km wide sample. The change in concept at 117 km is as clear as before, but from this data it's not possible to make any further conclusions with the current level of Understanding.
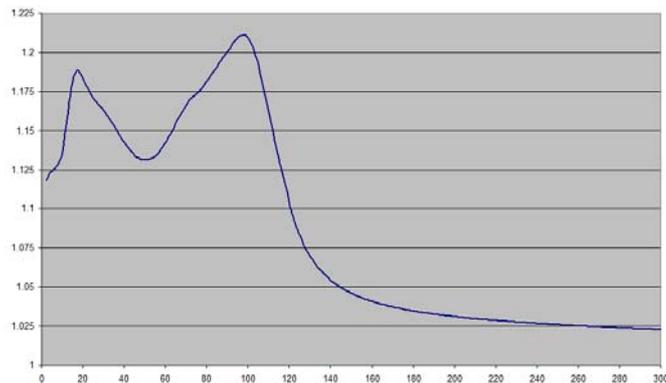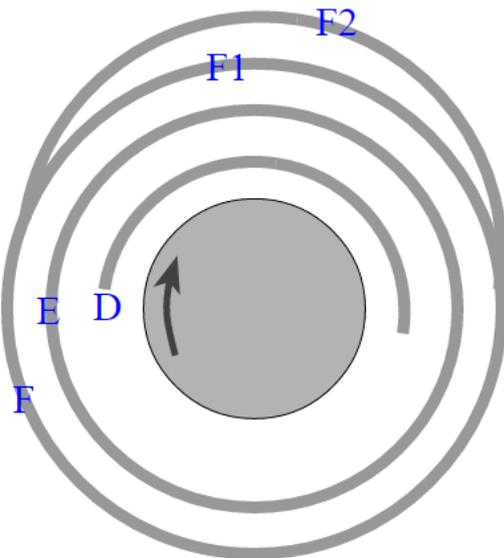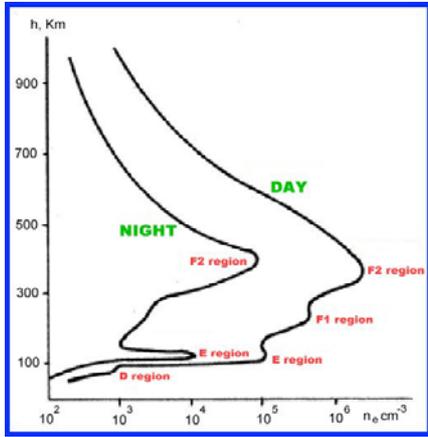
5 Other Planets

5.1 Condensed-Kinetic

The atmosphere of Venus has a pressure of 9.2 MPa, it's mostly Carbon dioxide, and has a temperature of around 740 K. The air density is 67 kg/m^3. So, the question is, if this is the solid/liquid "surface" of Venus? It's not so obvious. The density of fluid carbon dioxide is 713 kg/m^3 @ 25°C, And the Coefficient of thermal Expansion of Liquid @ 25 °C is 0.02066 1/°C. Thus with ΔT of 467 K, the volume of this liquid will change with a factor of 9.648 and 713/9.648 = gives 73.0 kg/m^3 which compared to 67 kg/m^3 is in the right order. The most probable cause for this 9% variation is that the Expansion coefficient is not constant. As the troposphere of Venus seems like a liquid (reduced visibility compared to gas) behaves like a liquid (flow velocities are in same range as in the ocean currents of Earth), and it's physical properties are similar to liquid, I assume it is a liquid in the sense we are talking here. Thus the Surface of Venus, must be there where the visible surface of this liquid is. According to this picture, it's also in Venus about there where the pressure is 1 bar. The temperature at this point is approx. 350 K. The "water" in Venus seems to be "Sulfuric acid", H_2SO_4 It's Melting point is 283 K, and boiling point 610 K at 1 atm. Careful analysis with the Wikipedia-data places the "c^3- point" to 48.65 km height, with a pressure of 133000 Pa and 357.5K. A paper "Venus Cloud Structure and Radiative Energy Balance of the Mesosphere" from Yeon Joo Lee,2012 Page 14 fig. 1.3 supports this idea.

Quick wiev, to other planets supports this too, The cloud bottoms are approximately on these conditions;
Jupiter; 49 kPa-132K.
Saturn; 33.5 kPa-90K.
The data I found for Uranus and Neptunus is approximate, but it seems that these values might suit;
Uranus 35 kPa-94 K,
Neptunus 13 kPa-35 K

5.1 Kinetic-Plasma
Following data for Stratopause's were found;
Venus; Height 65 km, 9900 Pa, 233 K, mean free path of CO_2; 2.7x10^{-13} s.
This is obviously NOT the Stratopause as explained here.
At 100 km height, 2.7 Pa, 160 K, Mean free path of CO_2; 4.8x10^{-10} s, from here can be concluded, that the Stratopause of Venus might be at ~105 km height, in 0.4 Pa, and 165 K temperature. The picture of the atmosphere of Venus, supports this.
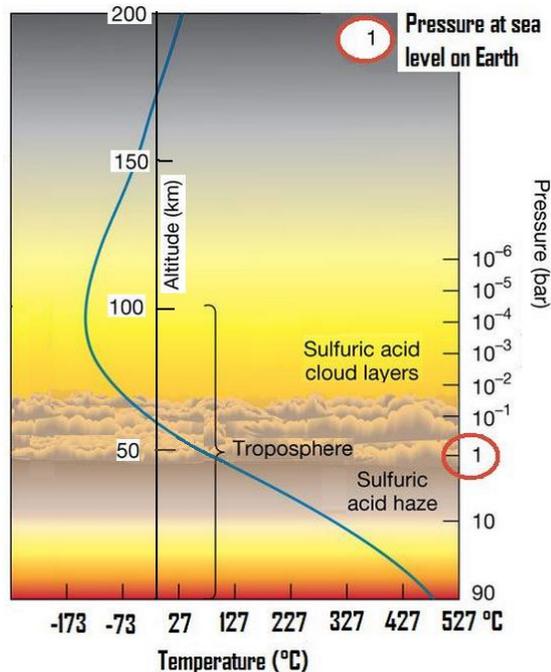
Mars; There is not enough data easily found from Mars, but obviously the pressure and Temperature are really low, and the gas is mainly CO_2. This values could be 110 Pa, 90 K and as the Surface pressure is just 600 Pa, this would mean that the Stratosphere is on 13 km height.

Jupiter provides much better data; 0.1 Pa, 150-200 K, at 320 km height, mostly Helium. This (175 K, 0.1 Pa) gives already really close figure. The accurate values seems to be 300 km hight, and 0.2 Pa. The Picture from Wikipedia Supports clearly the idea;
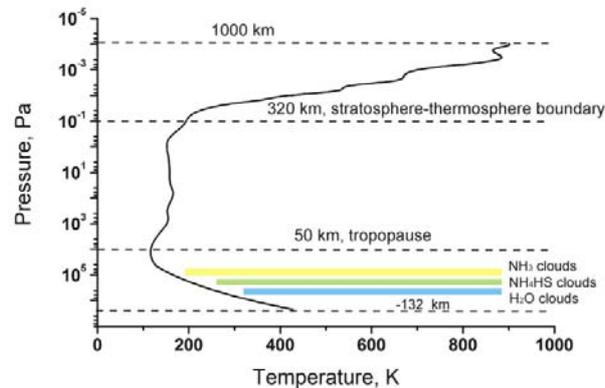
5.2. Plasma-Electric

While starting to write this paper, I had no idea that this new matter is to be found. As it's analysis is not exact even in Earths atmosphere. It makes little sense to try to interpret some incomplete data from other planets to support this. The proof for this idea, is much easier to be searched in a lab. Thus further evidence from other planets is not looked at all.

6. Turbulence

My solution, or explanation for Turbulence also Supports this idea. If the occurrence of viscous-forces needs the matter to be Condensed, and the full appliance of Kinetic theory requires, that no molecule Condensation are aloud, then it's more than obvious, that a laminar fluid, works as a condensed matter, and a fully turbulent fluid, with very small homogenous condensed particles, works like kinetic gas. This all is already principally explained in my old paper. And it's therefore not needed to repeat here.

Yet, the Electric aspect of Turbulence is not seen. In Water the hydrogen bonding, is a phenomenon, where Hydrogen atoms are changing their parent atom in very high frequency. When shear velocity exceeds the velocity of these ions -they most be ions for a short time in such a process- then the fluid intern surface is developed simply because the electric charges repels each other. The exact time, when Turbulence Starts, must also be able to be calculated, from the speed of light with the principles shown here. This task is left uncompleted.

7. Gravity.

These observations supports strongly the simple Gravity Theory presented originally by Nicolas Fatio in 1690, further developed in 1748 by Le Sage, and thus known as "Le-Sage-Gravitation". As the complexity behind this simple idea is too remarkable, in this paper is said no more.

8 Conclusions

The fundamental idea behind this paper is that everything is light. That mass is a fictitious like the fictitious forces. The "key to science" presented in the introduction has been my guiding light here. It's been really annoying to notice, that though I've actually had the basic idea and supporting observations for quite a while (Since 2012), it has been more than painful to found the combining math and easily comprehensible observations.

Now, white the observations presented here this verification must be straight forward.
1. The Matter must be compressed in pressure and temperature, which forces the molecule to a space less than 1/c [m] to force it to **Condensated Matter**.
2. The Molecular density must be compressed below pressure and temperature, which forces the molecule to have less than 1/c [s] mean-free-path to force it to form tensionless **Kinetic Matter.**

3. The Molecular density must be compressed below pressure and temperature, which forces the molecule to have less than $\sqrt{1/c}$ [s] mean-free-path to force it to form a **<u>Grounded Matter</u>** free of permanent Electric potential differences.
4. Matter which doesn't have the required pressure and Temperature remains permanently charge carrying **<u>Electric Matter</u>**.

[1]
[2]

The rest of the information is searched mainly from Wikipedia.
I also want to mention Feynman lections, as a source of inspiration.