WAVE PROPAGATION INTO THE GALACTIC ATMOSPHERE

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We present hydrodynamical modelling of wave propagation into the Galactic atmosphere. Spectra consistent with observations are shown to be a natural consequence of the dynamical response of the thick Galactic disk of gas, cosmic rays and magnetic field to disturbances produced at the midplane of the Galaxy. The response to the spiral density wave is studied. Regardless of the source of the disturbance, an initial velocity gradient along the line of sight towards the Galactic halo has as a response the expansion of the disk followed by an eventual differential fall back of the structure, with the lower parts of the disk falling first and the outer parts later. The two regions are separated by a shock front that rapidly decelerates the infalling outer gas. The spectra so obtained reproduce naturally the main features of the kinematics observed above the Galactic plane, namely the two velocity components at roughly 0 and −50 km/s from the H I profile, and *HST* ultraviolet observations of the Galactic halo star HD 93521 presented by Spitzer & Fitzpatrick (1993).

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CONSTRAINTS ON THE ORIGIN OF ULTRA-HIGH ENERGY COSMIC RAYS

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We report the results of 3-D simulations of non-diffusive propagation of Ultra-High Energy Cosmic Rays (UHECR) ($E > 10^{20}$ eV) through the inter-galactic and extended halo media. We quantify the expected angular and temporal correlations between the events and the sources for these distance scales. Our results indicate that the Yakustk and Fly's Eye events probably lie outside the supergalactic plane. The so-proposed angular correlations with several extragalactic radio sources are found to be unlikely. The calculated time delays between UHE protons and gamma-ray counterparts do not match the claimed GRB-UHECR associations for either nearby extragalactic or extended halo distance scales. The present results impose rather severe constraints on the search of UHE acceleration sources.

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A SEARCH FOR SPECTROSCOPIC BINARIES IN THE MAGELLANIC CLOUDS

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As part of an ongoing observing program devoted to the study of massive binary stars in the Magellanic Clouds, we have determined radial velocities for OB stars searching for variations due to binary motion. Based on spectroscopic observations obtained at CTIO, Chile, and CASLEO, Argentina, we present here the results of our study of the radial velocity behavior of 2 stars in the Small Magellanic Cloud (SMC), and 5 stars in the Large Magellanic Cloud (LMC).

In the SMC we performed a new determination of the radial velocity orbit of the WN3 + O binary AzV 332. We find that the absorption lines in this system arise from at least two different stars, thus indicating that AzV 332 is a multiple system.

In the SMC we also studied the B1Ia type star AzV 78, which turns out to have constant radial velocity within the observational errors. Our radial velocity values for this star are in good agreement with previously determined values.

We have found two new binaries among the stars studied in the LMC, namely Sk −66° 35 (B1.5Ia) and Sk −67° 167 (O4If). The former appears to be a long period single-lined binary with an elliptical orbit; while the latter shows double lines in its spectrum.

Marginal evidence of radial velocity variations was found from 8 spectra of Sk −67° 211 (O3III).

No significant radial velocity variations were found in the available spectroscopic observations of Sk −71° 42 (B2Ia) and Sk −67° 166 (O4If).

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