A SOLUTION
TO THE HUBBLE TENSION PROBLEM?

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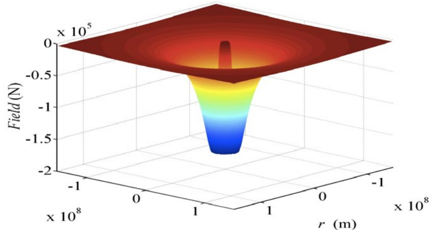

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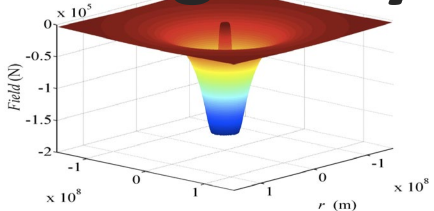
BIG MYSTERIES SURVEY

Among the ten foundational and controversial topics in contemporary physics, as reported in the large-scale survey conducted through the American Physical Society's *Physics Magazine* in 2024-2025, stands **the Hubble tension problem**, the difference between the measured values of the Hubble constant, based on gauging the distance to star and supernovae in the local universe using Doppler measurements or using measurements of more distant signals coming from the Cosmic Microwave Background (CMB) and large scale galaxysurveys.



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What is the most likely explanation for this « Hubble tension »?

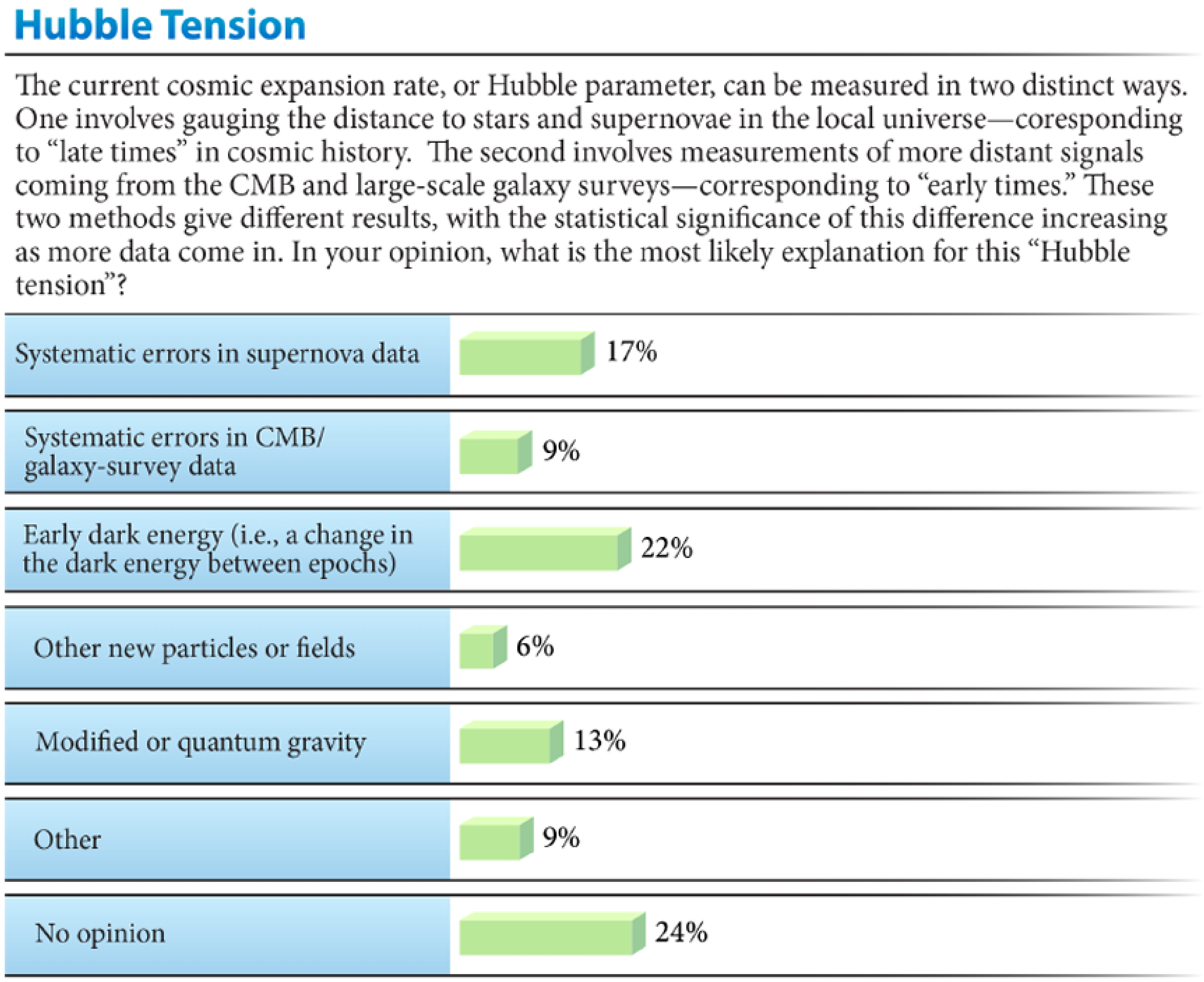
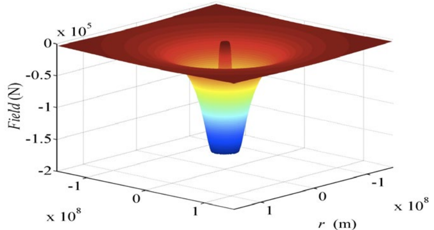


FIG. 6. Big Mysteries Survey (1,675 respondents): Most likely explanation for the Hubble tension.



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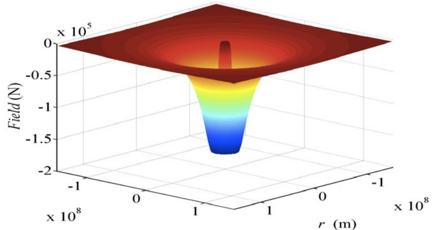
CONDITIONS FOR MODIFYING GRAVITY

If Newton's laws have to be modified, the resulting modified gravity shall **be an emergent, universal, scale independent paradigm directly embedded in Einstein's General Relativity theory**

(no adhoc plug-in)



ROAD MAP

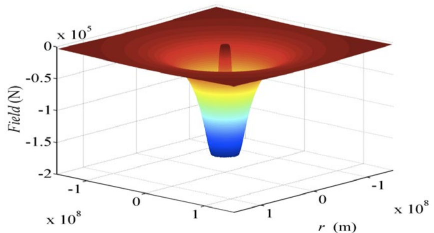
1-Emergence of a Modified Newton’s Law

2-The *erfc* Metrics

3-Space time Expansion

4-Cosmic Microwave Background

5- Concluding remarks



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ROAD MAP

1-Emergence of a Modified Newton's Law

Plamondon, R., (2021) **What does the Central Limit Theorem Have to Say About General Relativity?**, in Quantum Theory and Symmetries, Proceedings of the 11th International Symposium, Montréal, Canada, , Paranjape, M.B., MacKenzzie, R, Thomova, Z., Winternitz, P., WitczKrempa, W., (EDS), Springer, CRM Series in Mathematical Physics, 503-511.

2-The *erfc* Metrics

3-Space time Expansion

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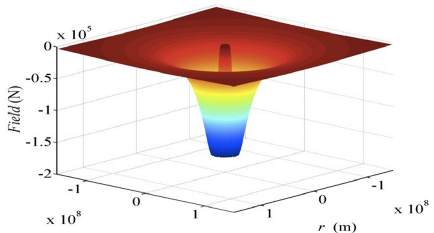

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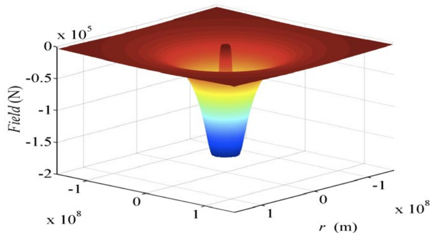
AN ANALOGY BETWEEN EINSTEIN'S LAW

$$G_{\mu\nu} = KT_{\mu\nu}$$

AND BAYES'S LAW

$$P(G_{\mu\nu} / T_{\mu\nu}) = P(T_{\mu\nu} / G_{\mu\nu}) \times \frac{P(G_{\mu\nu})}{P(T_{\mu\nu})}$$



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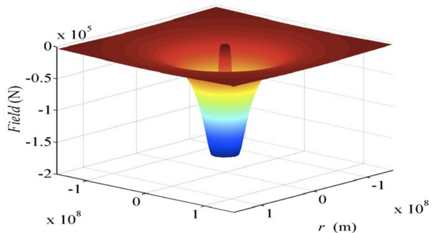
FOR A WEAK FIELD, LOW SPEED, SYMMETRIC STATIC SYSTEM

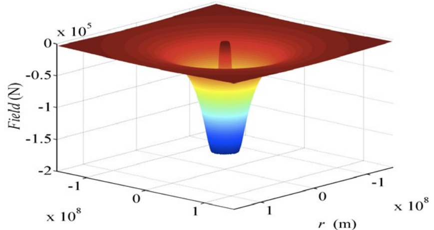
$$G_{00} \Leftrightarrow f(\mathrm{G}_{00}/\mathrm{T}_{00})$$

$$KT_{00} \Leftrightarrow \frac{f(G_{00})}{f(T_{00})} \times f(T_{00} / G_{00})$$



How can we take into account the probability of presence of the energy-momentum at a given curvature?

$$f(T_{00} / G_{00}) \; ?$$



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Modelling the slow process of a star formation

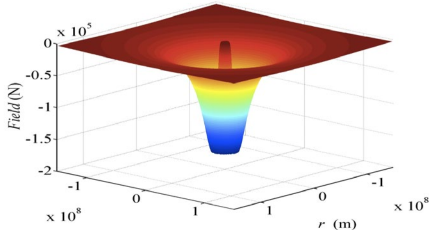
from the addition of chunks of energy-momentum considered as random variables

(or of a galaxy from the addition of stars)

(or a universe from the addition of galaxies)

and **using the Central Limit Therorem** projected in a curved spacetime, we obtain:

$$f(T_{00} \ / \ G_{00}) = \frac{1}{4\pi^2\sigma^2\hat{r}^2}\exp\left(-\frac{\sigma^2}{2r^2}\right)$$



AN EMERGENT PARAMETER

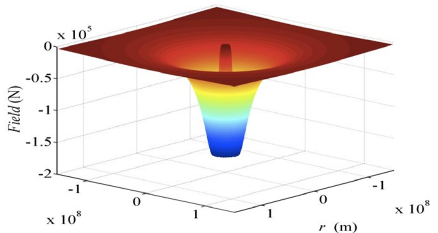
$$f(T_{00} \ / \ G_{00}) = \frac{1}{4\pi^2\sigma^2\hat{r}^2}\exp\left(-\frac{\sigma^2}{2r^2}\right)$$

$$\sigma = \text{ Lorentz Scalar}$$

An intrinsic and emergent feature of the central limit process.

The system reference proper length.

An intrinsic scale factor.



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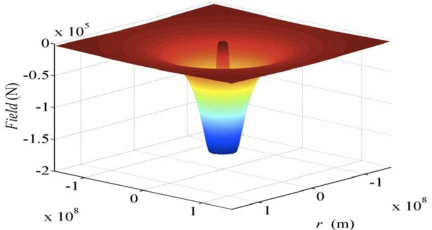
THE EMERGING LAPLACIAN

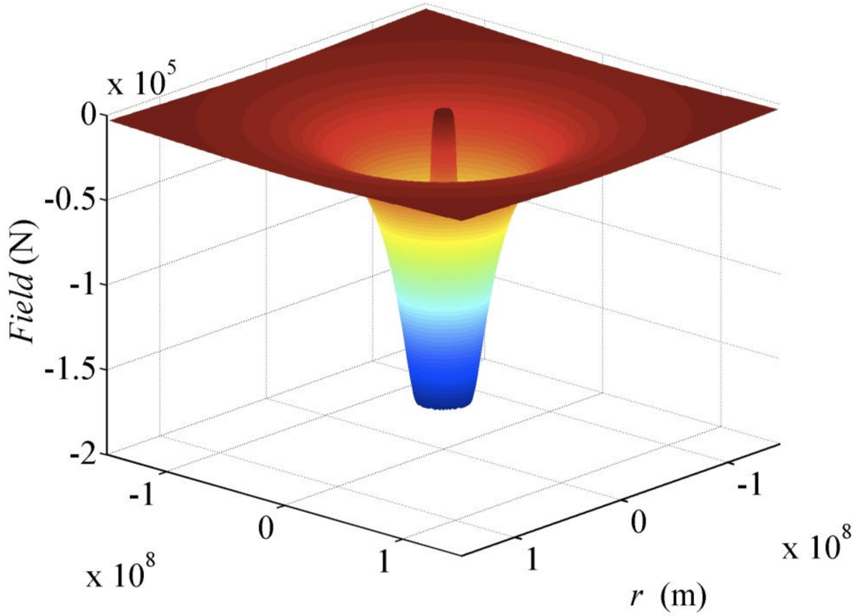
$$R_{00} \cong \frac{1}{c^2}\nabla^2\Phi = \frac{1}{2}KT_{00}f(T_{00} / G_{00})$$

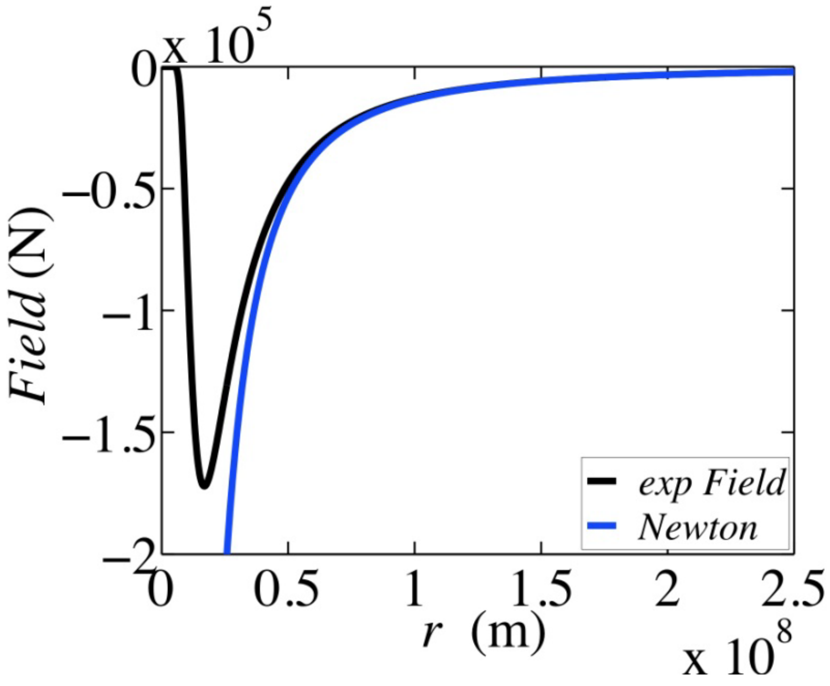
$$\nabla^2\Phi = \frac{GM\sigma^2}{r^5}\exp\left(-\frac{\sigma^2}{2r^2}\right)$$

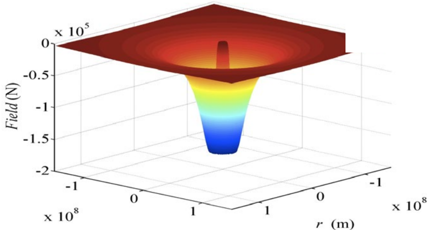


THE EMERGING FIELD

$$g(r) = -\left|\vec{\nabla}\Phi(r)\right| = -\frac{GM}{r^2}\exp\left(-\frac{\sigma^2}{2r^2}\right) \Rightarrow \simeq \left.\frac{GM}{r^2}\right|_{r\to\infty}$$







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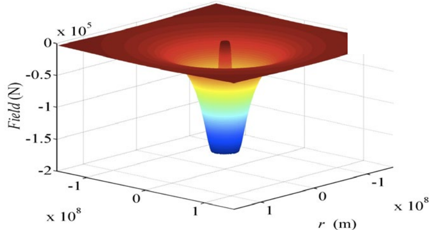
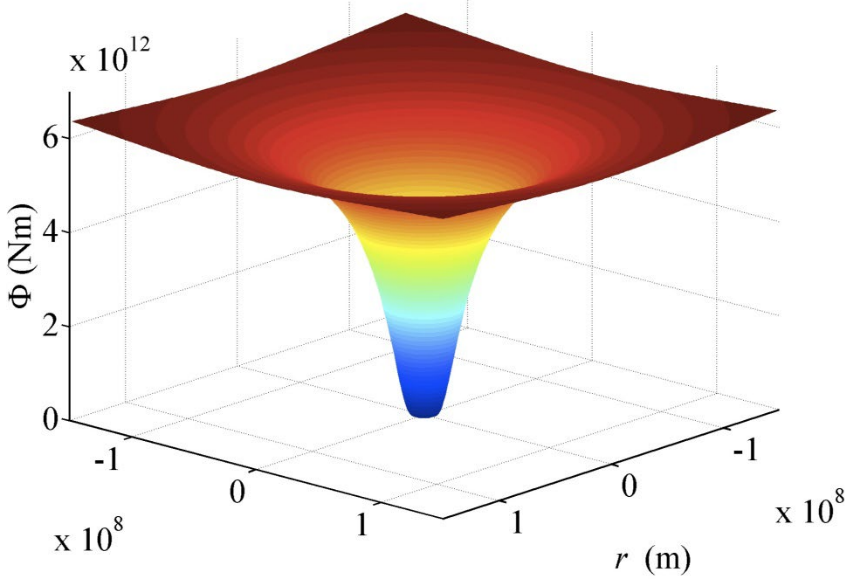
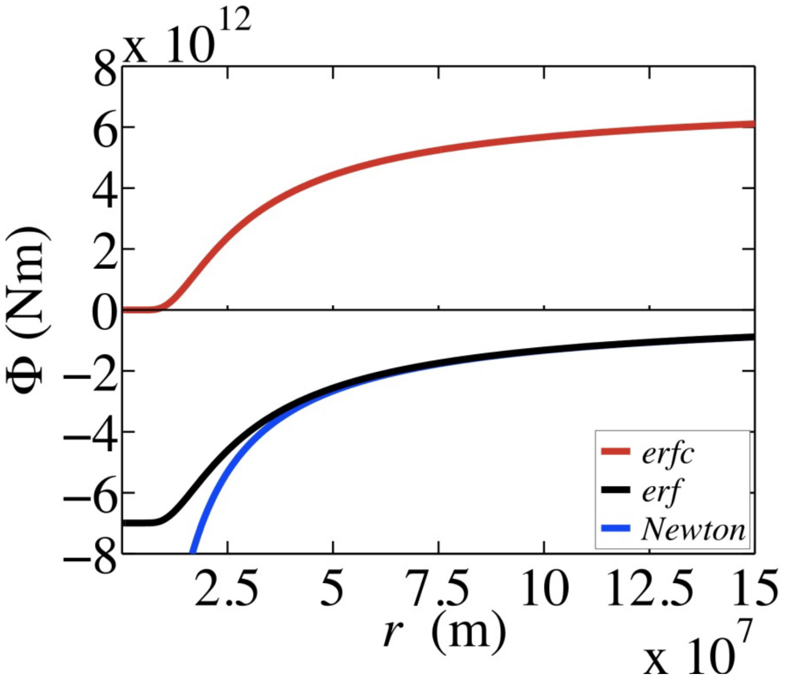
THE EMERGING POTENTIAL

$$\Phi_{erfc}(r) = GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right) erfc\left(\frac{\sigma}{\sqrt{2}r}\right)$$







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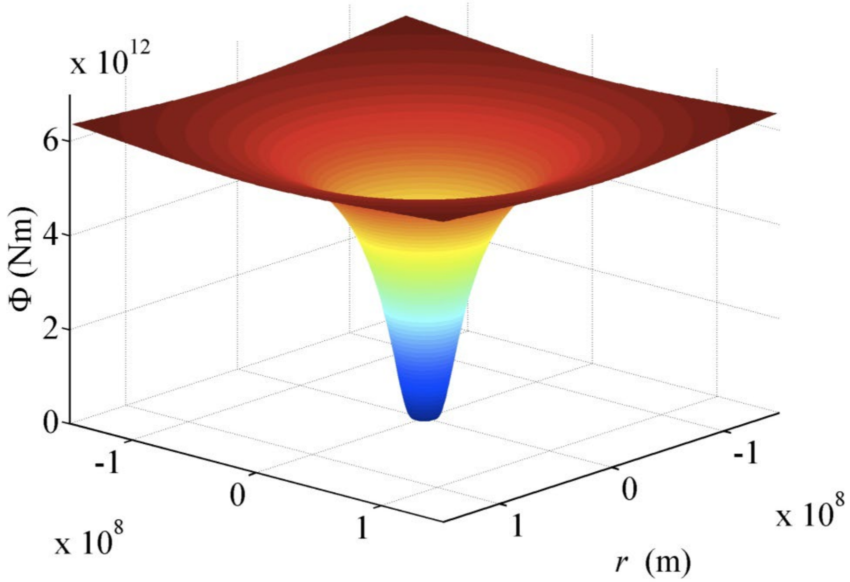
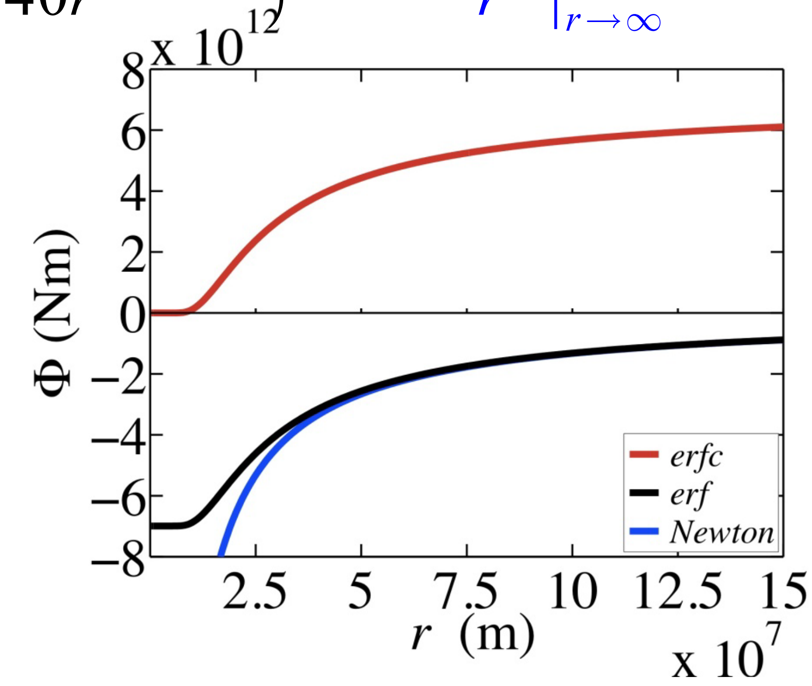
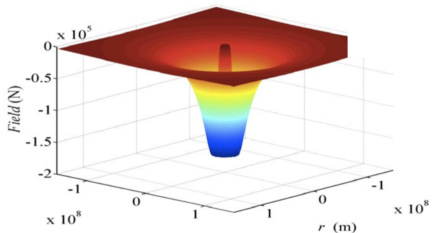
THE EMERGING POTENTIAL

$$\Phi_{erfc}(r) = GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right) - GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right) erf\left(\frac{\sigma}{\sqrt{2}r}\right)$$

$$\Phi_{erf}(r) = -GM\left(\frac{1}{r} - \frac{1}{6r^3} + \frac{1}{40r^5} - \ldots\right) \cong -\frac{GM}{r}\bigg|_{r\to\infty}$$

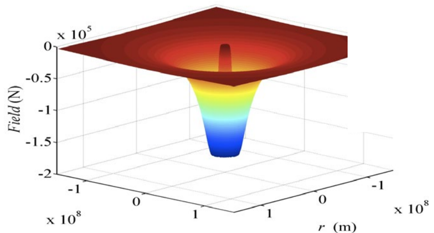


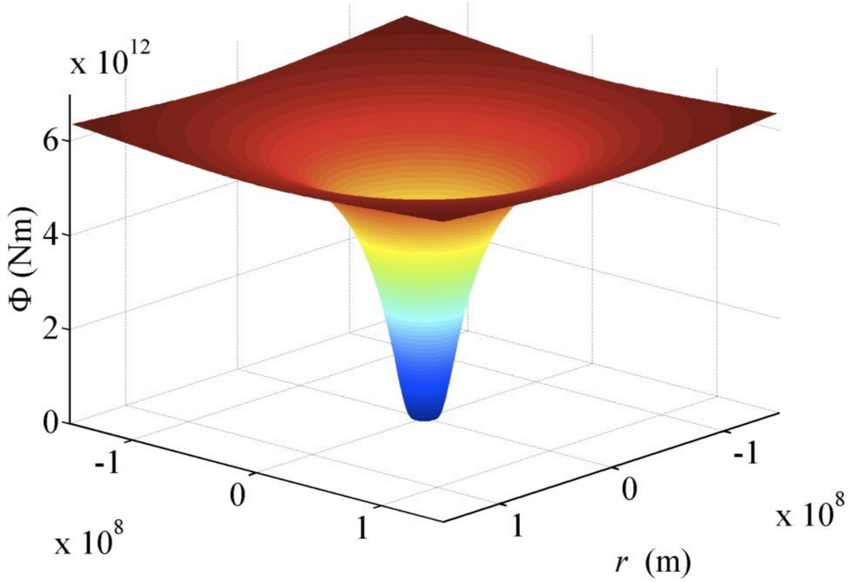


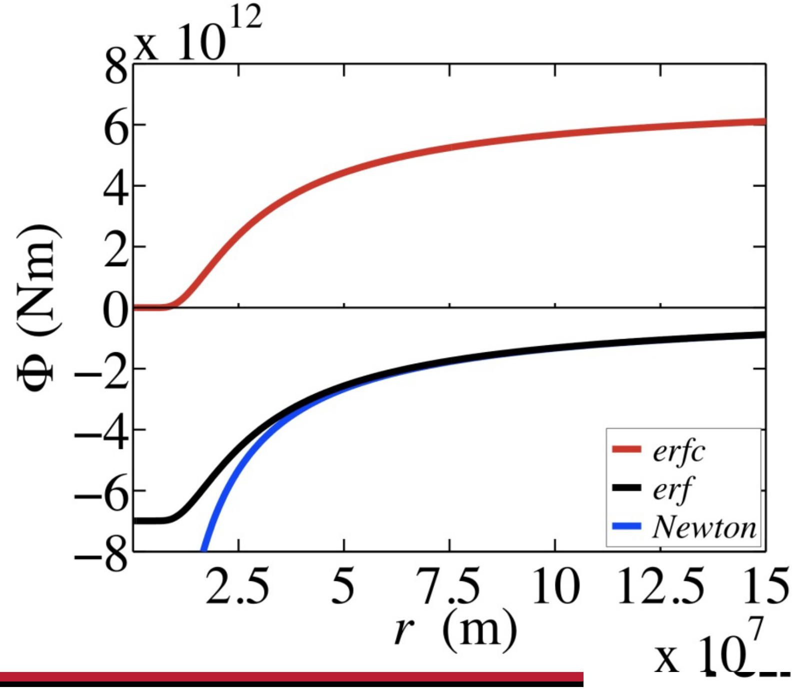


The Model Predicts the Emergence of a Constant Baryonic Potential

$$\Phi_{erfc}(r) = GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right) - GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right)erf\left(\frac{\sigma}{\sqrt{2}r}\right)$$







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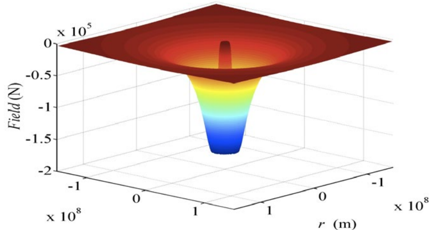
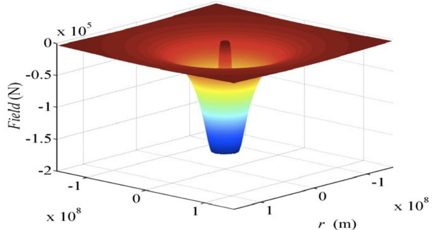


The *erfc* metric

$$ds^2 = \left[1 + \frac{\sqrt{2\pi}GM}{\sigma c_{th}^2} erfc\left(\frac{\sigma}{\sqrt{2}r}\right)\right] c_{th}^2 dt^2 - \left[1 + \frac{\sqrt{2\pi}GM}{\sigma c_{th}^2} erfc\left(\frac{\sigma}{\sqrt{2}r}\right)\right]^{-1} dr^2 - r^2 d\theta^2 - r^2 \sin^2\theta d\phi^2$$

This diagonal metric is a solution to the Einstein's field equations for a spherically symmetric system from r=0 to r=∞ . There is no null vacuum solution. Moreover, the relativistic tensors $R_{\mu\mu}$, $G_{\mu\mu}$, the Ricci and the Kretschmann scalars, all extend from $0 \le r \le \infty$ without any singularity.



Plamondon, R., (2018), **General Relativity: an erfc metric**, Results in Physics, 9, 456-462.

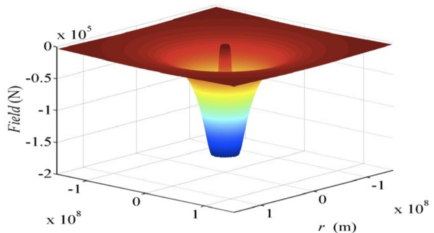
The far distant gravitational solution

Whatever the value of σ , at $r = \infty$

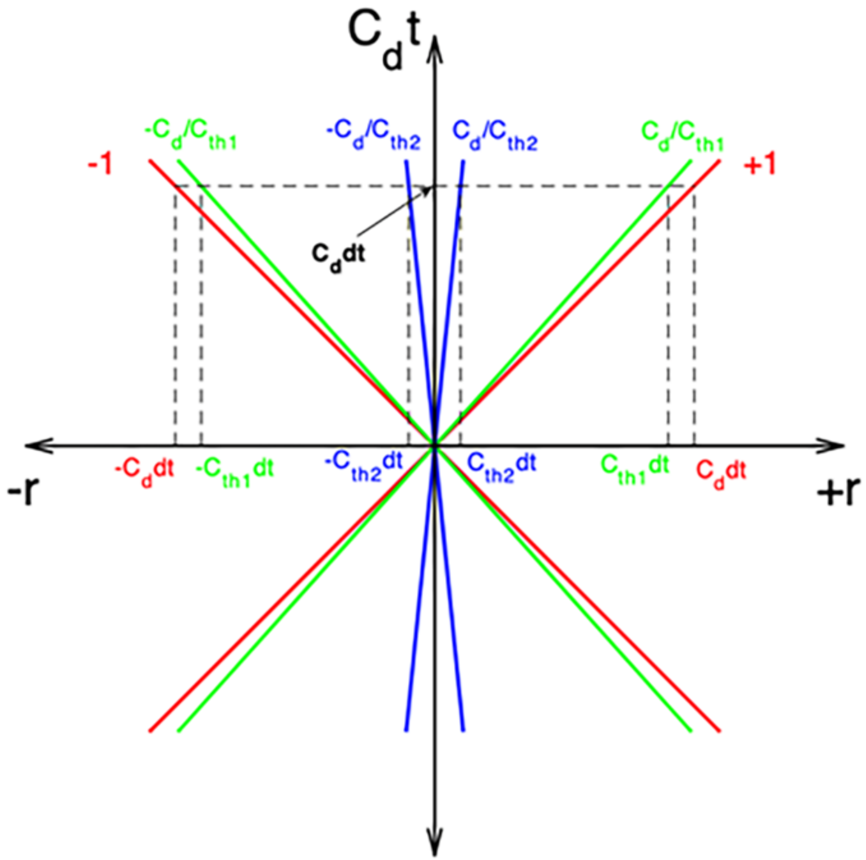
$$ds^2 = \left[1 + \frac{\sqrt{2\pi}GM}{\sigma c_{th}^2}\right] c_{th}^2 dt^2 - \left[1 + \frac{\sqrt{2\pi}GM}{\sigma c_{th}^2}\right]^{-1} dr^2 - r^2 d\theta^2 - r^2 \sin^2\theta d\phi^2$$

Equivalent to a Minkowski metric
if this binomial condition is respected:

$$c_{th}^2 - c_{th}c_d + \frac{\sqrt{2\pi}GM}{\sigma} = 0$$



The real solutions $\Delta > 0$

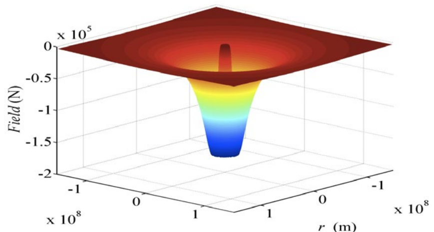


$$c_{th1,2} = \frac{c_d}{2} \pm \sqrt{\frac{c_d^2}{4} - \frac{\sqrt{2\pi GM}}{\sigma}}$$

$$c_{th1} + c_{th2} = c_d$$

$$c_{th1} c_{th2} = \frac{\sqrt{2\pi GM}}{\sigma}$$

$$ds_d^2 = ds_{th1}^2 + ds_{th2}^2$$



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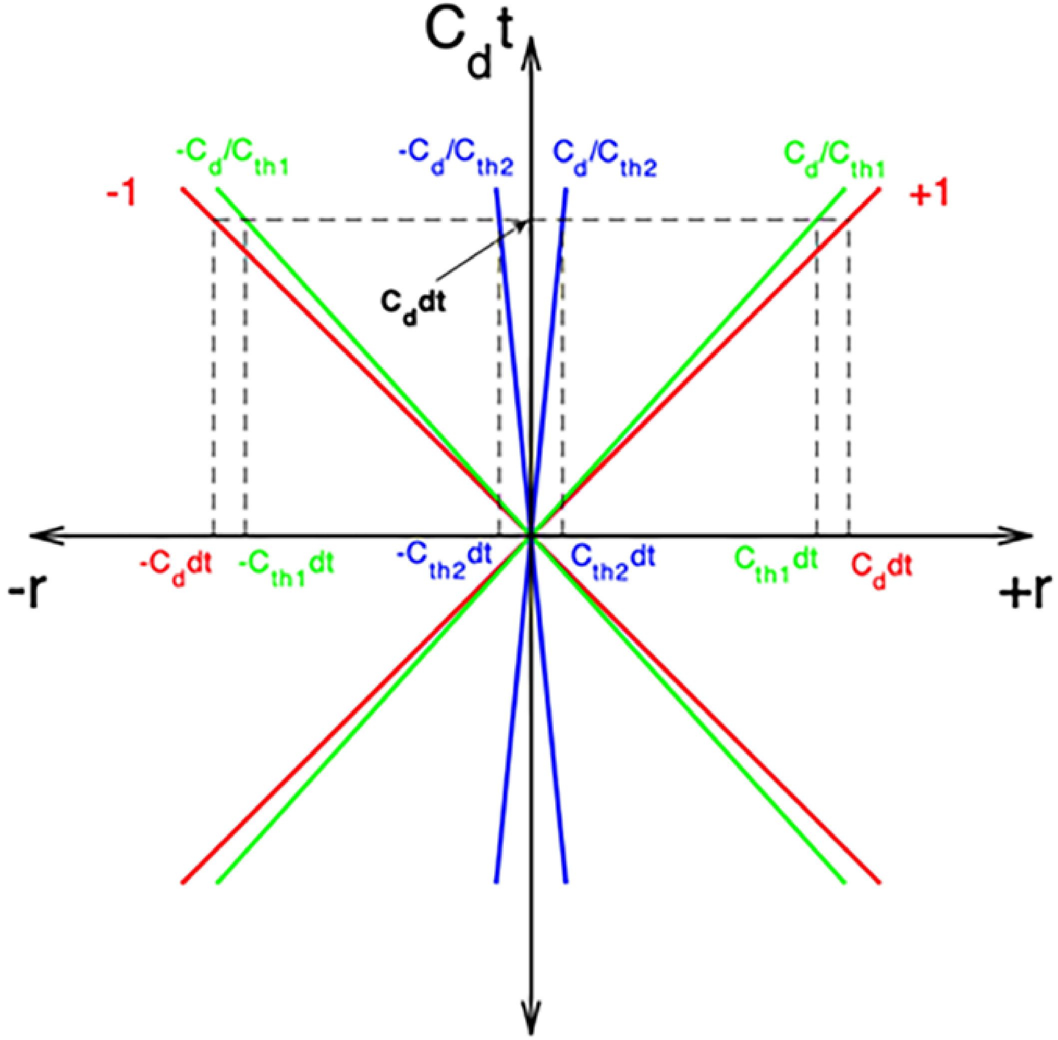
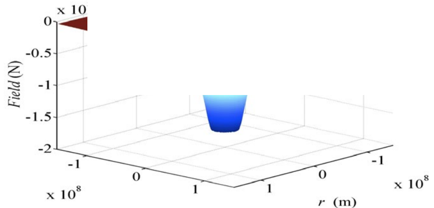
The real solutions $\Delta > 0$



where the c_{th1} component can be seen as the speed of light with respect to a fixed space-time and the c_{th2} component as a spacetime expansion.



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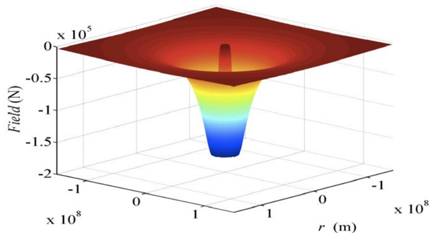
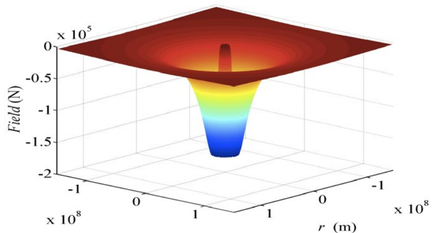


A Doppler Interpretation

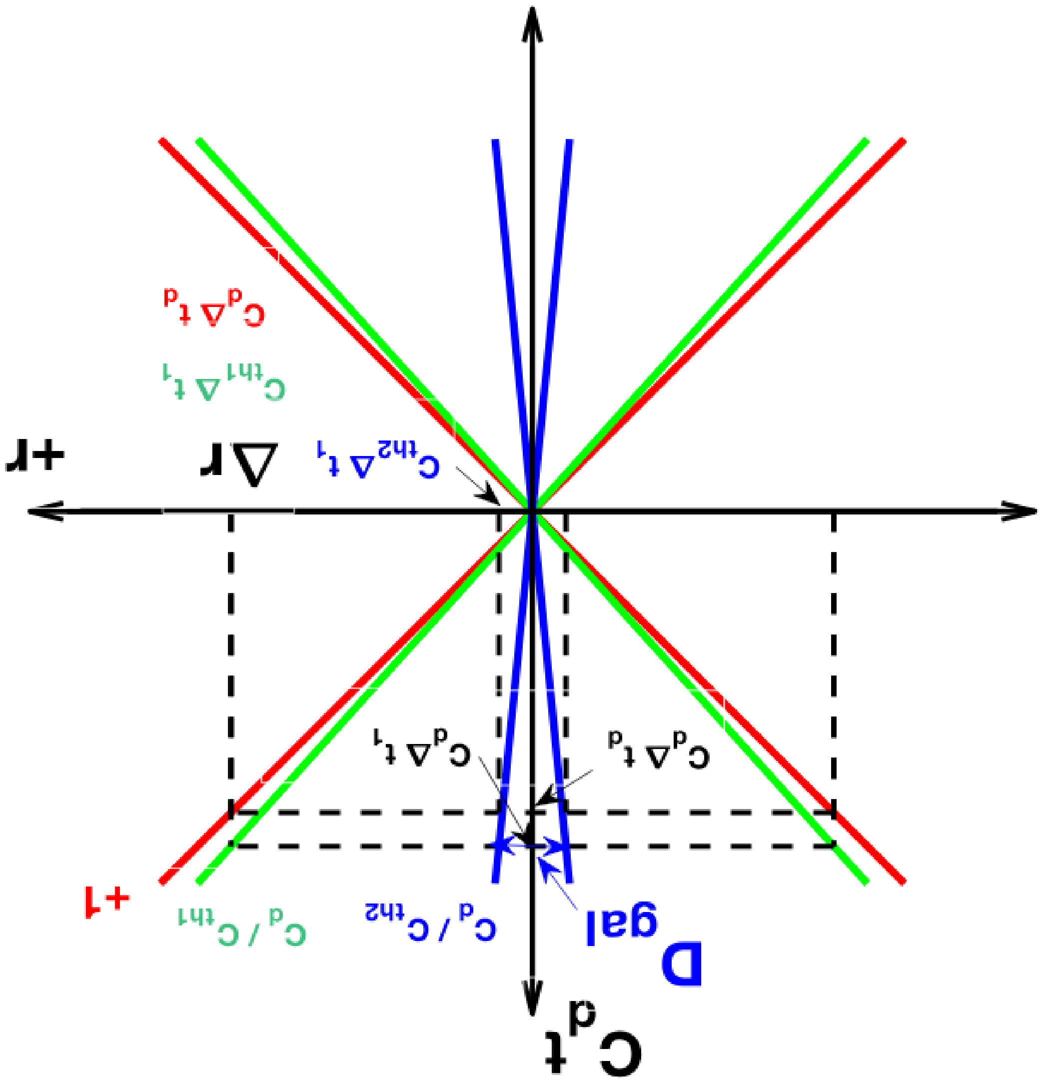
$$\frac{c_{th_2}}{c_d} = \frac{\lambda_d - \lambda_{th_2}}{\lambda_d} = \frac{\Delta\lambda}{\lambda_d}$$

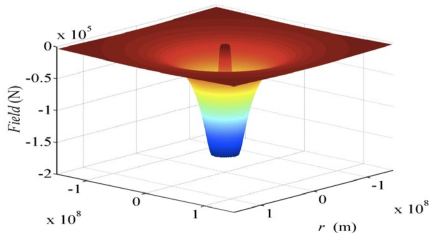
For an observer working with c_{th1} in the solar system and exploring a galaxy at a distance D_{Gal} in the outer space will conclude that the corresponding space-time is expanding:

$$V_{stex} = c_{th_2}$$



Looking back in the past





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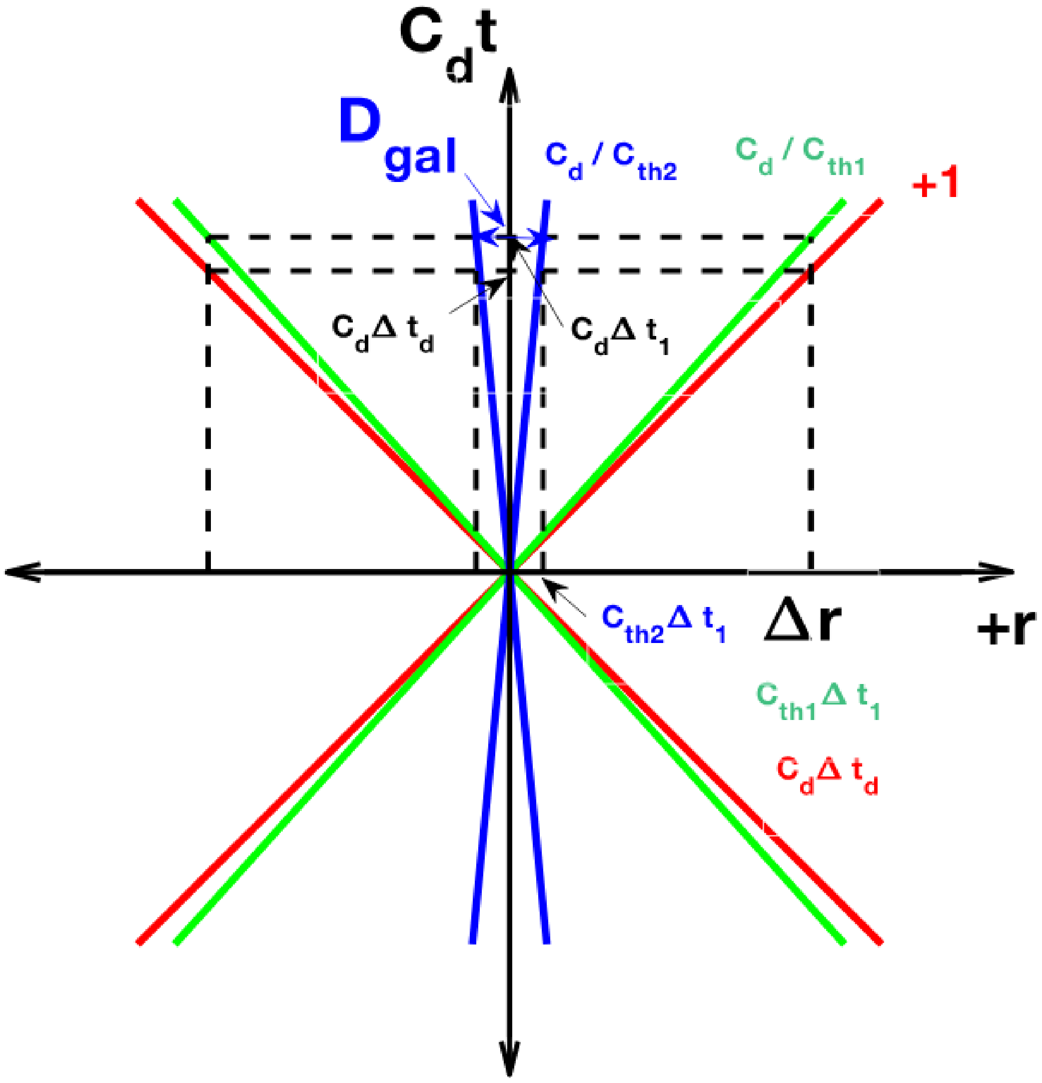
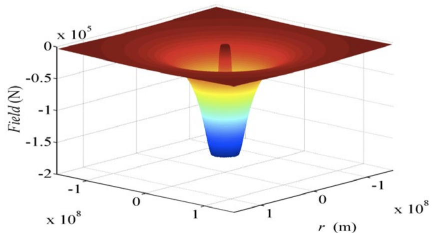
Flipping for a better visualization





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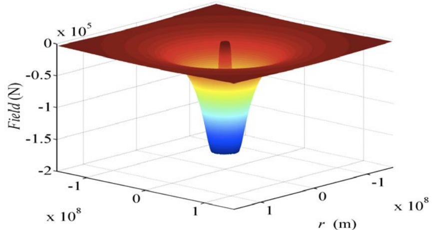
Along the Perpendicular Axis

Equivalence along the radial axis:

$$\Delta r = c_d \Delta t_d = c_{th_1} \Delta t_1$$

Difference along the time axis:

$$\Rightarrow \Delta t_d = \frac{c_{th_1} \Delta t_1}{c_d} \Rightarrow \Delta t_d < \Delta t_1$$



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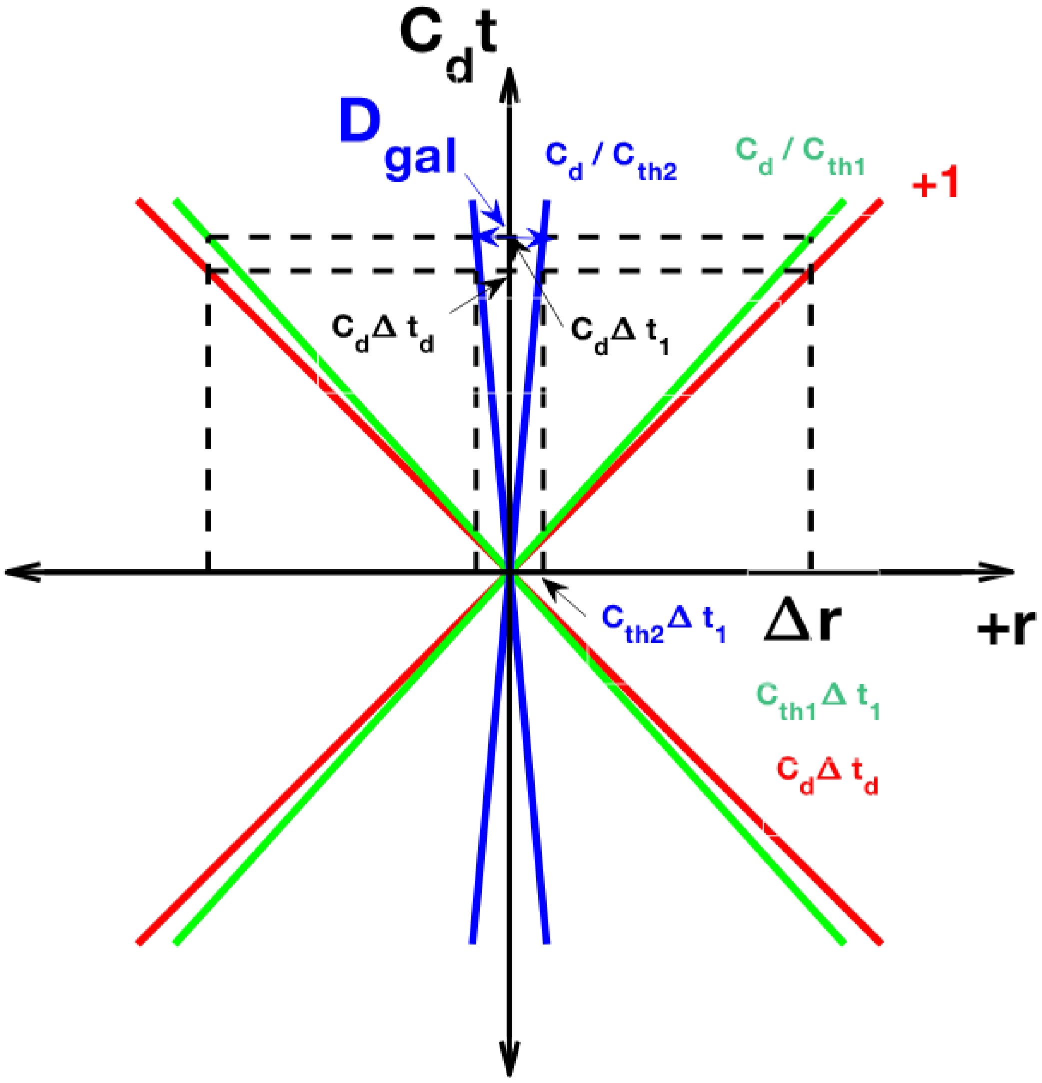
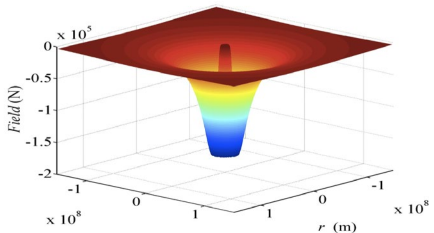


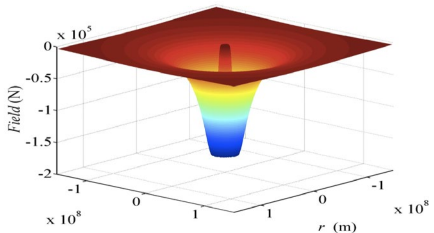


Along the Oblique Axis

$$V_{Gal} = \frac{D_{Gal}}{\Delta t_1} = \frac{D_{Gal} c_{th1}}{c_d \Delta t_d} \text{ along the } c_{th1} \text{ axis}$$

$$D_{Gal} = 2 c_{th2} \Delta t_1 \text{ along the } c_{th2} \text{ axis}$$

$$\text{Combining: } V_{Gal} = \frac{2 c_{th_2} c_{th_1} \Delta t_1}{c_d \Delta t_d} = \frac{2 c_{th_2} D}{D_{ref}} \text{ along the time axis}$$



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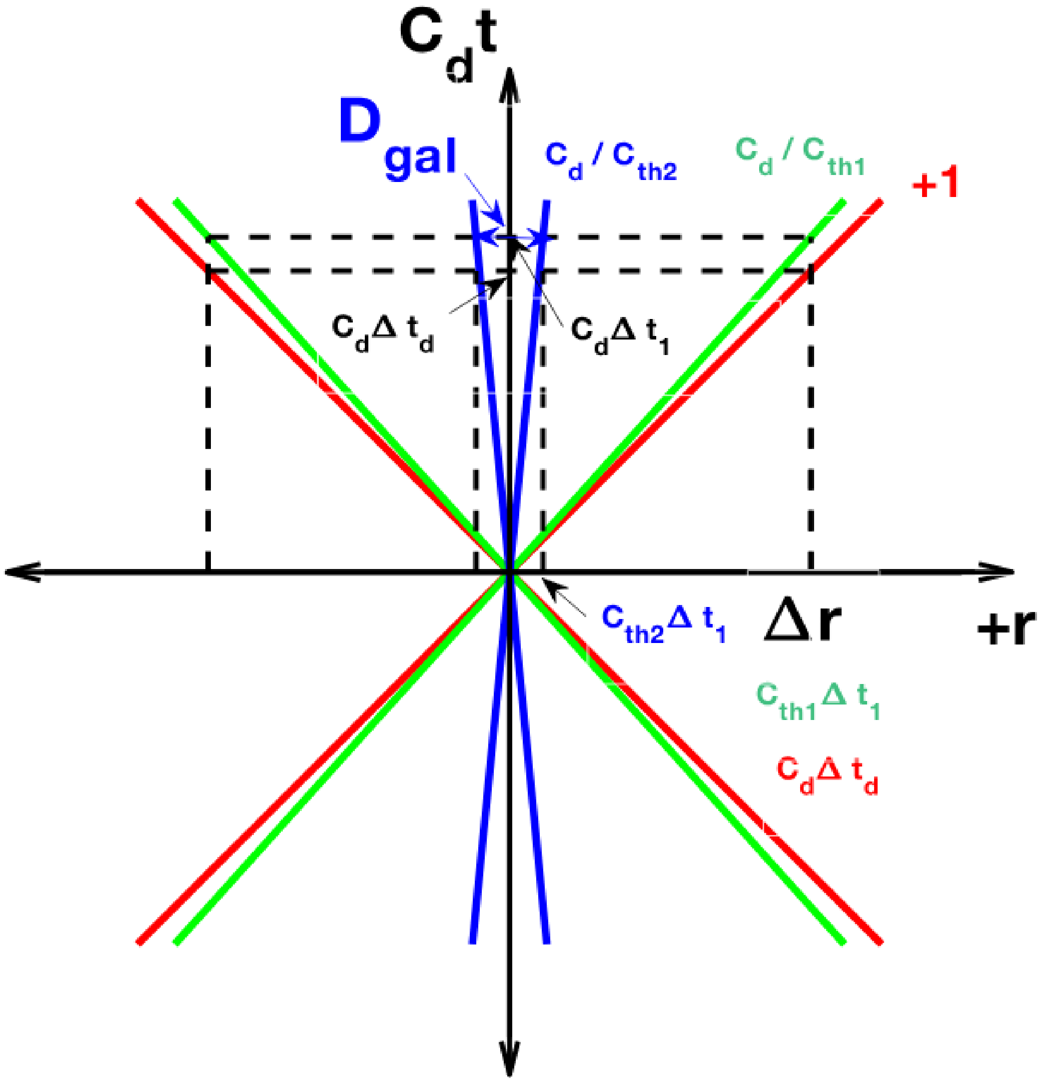

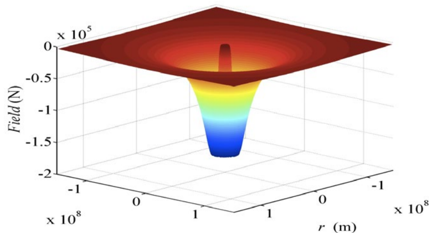

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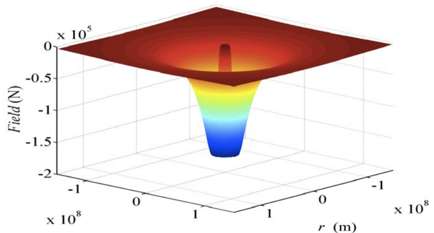
A Doppler Interpretation

with D_{ref} and D in Mpc

and $c_{th2} \Rightarrow \dfrac{c_{th2}}{3.26}$ in km/s

$$V_{Gal} = \frac{2c_{th_2} D}{\mathrm{D}_{ref}} = \frac{2c_{th_2}}{3.26 \times 1\mathrm{Mpc}} D_{\mathrm{GalMpc}}$$



POLYTECHNIQUE MONTRÉAL

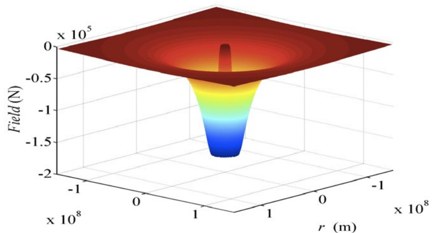
In the solar system

$$ds^2 = \left[1 + \frac{\sqrt{2\pi}GM_{Sun}}{\sigma_{Sun} c_{th}^2}\right] c_{th}^2 dt^2 - \left[1 + \frac{\sqrt{2\pi}GM_{Sun}}{\sigma_{Sun} c_{th}^2}\right]^{-1} dr^2 - r^2 d\theta^2 - r^2 \sin^2\theta d\phi^2$$

$$\sigma_{Sun} \frac{4\pi r_{Sun}^2}{(4/3)\pi r_{Sun}^3} = \left[\frac{\rho_{ref}}{\rho_{Sun}}\right]\left[\frac{u_m}{m_{s1}}\right] \Rightarrow \sigma_{Sun} = \frac{r_{Sun}\rho_{ref}u_m}{3\rho_P m_{s1}}$$

With $\sigma_{Sun} = \dfrac{r_{Sun}\rho_{ref}u_m}{3\rho_{Sun} m_{H_2O}} = 9.1508(20)\times 10^6 \text{ m}$

PHYSICS ESSAYS 30, 4 (2017)



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In the solar system at $r \rightarrow \infty$

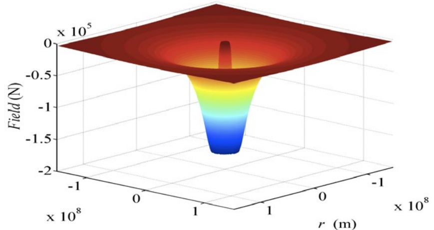
$$\sigma_{Sun} = 9.1508(20)\times 10^{6}\ \text{m}$$

$$c_{th1} = 299671152(27)\ \text{m/s}$$

$$c_{th2} = 121306(27)\ \text{m/s}$$

$$c_d = c_{th1} + c_{th2} = 299792458\ \text{m/s}$$

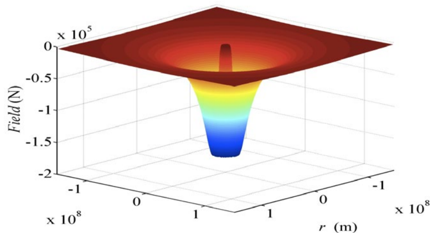
$$\Rightarrow c_{th2} = c_d - c_{th1} = \Delta c_{Sun}$$



Plamondon, R., (2017), Solar System Anomalies: Revisiting Hubble's law, Physics Essays, 30(4), 403-411.

The Doppler Hubble constant

$$V_{Gal} = \frac{2c_{th_2} D}{\mathrm{D}_{ref}} = \frac{2c_{th_2}}{3.26 \times 1\mathrm{Mpc}} D_{\mathrm{GalMpc}}$$



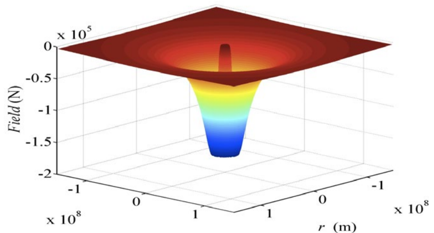
POLYTECHNIQUE MONTRÉAL

The Doppler Hubble constant

$$V_{Gal} = \frac{2c_{th_2}D}{\mathrm{D}_{ref}} = \frac{2c_{th_2}}{3.26 \times 1\mathrm{Mpc}} D_{\mathrm{GalMpc}}$$

$$V_{\mathrm{gal}} = H_{0\,Doppler} D_{\mathrm{Mpc}}$$

$$\text{where } H_{0\,Doppler} = \frac{2c_{th_2}}{3.26\mathrm{Mpc}} = 74.42(.02)\left(\mathrm{km/s} \cdot \mathrm{Mpc}\right)$$



ROAD MAP

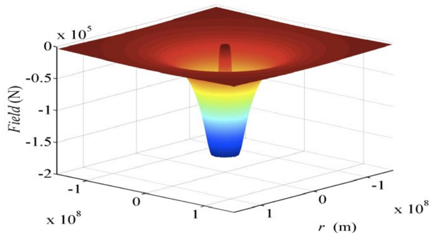
1-Emergence of a Modified Newton's Law

2-The *erfc* Metrics

3-Space time Expansion

4-Cosmic Background

5- Concluding remarks



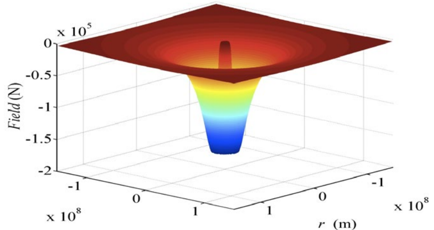
POLYTECHNIQUE MONTRÉAL

A Cosmological model

Hypothesis: the *erfc* potential is a source of baryonic matter energy density, describing the total energy available in the Universe:

$$\Omega_m + \Omega_r + \Omega_k = erfc\left(\frac{\sigma_U}{\sqrt{2r}}\right) = 1 - erf\left(\frac{\sigma_U}{\sqrt{2r}}\right)$$

where Ω_m , Ω_r , Ω_k are the dimensionless densities, with $\Omega_m + \Omega_r$ representing the total baryonic energy available in the universe and Ω_k the curvature density parameter.

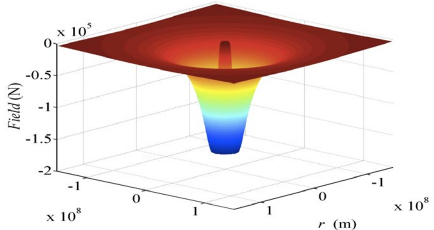


POLYTECHNIQUE MONTRÉAL

The Λ-CMB model

If we compare the previous equation with the currently accepted Λ-CDM model that incorporates a dark energy component Ω_{Λ}:

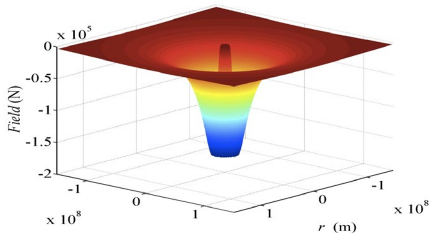
$$\Omega_m + \Omega_r + \Omega_\Lambda + \Omega_k = 1$$



Condition of equivalence

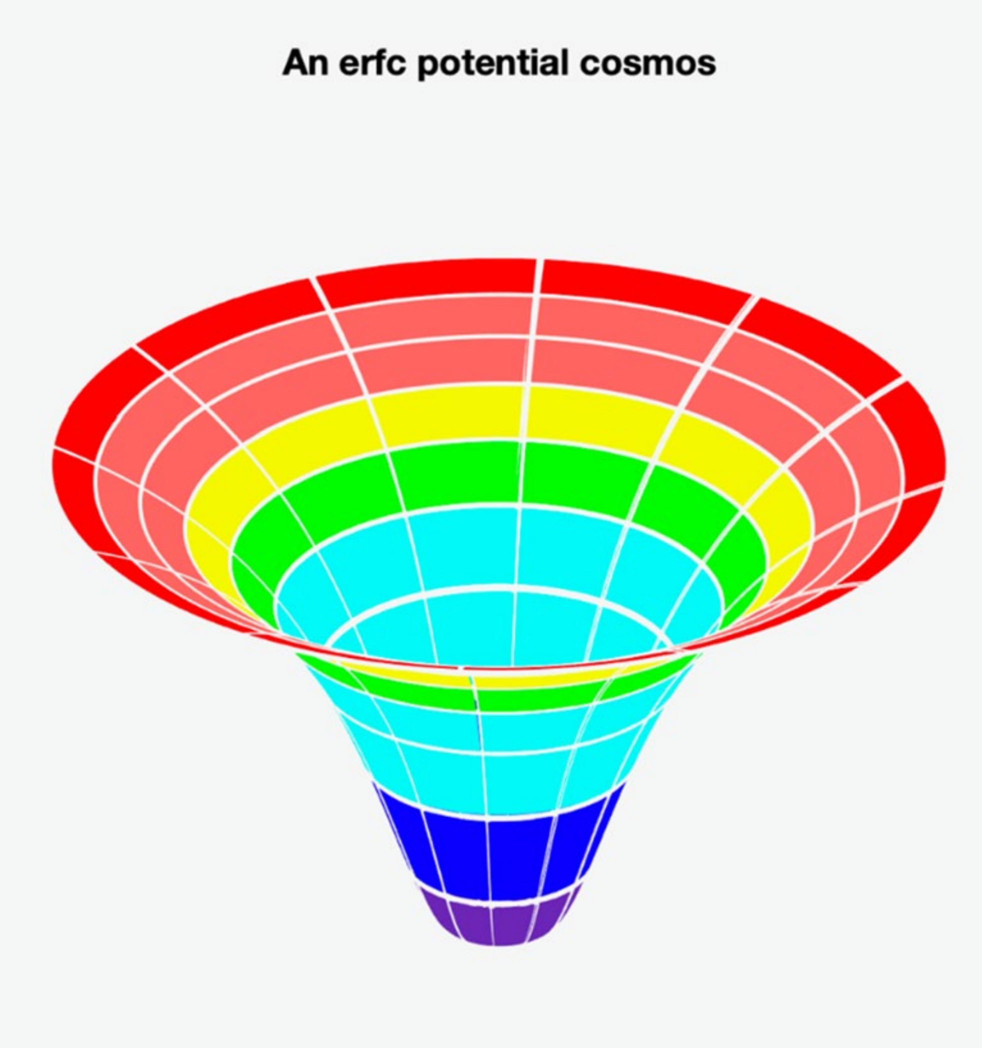
Equivalence if:

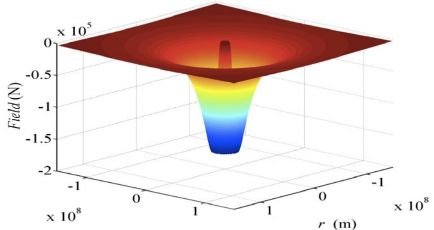
$$\Omega_{\Lambda} = erf\left(\frac{\sigma_U}{\sqrt{2}r}\right)$$



POLYTECHNIQUE MONTRÉAL

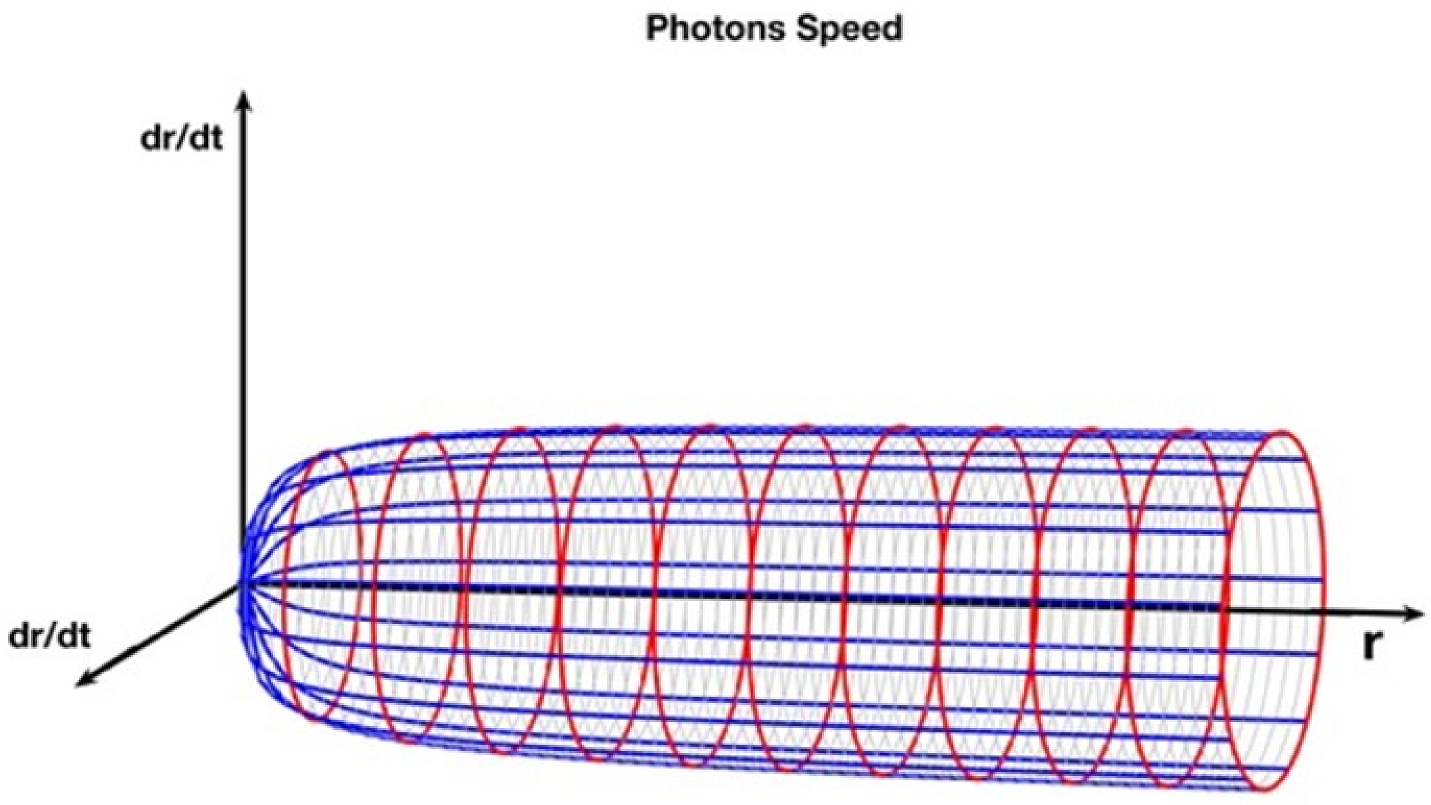
Evolution of an *erfc* universe

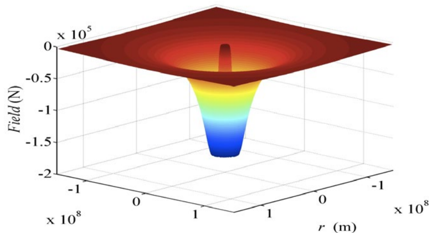




POLYTECHNIQUE MONTRÉAL

Photon Velocity in an *erfc* Universe



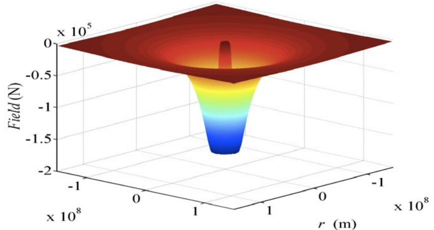


The Cosmological constant

$$\Lambda_{CMB} = 3\left(\frac{H_{0\mathrm{CMB}}}{c_d}\right)^2 \Omega_\Lambda = 3\left(\frac{H_{0\mathrm{CMB}}}{c_d}\right)^2 \times erf\left(\frac{\sigma_U}{\sqrt{2}r}\right)$$

at $r = \sigma_U$ this equation is independent of the observer position

$$\Lambda_{\mathrm{CMB}} = 3\left(\frac{H_{0\mathrm{CMB}}}{c_d}\right)^2 \Omega_\Lambda = 3\left(\frac{H_{0\mathrm{CMB}}}{c_d}\right)^2 \times 0.68268949214$$



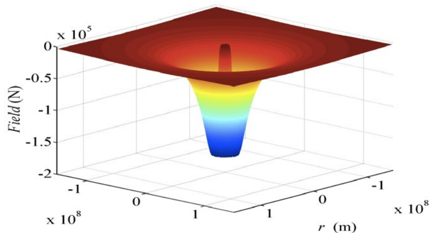
The Doppler vs CMB Hubble constant

Recalling that $H_{0\mathrm{Doppler}}$ has been defined at $r = \infty$

$$\Omega_m + \Omega_r + \Omega_k = erfc\left(\frac{\sigma_U}{\sqrt{2}r}\right)\Bigg|_{r=\infty} = 1$$

while H_{0CMB} is estimated at $r = \sigma_U$,

$$\Omega_\Lambda = erf\left(\frac{\sigma_U}{\sqrt{2}r}\right)\Bigg|_{r=\sigma_U}$$



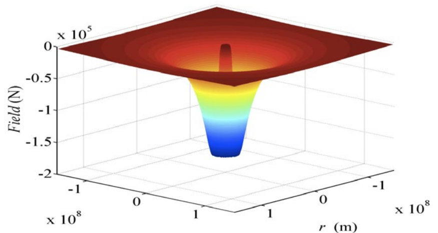
POLYTECHNIQUE MONTREAL

The Doppler vs CMB Hubble constant

Both values must be equal when the normalized linear density is taken into account that is;

$$H_{0\mathrm{CMB}} = H_{0\mathrm{Doppler}} \left(\frac{\Omega_\Lambda \big|_{r=\sigma_U}}{\Omega_m + \Omega_r + \Omega_k} \right)^{1/4} = H_{0\mathrm{Doppler}} \left(erf\left(\frac{\sigma_U}{\sqrt{2}r} \right) \Bigg|_{r=\sigma_U} \right)^{1/4}$$

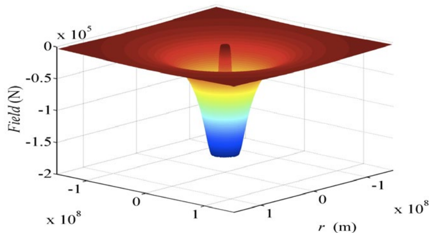
$$= H_{0\mathrm{Doppler}} \left(0.6827\right)^{1/4} = H_{0\mathrm{Doppler}} \times 0.909 = 67.64 \frac{\mathrm{km/s}}{\mathrm{Mpc}}$$



The Doppler vs CMB Hubble constant

$$H_{0\mathrm{Doppler}}\left(0.6827\right)^{1/4}=H_{0\mathrm{CMB}}$$

$$74.42\,\frac{\mathrm{km/s}}{\mathrm{Mpc}}\times 0.909=67.64\,\frac{\mathrm{km/s}}{\mathrm{Mpc}}$$



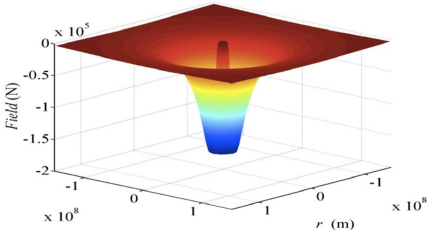
POLYTECHNIQUE MONTRÉAL

The Doppler vs CMB Hubble constant

$$H_{0\text{Doppler}}\left(0.6827\right)^{1/4} = H_{0\text{CMB}}$$

$$74.42\,\frac{\text{km/s}}{\text{Mpc}}\times 0.909 = 67.64\,\frac{\text{km/s}}{\text{Mpc}}$$

$$\Lambda_{\text{CDM}} = 1.0951\times 10^{-52}\,\text{m}^{-2}$$



ROAD MAP

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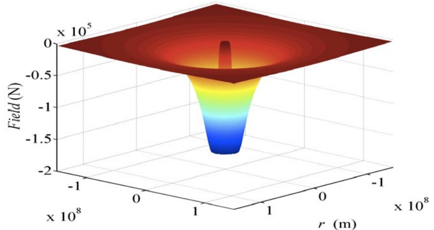
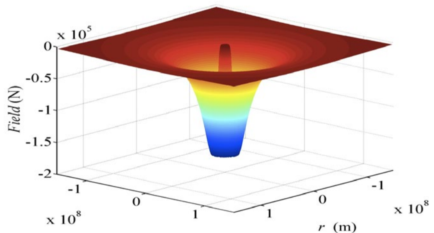


TAKE HOME MESSAGE #1

A **modified Newton's Law**
automatically emerges
from General Relativity
when the **probability of presence**
of the energy-momentum density
is taken into account into Einstein's equation.



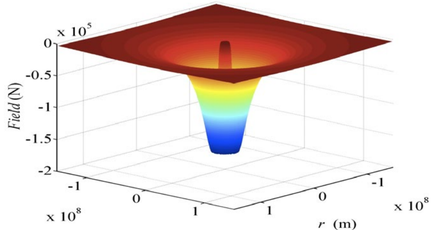
POLYTECHNIQUE MONTRÉAL

TAKE HOME MESSAGE #2

This modified Newton's Law

$$g(r) = -\frac{GM}{r^2}\exp\left(-\frac{\sigma^2}{2r^2}\right)$$

is characterized by an emergent Lorentz's scalar σ that defines the intrinsic reference proper length of any massive system



POLYTECHNIQUE MONTRÉAL

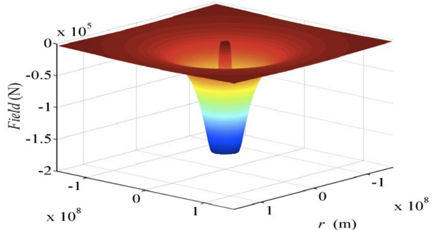
TAKE HOME MESSAGE #3

The emergent modified Newton's field relies on an *erfc* potential

$$\Phi_{erfc}(r) = GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right) - GM\left(\frac{\sqrt{\pi}}{\sqrt{2}\sigma}\right) erf\left(\frac{\sigma}{\sqrt{2}r}\right)$$

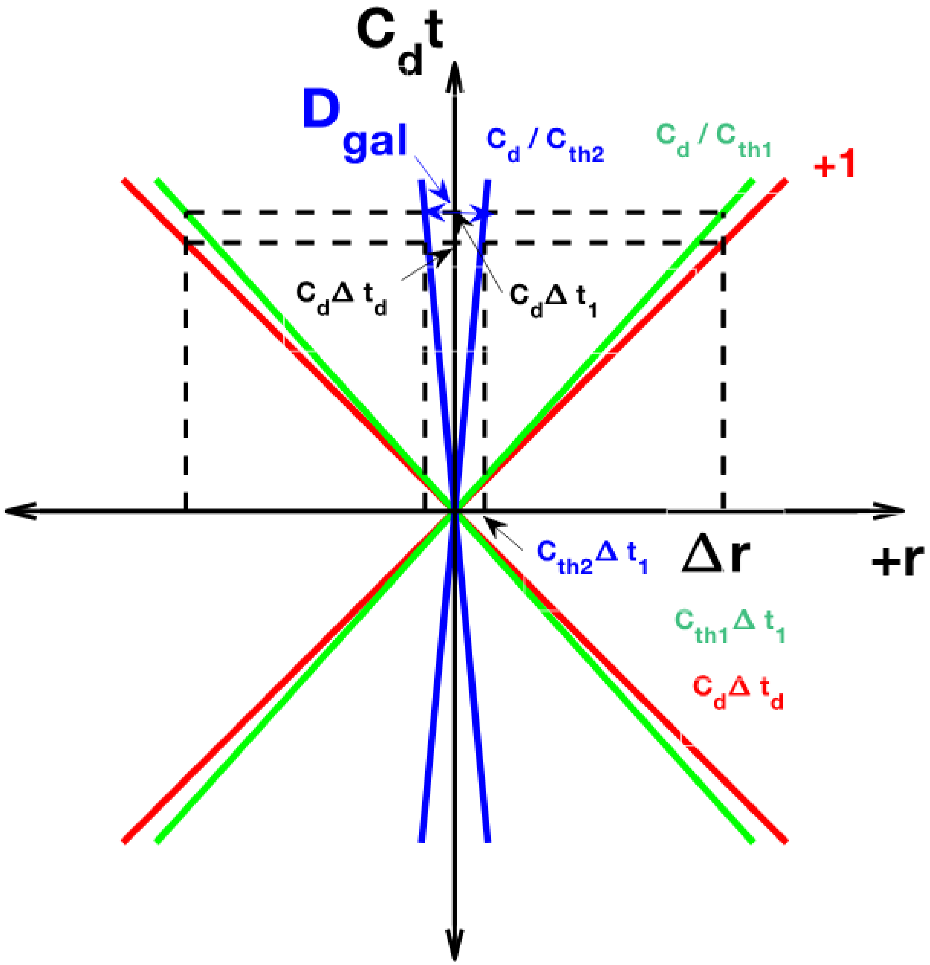
that incorporates

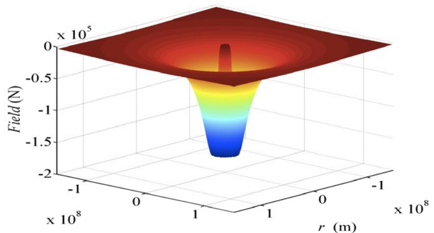
a constant reference component



POLYTECHNIQUE MONTRÉAL

A Worldline Interpretation



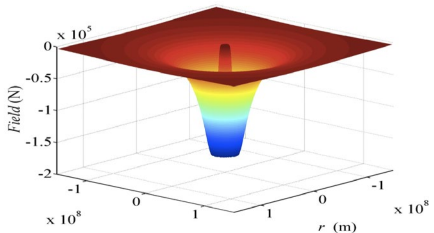


POLYTECHNIQUE MONTRÉAL

A Hubble Doppler effect

$$V_{\mathrm{gal}} = H_{0\,Doppler} D_{\mathrm{Mpc}}$$

$$\text{where } H_{0\,Doppler} = \frac{2c_{th_2}}{3.26\mathrm{Mpc}} = 74.42(.02)\left(\mathrm{km/s} \cdot \mathrm{Mpc}\right)$$



A Cosmological Model Interpretation

Hypothesis: the *erfc* potential is a source of baryonic matter energy density, describing the total energy available in the Universe:

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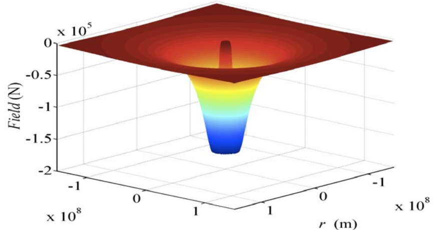
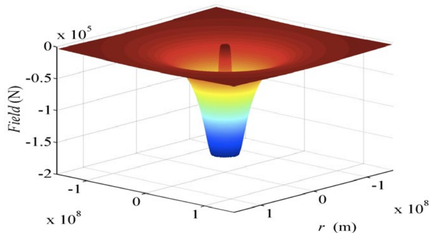


POLYTECHNIQUE MONTRÉAL

Once interpreted in terms of a CMB Baryonic dark energy

$$H_{0\mathrm{CMB}} = 67.64 \frac{\mathrm{km/s}}{\mathrm{Mpc}}$$

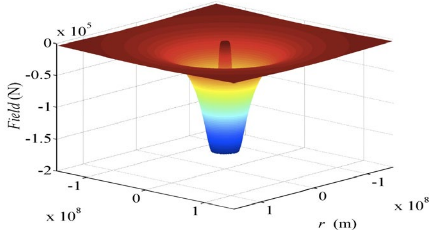


POLYTECHNIQUE MONTRÉAL

A Plausible Interpretation of the Hubble Tension Problem

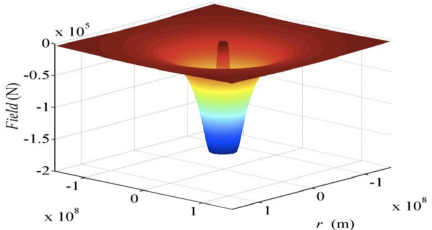
$$H_{0\text{Doppler}}\left(0.6827\right)^{1/4} = H_{0\text{CMB}}$$

$$74.42\,\frac{\text{km/s}}{\text{Mpc}} \times 0.909 = 67.64\,\frac{\text{km/s}}{\text{Mpc}}$$



FINAL TAKE HOME MESSAGE

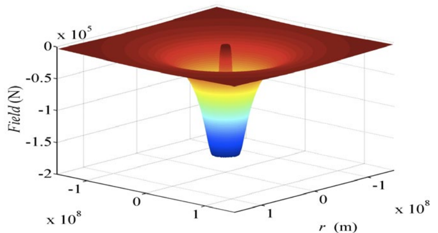
This emergent modelling paradigm raises more questions than the solutions it provides.



FINAL TAKE HOME MESSAGE

This emergent modelling paradigm raises more questions than the solutions it provides.

But it has been useful in predicting Galaxy rotational velocity (CAP2024)



POLYTECHNIQUE MONTRÉAL

Réjean Plamondon, Professor
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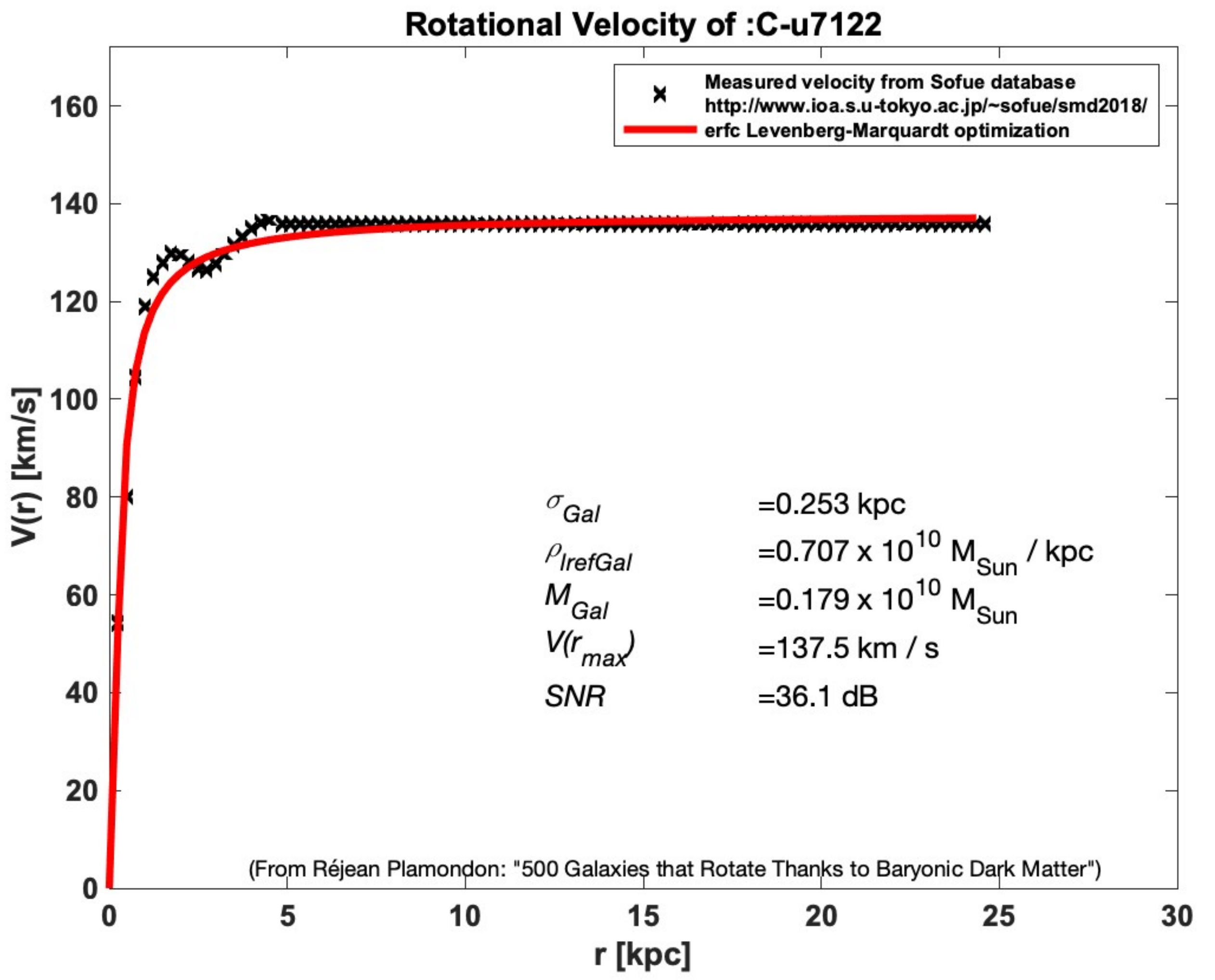
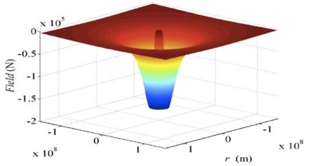
NIAS, IAPR and IEEE Fellow
Life Fellow IEEE
Head of Scribens Laboratory
Department of Electrical Engineering
Polytechnique Montréal, CANADA

500 GALAXIES THAT ROTATE FROM BARYONIC DARK MATTER

CAP 2024 MEETING LONDON ONTARIO

TYPICAL RESULTS >35dB





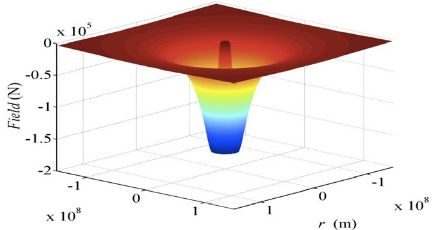
POLYTECHNIQUE MONTRÉAL

FINAL TAKE HOME MESSAGE

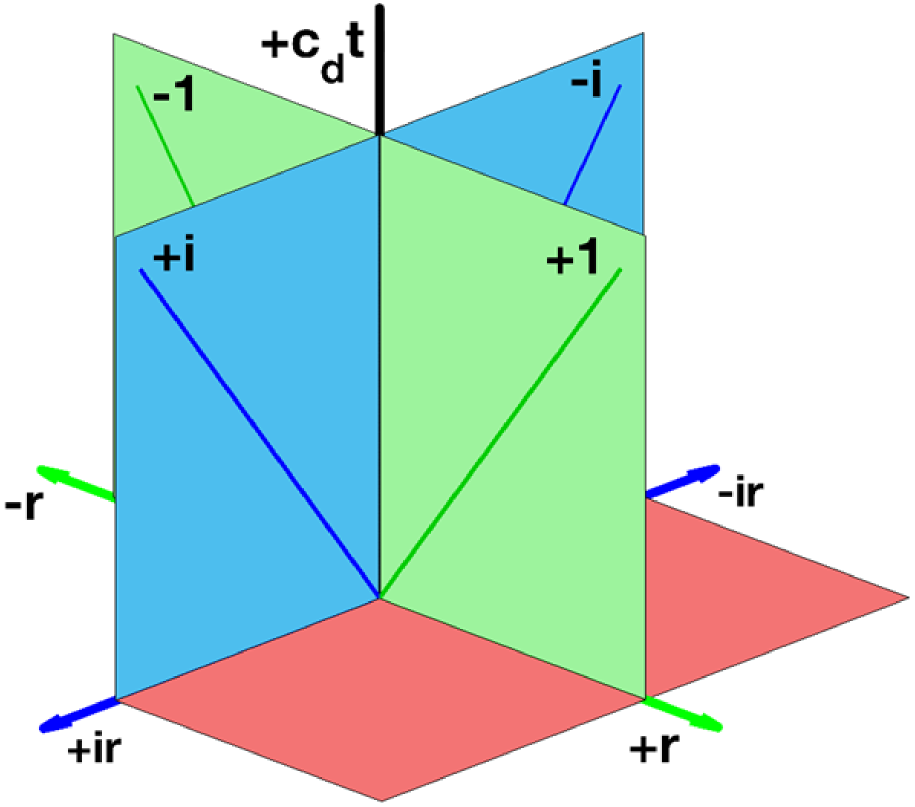
This emergent modelling paradigm raises more questions than the solutions it provides.

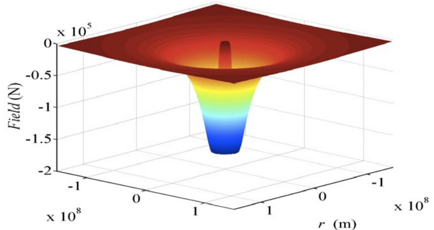
But it has been useful in predicting Galaxy rotational velocity (CAP2024)

And it predicts the emergence of a complex Spacetime where photons can go through both slits in a Young experiment (CAP2026)



Emergence of a complex spacetime





POLYTECHNIQUE MONTRÉAL

BRIDGING THE GAP BETWEEN CLASSICAL AND QUANTUM MECHANICS THROUGH GENERAL RELATIVITY

CAP2026
WEDNESDAY
June 24 10H30
SESSION
(DTP) W1-8
Mathematical Physics and Quantum Theory

Réjean Plamondon, Professor
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Life Fellow IEEE
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Department of Electrical Engineering
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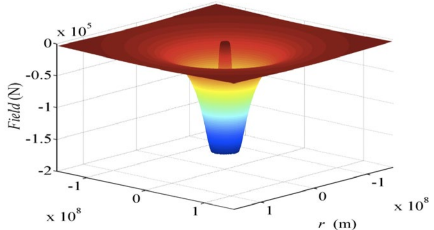
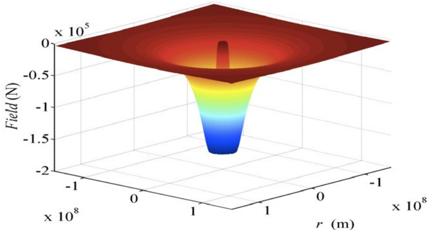


POLYTECHNIQUE MONTREAL

REFERENCES

1. Plamondon, R., (2024), **500 Galaxies Rotations Powered by Baryonic Dark Matter**, APS April Meeting, Sacramento, CA, USA.
2. Plamondon, R., (2021) **What does the Central Limit Theorem Have to Say About General Relativity?**, in Quantum Theory and Symmetries, Proceedings of the 11th International Symposium, Montréal, Canada, , Paranjape, M.B., MacKenzzie, R, Thomova, Z., Winternitz, P., WitczKrempa, W., (EDS), Springer, CRM Series in Mathematical Physics, 503-511. Available at: https://publications.polymtl.ca/10588/
3. Plamondon, R., (2018), **General Relativity: an erfc metric**, Results in Physics, 9, 456-462. Availlable at : https://publications.polymtl.ca/3572/
4. Plamondon, R., (2017), **Solar System Anomalies: Revisiting Hubble's law**, Physics Essays, 30(4), 403-411.



POLYTECHNIQUE MONTRÉAL

BRIDGING THE GAP BETWEEN CLASSICAL AND QUANTUM MECHANICS THROUGH GENERAL RELATIVITY

QUESTIONS?

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Life Fellow IEEE
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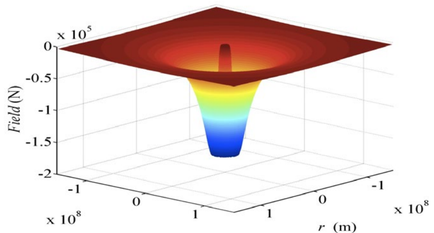
Polytechnique Montréal, CANADA



POLYTECHNIQUE MONTRÉAL