M01a SOHO/MDI 太陽振動高周波数データの自己相関関数解析

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It has been more than a decade since the so-called high-frequency interferrence peaks (HIPs) were found in solar oscillation spectra above the atmospheric cut-off frequencies of about 5.3mHz (Duvall et al 1991). In this frequency range the photosphere is essentially transparent to acoustic wave, so the peaks are not due to eigenmodes. The peaks have been explained by a model with acoustic sources in a radially thin layer; it has been shown that inteferrence between the waves emitted upward from such a layer, and the waves emitted downwards only to refract back towards the solar surface, leads to broad peaks in power spectrum (Kumar et al 1990).

Jefferies et al (1997) used the same model to analyze and interpret their South Pole data to find evidence of partial reflections at the photosphere and at a chromospheric layer. They also measured the reflection rates, which are related to the thermal structure of the solar atmosphere and convective energy transport in the upper convection zone.

We have repeated a similar analysis on MDI velocity, intensity and line-depth data via auto-correlation analysis. We note that there is a geometrical factor that seems to have been overlooked by Jefferies et al. This implies that their reflection rate has been underestimated. We have also found that the line-depth data present the best S/N ratio in the high-frequency range. The reason is still under investigation.