Solar Physics, Exercise 3

8 February 2017 at 14-16 in D116
Submit by 7 February 2017 12:00

1. Starting from the linearized equations (4.8), (4.11), (4.12), (4.13) and $\delta f = f_1 + \boldsymbol{\xi} \cdot \nabla f_0$, derive the equations (4.19)–(4.22) governing the eigenmodes of solar oscillations. Here, $g = -\rho_0^{-1} dP_0/dr$.

2. Derive the dispersion relation (4.30) starting from eqs. (4.24) and (4.25), and assuming slowly-varying values of g, c_s and H.

3. Helioseismic tomography can be used to image the farside of the Sun and hence predict the appearance of active regions on the earthside of the Sun well in a advance. Get yourself acquainted with this technique:
   http://gong.nso.edu/data/farside/more_info.html
   https://stereo-ssc.nascom.nasa.gov/beacon/beacon_farside.shtml
   http://gong.nso.edu/data/farside/calib_gallery.html
   Explain briefly the idea behind farside imaging of the Sun, draw sketches where necessary.
   Explore the results of helioseismic imaging for the last month using GONG data:
   http://gong2.nso.edu/products/scaleView/view.php?configFile=configs/farside.cfg&productIndex=0
   Were the predictions of farside active regions successful?