Status of the GONG time-distance pipeline

Kholikov Shukur

TD pipeline still under development and expected time of stable version is September-October 2003. The most computational steps already done. The main idea in time-distance analysis, computing the cross-correlation function (CCF) between a central point and annular region at an angular distance. Annular may be divided into section which allow to compute CCF for measuring travel time differences in corresponding directions (usually 4 sections north, south, west, east).

Here are some of the steps of measuring travel times.

1. Program to compute cross-correlations functions (CCF) for a given region on the surface of the Sun (C code).
2. Program to do temporary and phase speed filtering using Spherical harmonics coefficients (Fortran)
3. Fitting of CCF by Gabor wavelet (matlab code)
4. Program to measure the travel time differences for a given [lat,long] positions (north-south, west-east) – coming soon (difficulty is fitting of small number of averaged CCF for small region)

Below an example of measured CCF and corresponding TD curve using GONG and MDI one day data series (1024 min). Phase travel time can be determien more accurately (top line), that why some differences are visible only in envelop travel time.

Using this pipeline we can produce travel time maps for corresponding depths. Flow maps can be obtained after inversion of this kind of maps.

Future work:

Converting all codes into C to have a faster and easy to use tool.