Searching for GONG p-Mode Frequency Variations Generated by Perturbations Near the Base of the Convection Zone

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We have analysed p-mode frequency variations from GONG data in the period of 1996-2003 to search for solar cycle variations generated by perturbations near the base of the solar convection zone. The scaled relative frequency change variation with horizontal phase velocity from GONG data is consistent with a previous study based on MDI data. The scaled relative frequncy change shows solar cycle variations for the horizontal phase velocity greater than a critical value, which corresponds to a depth near the base of the convection zone. The magnitude of the change correlates with the surface magnetic activity. In comparison with models, the observed frequency change could be generated by a perturbation of $-\delta\Gamma_1/\Gamma_1(=-2\delta c/c) \approx 2-6\times10^{-5}$ at $r \approx 0.65-0.67R_\odot$, if the FWHM of the Gaussian perturbation is $0.05R_\odot$.

This work utilizes data obtained by the Global Oscillation Network Group (GONG) Program, managed by the National Solar Observatory, which is operated by AURA, Inc. under a cooperative agreement with the National Science Foundation. The data were acquired by instruments operated by the Big Bear Solar Observatory, High Altitude Observatory, Learmonth Solar Observatory, Udaipur Solar Observatory, Instituto de Astrofisico de Canarias, and Cerro Tololo Interamerican Observatory.

Serebryanskiy A.V. supported by grant of NSF-NATO Postdoctoral Fellowship in Science and Engineering for Scientists from NATO Partner Countries.

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