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Eigenfrequencies of solar high-degree f modes

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Abstract. The solar f-mode eigenfrequencies are known to be well approximated by the formula $\omega = \sqrt{gk}$, where g is the gravitational acceleration at the surface of the sun and k is horizontal wavenumber (for a mode with spherical harmonic degree l, $k = l/R_\odot$). The observed f-mode frequency ω_f is greater than $\sqrt{gk}$ for low-degree modes but then the ratio $\omega_\mathrm{f}/\sqrt{gk}$ begins to decrease with increasing l. This tendency is explained by properties of f-mode eigenfunctions. Duvall et al (1998) has found from SOHO/MDI data, however, that this decrease, when l is greater than about 1000, becomes steeper than possibly explained by the f-mode eigenfunction behaviour and has discussued that this may be caused by scateering by turbulent flow. Antia and Basu (1999), also from SOHO/MDI data, has found that for l greater than about 2500 the tendency actually reverses; the ratio $\omega_\mathrm{f}/\sqrt{gk}$ increases with l. The cause of this reversal, however, remains unexplained.
We have found, from Hinode/SOT data, a similar behaviour in f-mode frequencies. We discuss the possible causes of this behaviour of high-degree f-mode frequency.