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Charge Quanta as Zeros of the Zeta Function in Bifurcated Spacetime

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Abstract

In a fractal zeta universe of bifurcated, ripped spacetime, the Millikan experiment, the quantum Hall effect, atmospheric clouds and universe clouds are shown to be self-similar with mass ratio of about 10^{20}. Chaotic one-dimensional period-doublings as iterated hyperelliptic-elliptic curves are used to explain n-dim Kepler- and Coulomb singularities. The cosmic microwave background and cosmic rays are explained as bifurcated, ripped spacetime tensile forces. First iterated binary tree cloud cycles are related to emissions $1\cdots1000$ GHz. An interaction-independent universal vacuum density allows to predict large area correlated cosmic rays in quantum Hall experiments which would generate local nuclear disintegration stars, enhanced damage of layers and enhanced air ionization. A self-similarity between conductivity plateau and atmospheric clouds is extended to correlations in atmospheric layer, global temperature and climate.

Keywords

Charge Quanta, Zeta Function, Cosmic Rays, Cosmic Microwave Background, Bifurcated Spacetime

1. Introduction

Cosmological redshift and cosmic microwave background (CMB) seem to confirm a big bang scenario. An origin of cosmic rays (CR) has shifted to outer universe space. However, a big bang scenario is based on a four-dimensional elastic continuum. The present note explains experimental data by discrete superfluid flow dynamics and ripped spacetime. The Friedmann solution in Equation (2) is an elliptic integral [1]. Fractal zeta universe (FZU) sets period-doubling of one-dimensional maps as a complex bifurcated, ripped spacetime with ultra-high tensile forces and ultrahigh energies [2]. Feigenbaum constants α_F, δ_F and periods ν_{Sh}

due to Sharkovskii's theorem are central in FZU. Accordingly, CR origin is shifted to earth as a ripped texture of a bifurcating hyperelliptic-elliptic period-doubling discrete iterated complex spacetime. Based on dimensionless information currents FZU predicts a novel climate-weather model. S-matrix poles as masses are already shown to be related to Riemann zeta function zeros $\zeta(z_{nt})$ [3]. An area $2\pi\delta_F^2$ with Feigenbaum constant δ_F corresponds strikingly to the inverse fine structure constant α_f *[4]* [5]. A thermal diffusive theta function $\vartheta(u\omega)$ describes the superconducting flux order parameter φ [6]. For semiconducting states, a Benard convection instability has been predicted [7]. Like in Large Number Hypothesis (LNH) [8], Millikan's experiment [9], quantized Hall effect (QH), CR-atmospheric cloud and universe radius are shown to be self-similar [2]. Mediated by nontrivial zeros of the zeta function $z_{nt}[f(\omega)]$, bifurcating iterates of the Weber invariant $f(\omega)$ create a complex Riemann surface of ripped spacetime [2]. A ν_{Sh}-bifurcation tree is explained as a persistent balanced ionized state of created matter in universe. Charge quanta are defined as the number of simple nontrivial zeros z_{nt} in FZU where the Riemann zeta function $\zeta(z) \simeq \chi(\lambda\text{-}z_{nt})$ behaves volcano-like quadrupolar in shown in **Figure 1** for complex $\lambda \simeq z_{nt}$.

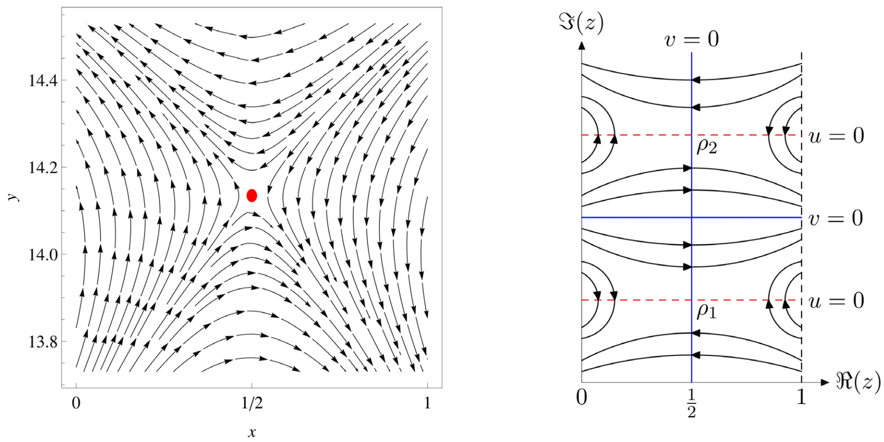

Figure 1. Volcano-like quadrupolar complex z_{nt}-zero region of the entire function $\xi(z) = -\partial j_{cloud}(z)/\partial z$ with $\Delta_h\xi(z) = 0$ and hyperbolic Laplacian $\Delta_h = y^2\left(\partial_x^2+\partial_y^2\right)$. Left: field lines in the vicinity of the first Riemann zero. Right: illustration of the field in the vicinity of two consecutive Riemann zeros of [10].

A fundamental interaction is regarded as a susceptibility plateau χ of a nondissipative large potential. A bifurcation flow 1, 2, 1', 2' contains non-observable ultra-high particles in ripped spacetime. This bifurcating complex string builds lines of a two-periodic superfluid potential flow with a second sound as entropy oscillations and temperature oscillations [2]. Within FZU expansion is apparent as a quadrupolar nonradiative scattering which explains the Hubble law as well, the cosmological redshift, and a decreasing velocity of light. This black hole van der Waals-like stability is a minimum near inflection line of a cubic potential. In FZU this note predicts a CMB and net rates of ultra-high rays in QH detectable only by large arrays [11]. Section 2 is devoted to link CR to complex scalar curvature. Complex curvature is regarded as equivalent to the Weber invariant of elliptic curves. A bifurcating spacetime is set equivalent to large tensile forces. Section 3 discusses the simplest cycles of iterated intervals of curvature equivalent to quadrupolar gravitational-like wave. A quadrupolar susceptibility increases with radius which is felt as apparent expansion of space inducing a redshift. Section 4 relates first *k*-components of a bifurcation tree where first Sharkovsky periods appear to an overall spatial wave felt as CMB. Section 5 discusses the infinite *k*-component limit which is viewed as capable to create Kepler and Coulomb charge singularities in the renormalized Feigenbaum function. Section 6 defines a highly correlated , non-dissipative, non-radiative potential flow as a conductivity plateau around iterated nontrivial zeros of the zeta function. Plateau transitions are responsible to generate CMB-CR. Mass ratios are compared in Section 7 which demonstrates the applicability of the two-dimensional map to field oscillations and global temperature oscillations. The concluding section relates pseudo-congruent *k*-components to quantum statistics. Pseudo-congruence should be related to class number one number fields. A definition of charge based on *k*-congruences explains quantum statistics and resolves the cosmological constant problem.

2. CR as Bifurcating Spacetime Tensile Forces

Zeta function ζ and ξ-function

$$\xi(z)=\binom{z}{2}\pi^{-\frac{z}{2}}\Gamma\left(\frac{z}{2}\right)\zeta(z)=\frac{1}{2}\prod_n\left(1-\frac{z}{z_n}\right)=-\frac{\partial j_{cloud}(z)}{\partial z}$$

with the exact integral

$$j_{cloud}(z)=-4\int_1^\infty\frac{\mathrm{d}t}{\log t}t^{-1/4}\partial_t\left(t^{3/2}\partial_t\left(\vartheta_3\left(0,\mathrm{e}^{-\pi t}\right)\right)-1\right)\sinh\left[\frac{1}{2}\left(z-\frac{1}{2}\right)\log t\right]$$

offer simultaneous maps $\gamma\xi$ and γz where the step number k is viewed as a clock frequency. Here ϑ_3 is the Jacobi theta function. The elastic spacetime of smooth, differentiable real Riemann surfaces is the continuous limit of an iterated dynamical time k for the e.g. complex Ricci scalar $R_k^2+c_M\to R_{k+1}$ for a discrete sequence of times k. This quadratic map is a partial case of a more general Hermite-Tschirnhausen map.

$$\gamma\left(\phi_3(t)\right)=\begin{vmatrix}\frac{1}{3}\phi_3'(t) & \phi_3(t)-\frac{t}{3}\phi_3'(t)\\ -1 & t\end{vmatrix} \tag{1}$$

of cubic roots $\phi_3(t)$ defining period-doublings. Elliptic time

$$ct=\int\frac{\sqrt{\varphi}\mathrm{d}\varphi}{\sqrt{\phi_3(\varphi)}} \tag{2}$$

in Friedmann universes already indicates a relation of the Ricci scalar R or radius $R_u\simeq\varphi\simeq K+iK'\simeq\omega_1+i\omega_2$ to an order parameter φ and quarter periods K, K'. FZU Legendre modular functions $\lambda[f(\omega(\ldots))]$ are iterated in discrete steps k giving a set of half-periods ω_1, ω_2. Large scalar bifurcating curvatures R_k indicate strong tensile forces such as nuclear disintegration stars. A Mandelbrot map demands $|R_k| < 2$ with parameter $c_M \simeq \Lambda$ equivalent to cosmological constant Λ. Rare ultra-high CR of low count rate of e.g. 10^{-2} per year producing air showers are counted as single zeta function zero [12]. Large detector arrays confirm a large correlation area triggered by a new nontrivial zero of the zeta function as a charge quantum which itself has $>10^{2000}$ fractal constituents.

3. Apparent Expansion by Quadrupolar Gravitational Waves

Apparent expansion appears by Feynman diagrams valid in FZU for interaction $w = 1, 2, 3, 4, 5$ = (strong, weak, em, Grav, dark) as nonradiative exchange (dark) polarization giving $\varepsilon_o \simeq R_u^2$. For cubic roots e_i one has $c_M \simeq \rho_{vac} \simeq \rho_{\pm}^2 \simeq \Lambda \simeq e_i \simeq \wp(u=\omega) \simeq \vartheta^2(0,\omega) \simeq \varphi \simeq R_u$, *i.e.* the background susceptibility ε_o appears as exact ϑ^4 equation for theta characteristics 01, 10, 11 for all periods ω. Einsteins work on gravitational waves g_k implicitly uses quadruple steps k, $k+1$, $k+2$, $k+3$ of simplest cycles $T_{k+3} = T_{\{k,k+1,k+2\}}$ of stress-energy T [13]. Gravitational waves g_k are proven by energy loss. FZU predicts a Carnot cycle-like energy gain due to gravitational waves g_k for simplest cycles. Simple quadrupolar zeros $\lambda_k \simeq z_{nt}$ are related to $\lambda(\omega)$ as iterates in $\zeta(z)$

$$\lambda(1-\lambda) = \frac{2^4}{f^{24}(\omega)} \tag{3}$$

of a cubic Weber-invariant $f(\omega)$, $f_k = f\left(\sqrt{\Delta_k}\right)$, with $\Phi_3(f(\omega)) = 0$ where iteration changes k^{th} discriminants Δ_k of the normal bicubic field. Like ξ functions with $\Delta_h\xi = 0$ for hyperbolic Laplacian $\Delta_h = y^2\left(\partial_x^2 + \partial_y^2\right)$ fractional $\gamma(\Phi_3) \circ f(\omega)$ create an entire holomorphic polynomial $f_k(\omega)$ with $\Delta_h f(z) = 0$. Measured (universe) radii $R_u \simeq \varphi$ behave like velocity and length of a traffic jam for a whole set of periods ω_k. The vacuum permittivity $\varepsilon_o \simeq R_u^2$ results from a potential $V(\boldsymbol{k}) \simeq I_{ij}\boldsymbol{k}_i\boldsymbol{k}_j / \boldsymbol{k}^2 \simeq 1/\varepsilon(\boldsymbol{k})\boldsymbol{k}^2$ with moment of inertia I_{ij} (quadrupole moment) and $\varepsilon_0(\boldsymbol{k}) = 1/I_{ij}\boldsymbol{k}_i\boldsymbol{k}_j$. Then $\varepsilon_0(\boldsymbol{k}) \to 0$ for $\boldsymbol{k} \to \infty$ which exhibits ultraviolet divergence or infrared divergence implying a superconducting-super insulating duality with common features of a non-dissipative ordered state of large potential [14]. A superconductor as a perfect diamagnet, is also a perfect insulator with zero dissipative current and zero magnetic field in the bulk. The light velocity c_l of the traffic jam decreases with increasing R_u which explains a confinement and the Hubble law $H_w \simeq R_u$. The Weber invariant $f(\omega)$ of a cubic Φ_3 for all periods ω enables a cubic minimum of $V_T(R_u)$ as a van der Waals-like attraction due to time-thermal Carnot cycles ν_{Sh} of iterated invariants f_k. Simplest cycles apply as well to shifts δ_k in quadruples $q = \{k, k+1, k+2, k+3 : 1, \delta_k, \delta_k\delta_k, \delta_k\delta_k\delta_k\}$ as an $\boldsymbol{E} \to \boldsymbol{D} \to \boldsymbol{H} \to \boldsymbol{B}$ field cycle for superconducting or super insulating fields which holds for all iterations. Correlated iterated nontrivial simple zeros z_{nt} are embedded into a maximal quartic surface in Equations (12) and (13), the Kummer surface $K(X = (\wp_{\pm\pm}, 1))$ and Weddle surface and $W(Y = (\wp_{\pm\pm\pm}))$. Hyperelliptic $\wp$-functions are rationalized $\wp_{\pm\pm} \simeq \left(1, -f, f^2\right)$ and $\wp_{\pm\pm\pm} \simeq \left(1, -f, f^2, -f^3\right)$ by Weber invariant

$f(\omega)$ as a parameter [15].

4. CMB Temperature

Unobservable ultra-high energy particles above GZK cutoff are identified with k-components between tree root in z_{nt} and first ν_{Sh} at $k = 3$. Doubling at logistic parameter $r \simeq 3.54 \simeq 4$ suggest a base 4 with Fermat number transforms. For all components, the elliptic addition theorem implies invariant $\lambda g^2 \simeq inv$ with modular unit g [16]. Then $\lambda g^2 \simeq G_w M_w^2 \simeq G_w H_w^{-2}$ with Cantor string coupling constant G_w

$$\ln G_w = -w!2^w \ln_3^w 2 \tag{4}$$

Bifurcations create cloud masses M_w as $M_w \simeq H_w^{-1}$, *i.e.* $M_5 > \cdots > M_1$. Interactions $w = 1, 2, 3, 4, 5$ obey invariant plateaus of vacuum density

$$\rho_{vac} \simeq \frac{H_w^2}{8\pi G_w} \simeq \frac{H_4^2}{\kappa_4 c_l^2} \simeq \hbar c_l \simeq inv \tag{5}$$

with

$$\kappa_w \simeq \frac{8\pi G_w}{c_l^4}.$$

Addition on fluctuating elliptic curves solves the cosmological constant problem with a w-independent mean vacuum density e.g. for dark matter $G_5 \simeq 10^{-167}$. Hubble parameter $H_w = \ln{}'\varphi$ depend on k-component as $\ln 2^{2^k}$. First ν_{Sh} up to third branch $k = 3$ yields a mean CMB energy density $\rho_{vac}^{CMB} \simeq T^4$

$$\rho_{vac}^{CMB} \to \frac{H_5^2}{8\pi G_5 \left(2^{2^3}\right)^2} \simeq \frac{\rho_{vac}}{2^4} \simeq \rho_{vac}^{CMB} \left(T \simeq 2.3\,\text{K}\right) \tag{6}$$

Thus, the tree root is embedded in a dark environment of a nearly isotropic 3K CMB of wavelength $1 \cdots 10$ cm or frequency $1 \cdots 10^3$ GHz. This supports a bifurcated spacetime.

5. Kepler and Coulomb Singularity from Cosmic-Ray-Charge-Clouds

One-dimensional bifurcations of iterates $f_k = f\left(\sqrt{\Delta_k}\right)$ change the k^{th} discriminant of the normal field Δ_k. Simplest cycles form quadrupoles and can create a dipole decaying into coulomb singularities due to Feigenbaum renormalization. A self-similar simplest cycle scenario of electronic, atmospheric and universe clouds is a cloud adiabatically moving in an inert environment (e.g. electron-oil drop). The two-valley-Gunn-effect-like configuration enables a dipole. f_k iterates display a hysteresis loop on Feigenbaum xy plane where x-axis displays temperature (modular units $g\left(a\omega_k, \omega_k\right) \simeq \vartheta_k\left(f\left(\omega_k\right)\right) \simeq \varphi\left(\omega\left(\lambda\right)\right) \simeq T_k$) and y-axis displays entropy (Legendre modular function $\lambda(f(\omega_k)) \simeq \delta_k h_t$ as where $\omega_k \neq \Delta_k$). The area of the hysteresis loop is the Carnot cycle heat gain which is called charge for a dipole-like hysteresis. The process is driven by the quadratic map of cubic roots

x_3 [17] [18].

$$F(x_3,t)=\gamma(\phi_3(t))\circ x_3=\frac{\phi_3(t)}{t-x_3}-\frac{1}{3}\frac{\mathrm{d}\phi_3(t)}{\mathrm{d}t}$$
$$=\phi_3(t)G^{-1}(x_4)G^{-1}(x_4)-\frac{1}{3}\frac{\mathrm{d}\phi_3(t)}{\mathrm{d}t} \tag{7}$$

$\gamma(\phi_3)$ is quadratic in the bi spinor Green's functions $G(\not{x}_4)$ in Feynman slash notation of quartic roots where $x_3\simeq x_4^2$ for a shift x_4 to $\pm\infty\pm i\infty$ giving spins $s=1, 2, 3, 4$. Discrete shifts δ_k

$$\delta_k f(\omega_k)\simeq(curl\,\boldsymbol{f})z\simeq\gamma(\phi_3(f))\circ f\simeq G^{-1}\delta_k G^{-1} \tag{8}$$

are proportional to global temperature potential $V_{T_{global}}$ as a fractal line integral

$$V_{T_{global}}=\int\nabla V_{T_{cloud}}\mathrm{d}l_{xy} \tag{9}$$

Mean values in xy-plane are persistent rates

$$V_{T_{global}}\simeq R_{net}$$

and

$$V_{T_{universe}}\simeq R_{net}$$

and create a pole via

$$\frac{1}{2\pi i}\int\mathrm{d}x\mathrm{d}y(curl\,\boldsymbol{f})\to\frac{1}{2\pi i}\int\mathrm{d}x\mathrm{d}yG\delta_k G\to a_{-1}\to\frac{1}{2\pi i}\oint\mathrm{d}z\,f_{ren}(z) \tag{10}$$

Feigenbaum renormalization $f\to f^{(ren)}$ replaces k-components $\gamma(\phi_3(f))\circ\cdots\circ\gamma(\phi_3(f))$ by two-components $\gamma(\phi_3(f^{(ren)}))\simeq\gamma(\phi_3(f^{(ren)}))\circ\gamma(\phi_3(f^{(ren)}))$ [19]. Besides a single $\zeta(z)$-pole the fractal zeta function has complex conjugated poles $\zeta(f^{(ren)}(z))$ in $f^{(ren)}(z)$ near simple zeros $\lambda(f^{(ren)})\simeq z_{nt}$. A Laurent series $f^{(ren)}=\sum a_k z^k$ changes to a single pole in $f^{(ren)}$ on simplest interval cycles [20]. Moreover, scaling $f_k^{(ren)}=-\alpha_F f_{2k}^{(ren)}$ suggests $z\to\alpha z$ for arbitrary α [19]. With increasing logarithmic 10^∞ zoom the mean quadrupolar thermal current in Equation (10) confirms [5] by residue

$$a_{-1}=\frac{m}{2\pi i\delta_F^2(2n+1)}\oint\mathrm{d}z\nabla V_{T_{cloud}}(z) \tag{11}$$

Iterates $f_{k+1}\leftarrow\gamma(\phi_3(f_k))\circ f_k$ are period-doublings if $\lambda_k\neq\lambda_{k+1}$ whereas invariant $\lambda[\delta\wp]\simeq\lambda[\gamma\circ\delta\wp]$ are laps around a quadrupolar vicinity in **Figure 1** of z_{nt} and f_{nt}. An air shower of bifurcating flow lines of $f(\omega)$ is a binary tree. A quadrupole $f(z)$ capable for dipole-dipole interaction creates charges and releases heat. The Kepler singularity (ζ-pole) and Coulomb singularity ($f^{(ren)}$-pole) are due to bifurcations as additions on hyperelliptic quartics $K(X(f))$ and $W(Y(f))$

$$[\zeta(z),\zeta(z')]\to[R_{net},R_{net}]\to[\zeta(z,\mathbb{K}),\zeta(z',\mathbb{K})]$$
$$\to\frac{\sigma_{u+v}\sigma_{u-v}}{\sigma_u^2\sigma_v^2}=X(f)\,jX(f)\to 0 \tag{12}$$

$$\to\alpha m_+^2+\beta m_+m_-+\gamma m_-^2\to 0. \tag{13}$$

The partial case $\alpha:\beta:\gamma=1:-136:10$ yields the Eddington equation with weights $W\simeq 2^{2^k}$ in hyperelliptic characteristics (α, β, γ) giving proton stability for $W\to\infty$. Quarter periods $K(\lambda)$ as temperature potential V_T obey [17].

$$\frac{\mathrm{d}}{\mathrm{d}\lambda}\lambda\lambda'\frac{\mathrm{d}K}{\mathrm{d}\lambda}=\lambda\lambda'\frac{\mathrm{d}^2K}{\mathrm{d}\lambda^2}+\left(\gamma-(\alpha+\beta+1)\lambda\right)\frac{\mathrm{d}K}{\mathrm{d}\lambda}=\alpha\beta K \tag{14}$$

The hypergeometric $K(\lambda)={}_2F_1(\alpha\beta\gamma\lambda)={}_2F_1(1/2,1/2,1,\lambda)$ is linearized in 4-component quarter periods $\lambda=\lambda_m/m+1/2$. The Dirac bi spinor $\lambda_m\simeq\psi_s$ transmits to invariant f_s and units E_s as a simplest cycle with bi spinor bicubic number field norm $E_s\psi_s\psi_s$ with real unit E_S. Superposed units E and $\ln E$ are optimal and minimize the regulator R_Δ which yields an invariance $f^{(ren)}\to \mathrm{e}^{\mathcal{L}}f^{(ren)}$ with phase-factor $\mathrm{e}^{\mathcal{L}}$ where $\mathcal{L}$ is Lagrangian-like [2]. With a_{-1} the Schrödinger-like Equation (11) gets a constraint

$$f_{ren}\simeq\frac{m}{\hbar^2}\left(V_T+\frac{Ze^2}{\lambda-\lambda_0}\right) \tag{15}$$

as well as a cubic $\phi_3(f_k)$ congruence being the Higgs-Kibble-Landau-Ginzburg term. The one-dimensional Coulomb Green's function of Equations (13) and (14) yields n-dimensional Coulomb forces applying $\hat{O}=\partial_{x-y}\left(\partial_x-\partial_y\right)$ [21]-[23]. Based on only two variables $x=r_1+r_2+r_{12}$ and $y=r_1+r_2-r_{12}$ which are ±π rotations on interval [0,1] the n-dimensional Coulomb force depends on simplest cycles on the real interval [0,1]. Optimal iterates are superpositions of a unit E with a definite zoom $\ln E$. Cycles and periods ν_{Sh} yield an optimal spatial box. Zoomed cardioids are projected onto Riemann sphere with doubly periodic boundary conditions. Zoomed iterates of period-doublings as cubic roots of elliptic curves up $k>10^{2000}$ are capable to create a dipole in Equation (12) as a potential bifurcating flow.

6. QH Plateau and CMB-CR near Nontrivial Zeros of the Zeta Function

In distinction to filled Landau levels plateaus QH susceptibility plateaus χ_H are iterated, bifurcating simple-zeta-zero-quadrupole clouds as charge constituents. The cosmic microwave background (CMB) and cosmic rays (CR) are explained as bifurcating ripped spacetime tensile forces below and above first ν_{Sh} from the tree root up to third branch component. At QH CMB emissions ($1\cdots10^3$ GHz) are predicted by the iterated binary tree cloud which are possibly already detected [24]. An interaction-independent universal vacuum density allows to predict large area correlated CR in QH-experiments which would generate local nuclear disintegration stars, enhanced damage of layers and enhanced air ionization [1]. Longitudinal thermopower measurements yield a linear response [25] [26]. In FZU quadratic thermopower cycles are the origin of charge [2]. A charge of small mass m_e floats in a quasi-homogeneous cloud of a large background mass M_p. A sequence of universe mass $M_u\simeq10^{56}$ g to mass of solar system 2×10^{33} g (10^{24}), mass 5×10^8 g of a 10^9 m^3 cloud of density 0.5 g·m^{-3} to earth mass of 5×10^{27} g (10^{19}), oil drop mass 10^{-12} g to electron mass 10^{-30} g (10^{18}) contains its ratio in brackets as the fourth power κ^4 of the Born-Oppenheimer parameter κ. Opposed is a liquid cloud mass 10^{-5} g surrounding an electron mass 10^{-30} g (10^{25}) as a correlated thermal potential V_T where path-ordered flow lines are a non-dissipative, non-radiative liquid slushy. The Millikan experiment for an oil drop of 10^{-12} g has a Born-Oppenheimer parameter $\kappa = 10^{-3}$. Accordingly, a QH tight-binding model with measurement precision $\kappa = 10^{-5}$ requires a thermal background cloud potential - mass equivalent V_T of Planck mass $M_p \simeq 10^{-5}$ g [2] [27]. Surprisingly, atmospheric clouds have a similar mass ratio with respect to earth mass. Accordingly, an electronic tight-binding model for σ_H describes a neutral quadrupolar current near z_{nt} where σ_H is a coupling constant for various topological entropies. The theory starts with a regulator R_Δ of number field $\mathbb{K}[\partial, \{1^{1/m}\}]$ which is expanded as a Lovelock-like Lagrangian into subsequent minima as subsequent w boxes in a box of weight $e^{-w!}$ displaying coupling constants in Equation (4) for five interactions $w = 1, \cdots, 5$. A non-dissipative current j_H origins from temperature cycles and entropy cycles as congruent k-components. A chaotic superfluid creates a potential $V_{T_{cloud}}$ with two Feigenbaum constants α_F, δ_F. Cycles in $V_{T_{cloud}}$ depend on $\gamma(\phi_3(f(\omega)))$-fixpoints, on theta constants and the Dedekind eta function. Unlike thunder and flash bang convection turbulences are not needed for the iterated superfluid flow in Equations (12) and (13). Two-periodic partial solutions $\psi = \sum_{n\in\mathbb{Z}} c_n e^{inky} \varphi_n(x)$ of (14)

$$\frac{d^2K}{d\lambda^2} - \lambda \frac{dK}{d\lambda} + nK = 0 \tag{16}$$

are Hermite polynomials $\varphi_{n,m}$ which are capable to explain the QH conductivity [27]. The order parameter $\varphi_{n,m}$ belongs to a nearly homogeneous cloud with temperature gradient $\nabla T \simeq \boldsymbol{E}$ building an electric field $\boldsymbol{E}$ and topological entropy convection cycles $\delta_k h_t \simeq \boldsymbol{B}$ as magnetic field-like $\boldsymbol{B}$ period-doublings. Electron-oil clouds (Millikan), electron clouds (QH) and atmospheric clouds differ by mass ratio $10^{18}, 10^{25}, 10^{19} \simeq \kappa_{BO}^{-4}$ giving accuracy $\kappa_{BO} \simeq 10^{-4}, 10^{-6}, 10^{-5}$, respectively. Mean values $\int_0^\infty dh$ over altitude h satisfy analogously to $\xi(z) = -\partial j_{cloud}(z)/\partial z$ a Laplace Equation $\Delta_h \xi(z = x + iy) = 0$. The cloud current density j_{cloud} is assumed perpendicular to the gradient of cloud temperature $\nabla V_{T_{cloud}}$. Changes of topological entropy $\delta_k h_t$ are proportional to the number of quasiparticles $N_{qp} \simeq \boldsymbol{B}$ realizing QH geometry $\boldsymbol{B} \perp j_{cloud} \perp \nabla V_{T_{cloud}} \simeq \boldsymbol{B} \perp \boldsymbol{E}$. The cloud current $j_{cloud} = \chi \nabla V_{T_{cloud}}$ depends step-like on convection change $\delta_k h_t$ as a $\boldsymbol{B}$-like axial vector flow over period-2^k components of chaotic, regular, non-stochastic clouds. A density of residue (11) is called a fractional charge. A fractional correlated areal thermal heat density in FZU

$$\frac{m}{2\pi i \delta_F^2 (2n+1)}$$

is centred near z_{nt} and vanishes for $n \to \infty$. Iterated $f(\omega)$ and iterated periods $\delta_k \delta_k \omega \simeq \delta_k \omega \simeq \lambda = 1 - \delta_k h_t$ behave as a Gaussian kernel with width δ_F. The Hausdorff measure as density of states is step-like with respect to $\delta_k h_t$. The density of poles and residue is equivalent to a large mass M_{cloud} as a large but non-dissipative potential

$$V_{T_{global}} \simeq \sum \frac{Ze^2}{\lambda - \lambda_0} \simeq M_{cloud} c_l^2$$

around a non-trivial zero of $\zeta(z)$. Complex conjugated zeros z_{nt} enhance the correlated area by a factor 2 which is called thermal pairing. It is argued that integer QH as well superconducting pairing are thermal pairings. In FZU quarter period K, order parameter φ and e.g. universe radius $R_u \simeq K(\lambda \simeq 1 - \delta_k h_t) \simeq \varphi \simeq R_u$ depend step-like on entropy changes $\delta_k h_t \simeq \boldsymbol{B}$ as a thermal potential $V_{T_{global}} \simeq j_H$.

7. A Climate-Weather Model

A factor 10^{20} self-similarity between Millikan experiment, QH, atmospheric and universe clouds consist in a superfluid with two separate cycles of entropy and temperature. A cosmic-ray-charge-cloud has a balanced net rate with elastic spacetime enveloping ripped bifurcations. CMB and CR correlations of the atmospheric layer superfluid influence global temperature and climate. Self-similar temperatures, energies and masses but constant vacuum densities apply equally well to microstructures, atmospheric clouds and to the universe.

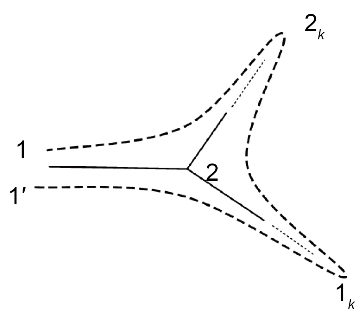

Figure 2. A period-doubling fluid potential (9) between points 1 and 1' correlates large distances of bifurcating fractal lateral points 1, 1′ → 2 → … → 1_k → … → 2_k (dotted line).

Tidal tensile forces in Equation (9) explain CR and CMB as well the correlated stability of objects similar to **Figure 2**. Global temperature (9) yields a climate-weather relation to CR and CMB and to a one-dimensional model. Previous hypotheses already suggest a relation between CR, atmospheric clouds and global temperature [28]-[32]. A self-interaction between CR and atmospheric clouds as part of FZU supports a continuous creation of matter near nontrivial zeros z_{nt} of $\zeta(z)$. A bifurcating fluid flow near z_{nt}-quadratic maps is partially nonergodic as an irreversible Carnot cycle which defines an arrow of time. A zeta zero z_{nt} is a catalyst for cloud growth. Created clouds are a fluid-liquid-gaseous slushy-like dark superfluid. A radiation component appears as an unnecessary turbulence. Positive ultra-high mass-energies are a counterpart to negative long-range van der Waals-like cubic forces balanced for $k \to \infty$-components and stabilized by ν_{Sh}. Apparent stochastic cloud net rates in 5-dimensional spacetime

$$\frac{d\rho_{\pm}}{dt} + div\, j_{\pm} = R_{net\pm} \tag{17}$$

reduce to complex time-thermal cloud cycles j_{cloud} with $\Delta_h \xi(z) = 0$ for $\xi(z) = -\partial j_{cloud}(z)/\partial z$ for mean values $\int_0^\infty dh\ldots$ over altitudes h. Equation (17) reduces to a quasi-two-dimensional regular chaotic equation for the zeta function $\zeta(z)$. Iterated by elliptic invariants the differential $d\lambda \simeq dI_{xy}$ for $\lambda \simeq \sigma(u\omega)$ depends on e.g. the Heuman lambda function which for $\lambda \to 0$ for $\omega \to 2^k\omega$ and $k \to \infty$ behaves plateau-like as shown in **Figure 3**. Global temperature (9) displays an entropy-based susceptibility plateau.

Gradient field $V_{T_{cloud}}$ oscillations are confirmed by temperature changes over 106 years as shown in **Figure 4** [33]. Constant vacuum densities (5) represent mean densities of period-doubling (elliptic addition) in FZU. Large CR-rates are

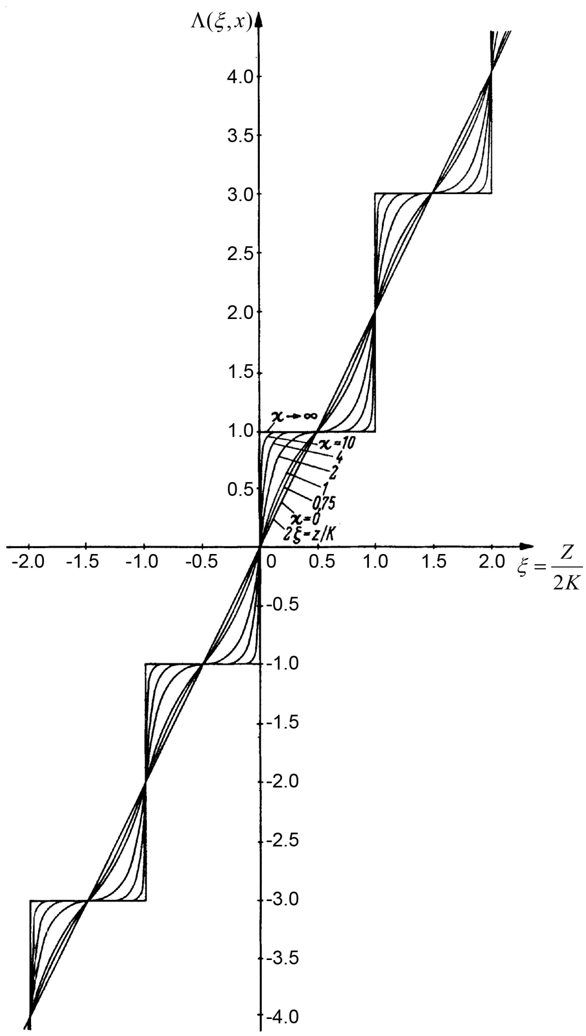

Figure 3. The differential $d\lambda \simeq dI_{xy}$ where $\lambda \simeq \sigma(u\omega)$ of iterated elliptic invariants depends e.g. on the Heuman lambda function which for $\lambda \to 0$ for $\omega \to 2^k\omega$ $k \to \infty$ behaves plateau-like [34].

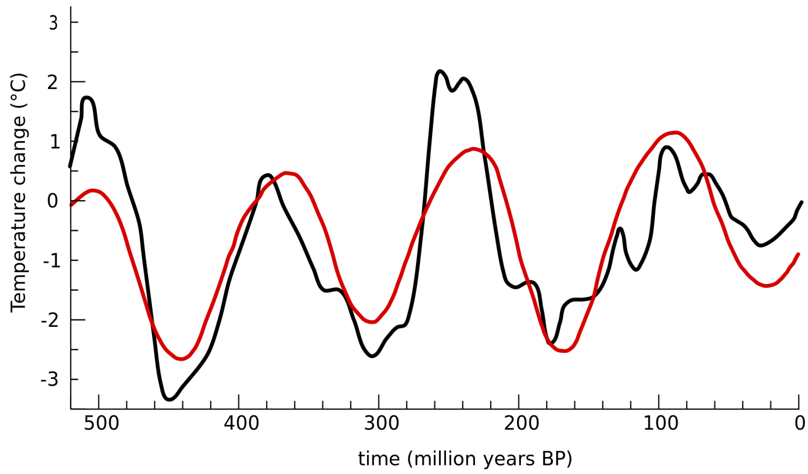

Figure 4. Cosmic radiation (red) and global temperature (black) assumed from geochemical findings over 5×10^8 years from [33].

low k-component rates with ripped spacetime. With increasing k-component thermal forces enhance elastic spacetime. The non dissipative dynamics is a unified superfluid of persistent ionization process. Standard units of time and energy count the number of precessions n and the number of Carnot cycles m independent on current values of fluctuating two-periods.

Regular chaotic clouds draw a fractal line integral $V_{T_{global}}$ which increases steplike with increasing disturbing convection $\delta_k h_t$. Global warming decreases for negative entropy change $\delta_k h_t < 0$ by lowering cyclic atmospheric perturbations.

8. Conclusion

Central to FZU is a relation of a period-doubling chaotic map to doubly-periodic elliptic theta of iterated lattices. The regulator index R_Δ of the fluctuated number field displays a number of circulant matrices. Analogous to an infinite Mandelbrot Zoom, the pseudo-random map can at best be pseudo-congruent with respect to period-doubling k-components. The pseudo-congruence is expected on a general Riemann surface where the genus is the dimension w of complex space with $\binom{w+1}{2} < 3w+3$ which yields $w = 5$. Like an algebraic representation of π with accuracy of $<10^{-5}$ in case of nine class number one fields the pseudo-random condition results from the coupling G_5 in Equation (4) which reflects a pseudo-congruent regulator index giving a factor $G_5^{-1} \simeq 2^{2^k}$. This factor e.g. the $k = 9^{\text{th}}$ component is regarded as the quantum statistics pre-factor in the experimental value ρ_{vac}. Accordingly, quantum statistics implies k-incongruence. As a result, the maximal number of fermions in the universe seems to be 2^{2^8} being the Eddington number. A pseudo-congruence $2^{2^k} \to 1$ is known as LNH. This yields the measured value of the vacuum energy density [35] corrected by $10^{50\cdots200}$. This congruent pre-factor can be captured as a charge. A change from dimensionless potential V_T to a dimensioned potential yields an energy $M_{cloud}c^2$ where the mass

M_{cloud} is a measure of dissipation-less, non-radiative correlation. A congruence by the parameter "charge" illustrates the difference between quantum statistics and unified fields in FZU. A pseudo-congruent correlated $k = 7$-component yields a factor 10^{38}. For a unit of 1 Volt, one would get a congruent energy 10^{38}eV→1eV despite a mean energy 1 eVcm^{-3}. Within FZU second sound, CR, CMB is predicted at quantized susceptibility which solves CCP $\rho_{exp} \neq \rho_{QS}$ by relating QS to a lap number of k-components. Iterated invariants $f_k(\omega)$ and periods $\omega = \omega_k$ predict a one-dimensional complex bifurcation tree of bifurcating complex curvature R. Tensile forces of bifurcated, ripped spacetime are felt as CR and CMB [35]. Iteration by (1) around invariant zeros $z_n = \xi^{-1} = E^{-1}$ is E-field-like and can be visualized by strings of $j_{cloud}(z)$ at cycles ν_q of a bifurcation tree of quadrupolar points 1, 2 → 1', 2'. Like a Mandelbrot zoom with γ-map $z_k \to z_{k+1}$, $j_k \to j_{k+1}$, $E_k \to E_{k+1}$ the normal of complex plane embeds into space where $j(z) \to \boldsymbol{j}(z)$, $E \to \boldsymbol{E} + i\boldsymbol{B}$. The chain of strings

$$\left[\frac{\delta \boldsymbol{j}_{cloud,k+N+1}}{\delta \boldsymbol{E}_{k+N}^{-1}} \cdots \left[\frac{\delta \boldsymbol{j}_{cloud,k+1}}{\delta \boldsymbol{E}_{k}^{-1}}\right]\right]$$

draws a doubly-periodic 2^{2^N}-polar ball as a singularity in two-dimensional Laplace equation [10] felt as a charge quantum. This is the fractal analog of the magnetic Dirac monopole problem for large (monopole) masses [35]. Subsequent quadrupolar waves yield a background $\varepsilon_0(\boldsymbol{k}) = 1/I_{ij}\boldsymbol{k}_i\boldsymbol{k}_j$ in Coulomb potential $V(\boldsymbol{k}) \simeq I_{ij}\boldsymbol{k}_i\boldsymbol{k}_j/\boldsymbol{k}^2 \simeq 1/\varepsilon(\boldsymbol{k})\boldsymbol{k}^2$ in $\boldsymbol{k}$-space like an exchange scattering term. Then the cosmological redshift and CMB are both caused by simplest cycles of clock frequency $j_{cloud}(z)$. Predicted emissions relate nanostructures to possible future energy technology as well as to consequences for the model of universe and climate.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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