Comunicações Orais

1	Adam Smith Gontijo	INPE	Coupling between gravitational waves and strongly magnetized plasma in binaries of neutron stars
2	Gabriel Freitas Silva	CBPF	A novel method for renormalization of the Feynman Green function in curved space-time
3	Ilya Shapiro	UFJF	TBO
4	Isaac Torres Sales	UFES	A Bouncing Fab Four Quantum Cosmological model with de Broglie-Bohm Interpretation
5	Josiel Mendonça Soares	UFRN	Discriminating Cosmological Expansion Models With Third Generation GW Detectors
6	Leila Lobato Graef	UERJ	
7	Raissa Fernandes Pessoa Mendes	UFF	Neutron star quasinormal modes in scalar-tensor gravity
8	Thiago Roberto da Possa Caramês	UFES	Cosmology within dissipative gravity

Resumos:

1) Coalescence of neutron star binaries produces a significant amount of Gravitational Waves (GWs). GW 170814 source was observed by gravitational and electromagnetic signals and confirms the model that neutron stars are also the progenitors of shorts Gamma Ray Burts (GRBs) events ($t^{<}_{\sim} 2 seg$). GRBs have a brightness of $10^{51} - 10^{52}$ erg/s. These emissions are produced according to fireball model that consists in electrons-positrons pairs, radiation and baryonic matter. The baryonic matter absorbs a larger part of the energy of the explosion, reaching Lorentz factors of the order of 10^2 - 10^3. Since the magnetic fields of neutron stars are intenses and the plasma is strongly magnetized surrounding the sources of GWs, magneto-hydrodynamic waves (MHD) modes -- AlfvÃ©n and magneto-acustic -- are excited by the polarizations $\times$ and $+$ of the GWs, respectively. The MHD waves charge energy through the plasma, suggesting an alternative mechanism for the acceleration of matter with high Lorentz factors. The amplitude of the GW depends on the frequency of the system, hence, the energy stored in the plasma depends on the frequency of the gravitational radiation. We evaluate the amount of energy transferred between the waves, and the existence of the electromagnetic radiation produced by this interaction on the plasma.

2) In quantum field theory in curved space-time, the expectation value of some physical quantities must be renormalized. The renormalization method that is usually implemented in the literature in principle only applies for static, spherically-symmetric space-times. However, it does not readily generalize to other types of space-time. We present a novel implementation of the renormalization procedure which may be used in the future for more general space-times such as Kerr black hole space-time. As an example, we apply our method to the renormalization of the square of the field operator for a scalar field in Bertotti-Robinson space-time (AdS2 x S2).

3) TBO

4) In 2012 Charmousis et. al. showed that imposing some conditions collectively known as self-tuning in the Hornsdeski Lagrangian, only four terms can survive. They called these the Fab Four. We present here a quantum cosmological analysis with a de Broglie-Bohm interpretation of one of the Fab Four Terms which has a non-minimal coupling between gravity and a homogeneous scalar field. The Hamiltonian obtained has non-integer power in the momenta and we solve this problem using the conformal fractional derivative. We show that this analysis leads both to singular and bouncing solutions, depending on the initial contitions above the scale factor and the scalar field.

5) In the advent of the Gravitational Waves cosmology, new windows were opened to study new aspects of the universe as well as to test our current cosmological models. The new third generation ground-based GW detector, the so-called Einstein Telescope, make an important step in this scientific progress. Making simulations of possible data that can will be extracted using this detector we can have a overview of how we

can discriminate some cosmological model from the another one. In this presentation, we use this simulation to compare the standard cosmological model (the Lambda CDM) with other model that make use of a different parametrization in the equation of state for the dark energy.

6) –

7) An interesting prospect in the era of gravitational wave astronomy is to probe General Relativity with strong gravity asteroseismology - the observation of vibration modes of compact objects such as black holes and neutron stars. In this talk I will discuss how the coupling to the new degrees of freedom present in modified theories of gravity can alter the general-relativistic spectrum. These changes include not only a shift in the GR frequencies, but also entirely new families of modes with no counterpart in GR. I will discuss a realization of this idea in the context of scalar-tensor theories of gravity and comment on astrophysical scenarios where these modes could leave imprints on electromagnetic and gravitational wave observations.

8) In this talk I present a cosmological model constructed within a theory of gravity endowed with a non-trivial conservation law for the energy-momentum tensor. It is shown an equivalence between such a novel scenario and the bulk viscous model at background level, which is not verified in the perturbative regime. I discuss the possible way outs for the viability of this model in light of some observational data.

Poster

1	Alan Miguel Velásquez Toribio	UFES	Gaussian Processes in Cosmology: Generalized Equation of State
2	Alefe de Oliveira Freire de Almeida	UFES	Galaxy rotation curves in modified gravity models
3	Alejandro Hernández Arboleda	UFES	Preliminary test of cosmological models in the scale-dependent scenario
4	Alexander Bonilla Rivera	UFJF	Forecasting constraints on f (R) gravity through gravitational waves
5	Aline Nascimento Lins	UFRN	Testing extensions to General Relativity with gravitational waves
6	Ana Paula Jeakel Dias	UFES	Introdução a Cosmologia Moderna
7	Brisa Margarita Terezón Segura	UDB	Kantowski-Sachs gravitational collapse
8	David Francisco Camarena Torres	UFES	The impact of the cosmic variance on H_0 on cosmological analyses
9	EDDY GIUSEPE CHIRINOS ISIDRO	UFES	Detection of baryonic acoustic peak in the large-scale correlation function of red light galaxies (SDSS-III-DR12) and extraction of cosmological parameters
10	Guilherme Brando De Oliveira	UFES	Spacetime Singularities in Generalized Brans-Dicke Theories
11	Hebertt Leandro SIlva	UFRN	Gravitational memory effects
12	Horacio Santana Vieira	UFPB	GEODESIC DEVIATION EQUATION FLUCTUATIONS
13	Ingrid Ferreira da Costa	UFES	Variation of the fine structure constant due to a cosmological scalar
14	Isabela da Silva Vieira	UFES	Black Hole Shadow
15	Jhonny Andres Agudelo Ruiz	UFES	Simple cosmological model with running \Lambda and RRG
16	Luiz Filipe Guimarães	CBPF	A bouncing cosmology mimicking the Starobinsky inflation
17	Nathália Mattos Novaes da Rocha	UFES	Time-scale analysis of the quasar 3C 273 from radio waves to γ-rays.
18	Olesya Galkina Vieira	UFES	Particle creation in expanding universe
19	Pedro Otavio Souza Baqui	UFES	Recostructing dark matter halos from baryons using maching learning
20	Raquel Emy Fazolo	UFES	On the difficulty to distinguish non adiabatic dark energy models to the LambdaCDM model
21	Renan Alves de Oliveira	UFES	Testing CMB Isotropy Using Multipole Vectors on Small Scales
22	Rodrigo Martins de Siqueira Barbosa	UFES	Averaged Lemaître-Tolman-Bondi dynamics
23	Sara Caroline Carrera de Aviz	UFES	Tsallis entropy applied to the Earth’s climate
24	Tábata Aira Ferreira	INPE	Multivariate analysis of transients in LIGO auxiliary channels using Machine Learning
25	Tales augusto oliveira gomes	UFES	Análise cosmologica de aglomerados de galaxias
26	Tibério Azevedo Pereira	UFRN	
27	Tulio Ottoni Ferreira da Costa	UFF	Quasinormal modes of neutron stars in Scalar-Tensor theories

Resumos:

1) –

2) In this work, we investigate the possibility that the galaxy rotation curves can be explained in the framework of modified gravity models that introduce a Yukawa term in the gravitational potential. We include dark matter and assume that the fifth-force couples differently to dark matter and to baryons. We aim at constraining the modified gravity parameters β and λ, that is, the strength and the range of the Yukawa fifth force, respectively, using a set of 40 galaxy rotation curves data from the SPARC catalogue. We include baryonic gas, disk and bulge components, along with a NFW halo of dark matter. Each galaxy rotation curve is modeled with three free parameters, beside the two global Yukawa parameter. We find that the inclusion of the Yukawa term improves the χ^2 from 680.75 to 536.23 for 655 degrees of freedom. As global best-fit we obtain $\beta = 0.34 \pm 0.04$ and $\lambda = 5.61 \pm 0.91$kpc and a dark matter content on average 20% smaller than without the Yukawa term. The Bayesian evidence in favor of a NFW profile plus Yukawa term is higher than 8σ with respect to the standard gravity parametrization.

3) In the present work, we study for the first time a scale--dependent gravitational theory in a cosmological context in a matter--dominated era. In particular, starting from the Einstein Hilbert action with cosmological constant assuming scale--dependent couplings, we derive the corresponding effective Friedmann equations for the model and we solve them. We analyse in detail our results by comparing them with observational LambdaCDM data as well as the very well-known running vacuum models. Finally, we have provided, in figures, the evolution of the Hubble parameter respect to the redshift as well as the gravitational coupling respect to the Hubble parameter and they show an agreement with the current observations.

4) We investigate the forecasting cosmological constraints from gravitational waves (GWs) as the standard sirens by using the Einstein Telescope, which is the third-generation GWs detector, on f (R) gravity. We simulate the luminosity distance and redshift measurements from 100 to 1000 GWs events, and analyze the constraints from these mock data at five bins on the Hu-Sawicki model considering GWs events alone, and also in combination with CMB and BAO data. We find that with about 1000 GWs events, a very small but non-zero deviation from ΛCDM cosmology is slightly favored. When analyzed in a joint analysis with CMB and BAO data, that small deviation is noticed with 800 GWs events. We also reconstruct the effective equation of state and and see that it has a phantom dynamics at late time. The GWs as the standard sirens, can provide an independent and complementary alternative to current and future experiments and clearly, f (R) gravity is consistent with these observations, and it can serve as a candidate for modified gravity.

5) We explore extensions to General Relativity (GR) adding to the GR Lagrangian high dimension operators constructed out of powers of the Riemann tensor. The presence of this operators modifies the gravitational potential between the compact objects, as well as their effective mass and multipole moments. Via Effective Field Theory methods we compute the corrections from to gravitational potentials and multipoles within the post-Newtonian approximation to GR.

6) AtÃ© entÃ£o, todas as observaÃ§Ãµes comolÃ³gicas disponÃveis podem ser explicadas pelo modelo padrao de cosmologia, segundo o qual o universo Ã© dominado por matÃ©ria escura, fria e uma energia escura em forma de uma constante cosmologica. Contudo, visto que ainda nÃ£o dispomos de uma explicaÃ§Ã£o teÃ³rica satisfatÃ³ria para o setor escuro, grandes esforÃ§os teÃ³ricos e experimentais (Laureijs et al., 2011; Benitez et al., 2014; Abell et al., 2009) tem sido feitos para melhor entender sua natureza. NÃ£o se pode negar que a prÃ³pria cosmologia Ì□e, no momento construÌ□Ä±da sobre fundaÃ§Ãµes nÃ£o tÃ£o sÃ³lidas, dependendo de um setor escuro ainda nÃ£o explicado para que as observaÃ§Ãµes se ajustem ao modelo. NÌƒao hÃ¡ limites para quÃ£o importante Ìƒpodem ser as implicaÃ§Ãµes desse fato. Este trabalho apresenta uma introduÃ§Ã£o Ã¡ cosmologia com um aprofundamento nas equaÃ§Ãµes de friedmann, e um conjunto de dados obervados no qual se obteve um modelo cosmolÃ³gico de melhor ajuste usando uma anÃ¡lise bayesiana.

7) In this work we study the collapse process taking into account an anisotropic spacetime. We work with analytical solutions of the Einstein field equations. In fact, when we speak of the Kantowski-Sachs this is characterized by have a possitive curvature. However, we consider the curvature an arbitrary feature that is usual procedure, presently, by other authors. The singularity formation is analyzed exploring using the Kretschmann scalar.

8) The current 3.8σ tension between local and global measurements of H_0 cannot be fully explained by the concordance ΛCDM model. It could be produced by unknown systematics or by physics beyond the standard model. In particular, non-standard dark energy models were shown to be able to alleviate this tension. On the other hand, the linear perturbation theory predicts a cosmic variance on the Hubble parameter, which leads to systematic errors on its local determination. Here, we study this cosmic variance on H_0 affects statistical inference. In particular we consider the γCDM, wCDM and γwCDM parametric extensions of the standard model, which we constrain with the latest CMB, BAO, SNe Ia, RSD and H_0 data. We learn two important lessons. First, the systematic error from cosmic variance is approximately 1.2% of local H_0 when considering the redshift range $0.0233 \leq z \leq 0.15$ and 2.1% of local H_0 when considering the wider redshift range $0.01 \leq z \leq 0.15$. Although the systematic error affects the total error budget on local H_0, it does not significantly alleviate the tension which remains at about 3σ. Second, cosmic variance, besides shifting the constraints, can change the results of model selection: much of the statistical advantage of non-standard models is to alleviate the now-reduced tension. We conclude that, when constraining non-standard models it is important to include the cosmic variance on Hubble constant if one wants to use the local determination of the Hubble constant by Riess et al. (arXiv:1804.10655). Doing the contrary could potentially bias the conclusions

9) Sanchez et al. (2013) proposed a simple recipe in order to measure the radial BAO in a model independent way. It was applied to a large N-body simulation and it was shown to be able to correctly obtain the BAO scale relative to the assumed cosmology. Here, we extend the methodology introduced in Sanchez et al. (2013) in order to apply it to observational data.

10) We study the formation of classical singularities in Generalized Brans-Dicke theories that are natural extensions to Brans-Dicke where the kinetic term is modified by a new coupling function in the kinetic term. We discuss the asymptotic limit, when this function tends to infinity, and show that the system generically does not approach General Relativity. Given the arbitrariness of it, one can search for coupling functions chosen specifically to avoid classical singularities. However, we prove that this is not the case. Homogeneous and spherically symmetric collapsing objects form singularities for arbitrary coupling functions. On the other hand, expanding cosmological scenarios are completely free of Big Rip type singularities. In an expanding universe, the scalar field behaves at most as stiff matter, which makes these cosmological solutions asymptotically approach General Relativity.

11) The gravitational memory effect is a permanent displacement caused in the detector by the passage of the gravitational wave. Working linearised gravity theory, we split the the perturbations in radiative and non-radiative modes and we investigate the non-radiative modes in a an non-vacuum situation for an astrophysically motivated source, considering the analogue memory effect in the gravitational modes sourced by mass, momentum and angular momentum. We conclude by analysing the possibility of a future detection of this effect.

12) The quantum fluctuations of the geodesic deviation equation in flat background spacetime are discussed. We calculate the resulting mean squared fluctuations in the relative velocity and distance of test particles. The effect of these quantum fluctuations of the spacetime geometry is given in terms of the Riemann tensor correlation function. Three different sources of the Riemann tensor fluctuations are considered: a thermal bath of gravitons, gravitons in a squeezed state, and the graviton vacuum state.

13) We study the temporal variation of the fine structure constant (alpha) in the presence of the cosmological scalar.

14) Projeto de IniciaÃ§Ã£o CientÃfica baseado em estudos aprofundados de Relatividade Geral e Restrita, estudos de Buracos Negros de uma forma geral, demonstraÃ§Ã£o de mÃ©tricas e a capacidade dos mesmos de formar Sombras no universo devido ao forte campo gravitacional que esses objetos produzem no Universo. PrevisÃµes teÃ³ricas dos formatos que as Sombras possuem, caso fosse possÃvel tirar uma foto de um Buraco Negro resolvendo equaÃ§Ãµes de propagaÃ§Ãµes de raios de luz na Relatividade Geral.

15) A simple cosmological scenario in the context of running cosmological constant (CC), considering the dark matter (DM) component as a reduced relativistic gas (RRG), is presented and discussed. The renormalization group equation (RGE) for the running of CC together usual cosmological Friedmann and conservation equation are setted up and solved analytically. An interaction between matter and dynamical vacuum is considered, as well as the process of creation of particles as a consequence of this interaction. Finally, some

constraints about the two free parameters (ν,b) of our model are imposed in order to describe some values of cosmic observables satisfactorily.

16) In this work, we use the Wand's duality for cosmological perturbations to devise a contracting matter dominated phase which produces the same scalar perturbations as the Starobinsky model for inflation. We then evolve the perturbations through a bounce using Loop Quantum Cosmology and determine its behavior entering the usual expanding universe.

17) The quasar 3C 273 is one of the most studied extragalactic sources, particularly in the search for observational periodicities and time-scale features. Since it is now possible to study time dependence of frequency variations using the wavelet procedure, we search to detect the spectral components and describe the variability of the quasar 3C 273 in a time–frequency analysis of flux curves using the continuous wavelet transform. By using the Morlet wavelet as a scale-varying basis function well localized both in time and on frequency, we obtain the local and global power spectra. From the wavelet analysis, we are able to compute variability periods from flux curves in the multi-wavelength bands from radio waves to gamma rays. Our results confirm the variability properties found by different authors and, in addition, we report short scale periodicities not yet reported in the literature. The quasi periodic-like behaviour shown in the wavelet spectra is persistent over the electromagnetic spectrum. The temporal variation of the long and short timescales helps on the identification of lasting and transient phenomena, which in turn lead us to the physical mechanisms responsible for these manifestations. Using a paired sample t-test, we demonstrate that there is no statistically significant difference between the method used in the present work and others found in the literature.

18) We study the phenomenon of particle creation in expanding universe. This phenomenon is closely linked to non-uniqueness of the vacuum when considering a curved manifold. In this work we intend to investigate the possible definitions of vacuum states in the presence of quantum fields defined over a curved spacetime but with flat spatial section. In particular, we consider quantum scalar massive and massless fields defined over singularity-free cosmological models originated from the Brans-Dicke theory.

19) We used Machine Learning (ML) on cosmological simulations in order to predict the properties of dark matter halos from their baryonic content. We trained the algorithms on the n-body Millenium simulation, where the dark halos are populated of galaxies with semi-analytical model G11. The predictions were made in two steps, both using dark matter halos with mass $M_{dark}>10^{12}M_{\odot}h^{-1}$. In the first step we divided the domain of the mass into three bin, and in the second step we analyzed the redshifts $z=0,0.5,1.5,2.0$. In both cases we compared the predicted values with the true values. We show that using hot gas M_{hg} characteristic only, we are able to predict the critical mass M_{200} and the critical radius R_{200} at 97-99.9\% in any case. We can predict the velocity of dispersion V_{disp}, and the maximum velocity V_{max} of dark matter at 90-99\% depending on mass and redshift range. These results are obtained implementing K-Nearest Neighbors , Decision Tree, Random Forest, Extremely Randomized Tree and Artificial Neural Network, all in their regressive form.

20) We study intrinsic and relative nonadiabatic dark energy perturbations. In the formalism of relativistic cosmological linear perturbation.
We noticed a non-expected quasi-degeneracy between non adiabatic dark energy models and LambdaCDM. Our results are supported by fsigma8 and ISWeffect data. Such study shows the need of more precisa analysis and new probes to reveal the influence of the nonadiabatic terms in the dark energy.

21) In this work, we analyzed multipole vectors distribution for multipoles up to l=1500. We compared multipole vectors for each Planck's pipeline CMB maps over several Monte Carlo simulations. We also introduced the Fréchet-Mean vectors which is a tool that points the direction of anisotropy on cosmological maps and might have applications for other areas besides cosmology.

22) We consider cosmological backreaction effects in Buchertâ€™s averaging formalism on the basis of an explicit solution of the LemaÃ®tre-Tolman-Bondi (LTB) dynamics which is linear in the LTB curvature parameter and has an inhomogeneous bang time. The volume Hubble rate is found in terms of the volume

scale factor which represents a derivation of the simplest phenomenological solution of Buchertâ€™s equations in which the fractional densities corresponding to average curvature and kinematic backreaction are explicitly determined by the parameters of the underlying LTB solution at the boundary of the averaging volume. This configuration represents an exactly solvable toy model but it does not adequately describe our â€œrealâ€ Universe.

23) –

24) The purpose is to work on a machine learning algorithm which intends to characterize glitches not only in the gravitational channel but also in the auxiliary channels.

25) Projeto de iniciacao cientifica baseado no estudo de aglomerados de galaxias a fim de fazer uma analise cosmologica dos mesmos.

26) –

27) In recent years, with the detection of gravitational waves by the LIGO observatory, we can now test our theories of gravitation with one of the most extreme events in the universe: the collision of compact objects, like neutron stars and black holes. So far, our best theory of gravity is Einstein's General Relativity, that is well tested in solar system scales. But maybe, in a cosmological scale and in very energetic events, the theory needs some modification, and that is the main idea of this project: explore the Scalar-Tensor theory, that adds a scalar field that couples with the curvature of space-time.
The goal of this project is to study the vibration modes of rotating neutron stars, and their quasi-radial modes in particular. The idea is to study these modes of vibration in General Relativity and in Scalar-Tensor theory, see how they differ from each other and how we can detect a physics beyond General Relativity, with the signature of the gravitational waves by colliding neutron stars.
In a two years project, we want to extend the work [1] for stars with rotation. But for now, we present a preliminary result, where we use the Hartle-Thorne formalism for Scalar-Tensor theories, building a neutron star with slow rotation in these theories [2].

References

[1] Raissa F. P. Mendes and Néstor Ortiz: "New Class of Quasinormal Modes of Neutron Stars in Scalar-Tensor Gravity." - Phys. Rev. Lett. 120, 201104 (2018).

[2] Paolo Pani and Emanuele Bert: "Slowly rotating neutron stars in scalar-tensor theories" - Phys. Rev. D 90, 024025 (2014).