PAINEL 250

MÉTODO NUMÉRICO DAS DIFERENÇAS FINITAS NO DOMÍNIO DO TEMPO APLICADO A ONDAS ALFVÉN EM PLASMA ASTROFÍSICO

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Ondas Alfvén em plasma astrofísico têm sido objeto de intenso estudo nas últimas décadas pelo fato de apresentarem papel importante em muitas áreas de pesquisa na astrofísica. Particularmente são importantes no mecanismo de aquecimento da coroa solar; em ventos estelares; em jatos galácticos e extragalácticos; em discos protoestelares, etc. A formulação para diferenças finitas no domínio do tempo (FDTD), aplicada a plasma magnetizado é desenvolvida para estudo das propriedades de ondas Alfvén em três dimensões (3D-FDTD). O método é aplicado inicialmente a um plasma homogêneo e isotérmico imerso em uma região com campo magnético externo B0, que sofre uma pequena perturbação. Uma vez gerada a onda, esta perturbação é retirada e, então analisamos a evolução temporal das ondas, bem como a forma de seu amortecimento.

PAINEL 251

SIMULATION OF THE MAGNETOSPHERIC ANTIPROTON FLUXES INCLUDING THE EFFECTS OF RADIAL DIFFUSION PROCESS

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The numerical simulation of the antiproton fluxes trapped in the magnetosphere of the Earth show that significant fluxes of these antiparticles could exist here. They are secondary in origin, and are the products of nuclear reactions of the high energy primary cosmic rays (CR) with the constituents of the terrestrial atmosphere. Direct extraterrestrial antiprotons impinging upon the Earth́s magnetosphere are themselves secondary in origin, i.e. they are born in nuclear reactions of the same CR passing through 5-7 g/cm^2 of interstellar matter. These exhibit lower fluxes compared to the magnetospheric antiprotons which are produced in the passage of the same CR through the Earth's residual atmosphere of hundreds of g/cm^2. Such locally generated antiprotons can be confined by the magnetic field of the Earth (or equivalently in any planet) and get accumulated in the magnetosphere. We present here the results of the numerical simulations of the production of the antiproton fluxes in the energy range from 10 MeV to several GeV in the Earth́s atmosphere at altitudes of about 1000 km and further consider the radial diffusion process. We compare these

antiproton fluxes in the magnetosphere with those produced in interstellar matter. The estimates presented herein show a significant excess (up to two orders of magnitude) of magnetospheric antiproton fluxes over those formed in the interstellar media at energies < 2 GeV. The radial diffusion process enlarges the spatial distribution in the radial direction (in the L space) essentially showing significant fluxes up to $L \approx 2$.

PAINEL 252

HALOS AROUND X-RAY POINT SOURCES DUE TO SCATTERING BY INTERSTELLAR DUST

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Small solid particles are an important component of the interstellar medium. The scattering of X-rays depends on the size, distribution and composition of these dust grains. An interesting effect due to scattering by interstellar dust is the existence of halos around X-ray point sources. A variety of X-ray halos has been reported by Einstein, ROSAT and Chandra observations. Measurements of X-ray halos have been used to estimate dust grain density and composition, as well as to determine distance to X-ray sources. We compute the scattering of X-rays by interstellar dust using Monte Carlo simulations. The physical scenario simulated is the small-angle scattering of soft X-rays, emitted by a point source, by grains in the interstellar medium. We evaluate the amplitude of the scattering of X-rays by interstellar dust using an approximation for the sum of the Thomson scattering amplitudes for all the electrons in the grain. The result of that process is an X-ray halo, surrounding the source, which depends on the distribution of interstellar dust grain, the source flux, the hydrogen column density along the line of sight and the distance to the source. The galactic grain distribution model used was obtained in the literature and contains spheres of carbon, graphite and silicate. The halos produced in our simulations are in reasonable agreement with observed halos for Cyg X-3, GX 13+1 and N Cyg 1992 reported in the literature. We also use our code to predict the halo intensity for other interesting point sources.

PAINEL 253

OPTICAL POLARIMETRY OF GRB030329

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We have obtained R band imaging polarimetry of GRB030329. The observation was performed with the IAGPOL double-beam imaging polarimeter and the IAG-USP 60cm telescope, at the Laboratório Nacional de Astrofísica. The observation spanned the period UT 01: 06 to 01: 51 on 31 March, 1.519 - 1.592 days after the event. We have measured the following linear polarization for

GRB030329: P = [1.97 ± 0.48] %, position angle = 83 degrees. We have obtained much smaller polarization for field objects, consistent with the low foreground reddening towards the field. Independent data suggest that dilution of the GRB intrinsic polarization by the much fainter host galaxy should be negligible, at least at the early stages of the burst. In addition, a large polarization component within the host galaxy interstellar medium seems unlikely. We conclude that a substantial fraction of the GRB030329 polarization is intrisic in nature. This strongly suggests that GRB030329 is non-spherically symmetric, lending further credence to the asymmetric fireball scenario for GRBs. This work is supported by FAPESP. AMM is partly supported by CNPq.

PAINEL 254

GALACTIC GRBs AND THE AGASA EXCESS AT 1 EeV

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AGASA has detected an excess of events coming from the central regions of the Galaxy at energies around 1 EeV. This excess can be divided into two components: one that fits a dipole distribution and can be attributed to the diffusion of heavy galactic nuclei, and another one, restricted to approximately the inner 30 degrees, that has remained so far unexplained. Here we propose that the latter component is due to the production of cosmic rays by the last few Gamma Ray Bursts (GRB) in our Galaxy. The basic idea is that protons accelerated inside GRB are effectively ejected as neutrons, which in turn build up through decay a population of protons that is diffusively trapped for some time in the inner few kpc of the Galaxy. These protons constitute an extended source of second generation neutrons which roughly trace the star formation rate in our Galaxy. We demonstrate that this model leads to a successful interpretation of the data.

PAINEL 255

A NONLINEAR RELATIVISTIC NUCLEAR MODEL FOR PROTONEUTRONSTARS

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In the last few decades, studies on the internal structure, composition, dynamics and evolution of protoneutron stars, neutron stars, pulsars, hybrid and strange stars became central topics for theoretical and experimental research. Since the observation of the first pulsar in 1967, whose

characteristic observational features allowed its identification as a rotating neutron star, nuclear models have been widely employed in the description of the holly graal of modern physics, the equation of state of dense matter. As under the pull of gravity the energy density in the core of these compact stars is thought to approach or even exceed more than 6 times the density of ordinary nuclear matter, predictions on the structure of the stars depend sensitively on the equation of state provided by model calculations. Combined with the equations of the general relativity metric, predictions on the mass, radius, crust extent and moment of inertia of the stars are then susceptible to the comparison to observation. In this work, a theoretical modeling for protoneutron stars (nuclear matter at finite temperature) is studied in the framework of an effective many-body relativistic mean field theory and the Sommerfeld approximation which contains the fundamental baryon octet and leptonic degrees of freedom, sigma, omega, rho and delta mesons, chemical equilibrium and charge neutrality. Our predictions include the determination of the mass of protoneutron stars, the mass-radius relation, relative population, gravitational redshift among other properties.

PAINEL 256

NEUTRINO-DRIVEN WAKEFIELD PLASMA ACCELERATOR

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Processos envolvendo neutrinos são importantes em uma grande variedade de fenômenos astrofísicos, como as explosões de supernovas. Estes objetos, assim como os pulsares e as galáxias *starburst*, têm sido propostos como aceleradores cósmicos de partículas de altas energias. Neste trabalho, um modelo clássico de fluidos é utilizado para estudar a interação não-linear entre um feixe de neutrinos e um plasma não-colisional relativístico de pósitrons e elétrons na presença de um campo magnético. Durante a interação, uma onda híbrida superior de grande amplitude é excitada. Para parâmetros típicos de supernovas, verificamos que partículas carregadas "capturadas" por essa onda podem ser aceleradas a altas energias. Este resultado pode ser importante no estudo de mecanismos aceleradores de partículas em ambientes astrofísicos.

PAINEL 257

NEGATIVE HEAT CAPACITY AND NONEXTENSIVE KINETIC THEORY

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The negative nature of the heat capacity C_V of thermodynamically isolated self-gravitating systems is rediscussed in the framework of a non-extensive kinetic theory. In particular, we derive a new analytical expression for this quantity which gives rise to an entire negative branch. We show that for this kind of system the value q=5/3 is an upper limit for the non-extensive parameter. In connection with stellar polytropes, the value of this parameter, q=5/3, corresponds to a polytropic index n=3 or n=-1, depending on the adopted relation for n and q.

PAINEL 258

DISCRIMINAÇÃO DE NÚCLEOS PRIMÁRIOS NO OBSERVATÓRIO AUGER

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A identidade das partículas, com energias E > 10EeV, que geram chuveiros atmosféricos extensivos (CAE) na atmosfera terrestre é um incógnita. Existem diferenças sutis, mas apreciáveis entre chuveiros gerados por fótons e por núcleos, como temos demonstrado em trabalho recente. Porém entre os núcleos, as diferenças são tão sutis, que a baixa estatística e incertezas experimentais têm limitado fortemente sua diferenciação até o presente. Tal discriminação precede qualquer aplicação astrofísica mas sofisticada de raios cósmicos de ultra-alta energia. Apresentamos aqui os resultados do desenvolvimento de novos métodos de diagnóstico para a análise de CAEs com aplicação específica ao Experimento Pierre Auger. Redes neurais, combinadas com simulações numéricas detalhadas de CAEs e dos dois tipos diferentes de detectores (Cherenkov em água e de fluorescência atmosférica) presentes no experimento são empregados na análise. Mostraremos a capacidade dos métodos de diagnóstico desenvolvidos, para a discriminação de diversas distribuições hipotéticas de massa-anergia.

PAINEL 259

PERDA DE MASSA EM VENTOS EMPOEIRADOS DE ESTRELAS SUPERGIGANTES

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Em praticamente todas as regiões do diagrama HR, as estrelas apresentam evidências observacionais de perda de massa. Na literatura, pode-se encontrar trabalhos que tratam tanto do diagnóstico da perda de massa como da construção de modelos que visam explicá-la. O amortecimento de ondas Alfvén tem sido utilizado como mecanismo de aceleração de ventos homogêneos. Entretanto, sabe-se que os envelopes de estrelas frias contêm grãos sólidos e moléculas. Com o intuito de estudar a interação entre as ondas Alfvén e a poeira e a sua conseqüência na aceleração do vento estelar, Falceta-Gonçalves & Jatenco-Pereira (2002)

desenvolveram um modelo de perda de massa para estrelas supergigantes. Neste trabalho, apresentamos um estudo do modelo acima proposto para avaliar a dependência da taxa de perda de massa $\dot{M}$ com alguns parâmetros iniciais como, por exemplo, a densidade ρ_0, o campo magnético B_0, o comprimento de amortecimento da onda L_0, seu fluxo ϕ_0, entre outros. Sendo assim, aumentando ϕ_0 de 10% a partir de valores de referência, vimos que $\dot{M}$ aumenta consideravelmente, enquanto que um aumento de mesmo valor em ρ_0, B_0 e L_0 acarreta uma diminuição em $\dot{M}$.