Basic Principles of Solar Acoustic Holography

ASTR 500

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Outline

"Basic Principles of Solar Acoustic Holography"
C. Lindsey and D. C. Braun
2000

1. Introduction
2. Basic Principles of Computational Seismic Holography
3. The Computational Task
4. Subjacent Vantage Holography
5. An Example
6. Acoustic Modelling Based on Holographic Images
7. Phase-Sensitive Holography
8. Green's Functions
9. Summary

Overview

Drawing on principles in optics and optical holography: *Observe* the p-mode spectrum, and extract information without using (possible incorrect) models.

Comparing:

- simple acoustic-power
- phase-sensitive

Will eventually based solar models off of holographic signatures.

Propose "simple computational principles" to produce images from observations.

1.1

"Seismic holography" was applied to helioseismic data from SOHO. "New" (1998-1999) solar acoustic phenomena:

- 'acoustic moats' surrounding sunspots
- 'acoustic condensations' 10-20 Mm beneath active regions
- 'acoustic glories' surrounding complex active regions
- first helioseismic images of a flare

$\rightarrow$ solar cycle dependence of global p-modes! (which is ... ?)

Magnetic regions reflect p modes above the acoustic cutoff frequency, where the surface of the *quiet* sun ($\sim$ 10 G) acts as a nearly perfect absorber of incident acoustic radiation coming from the sun's interior.

Figure 1

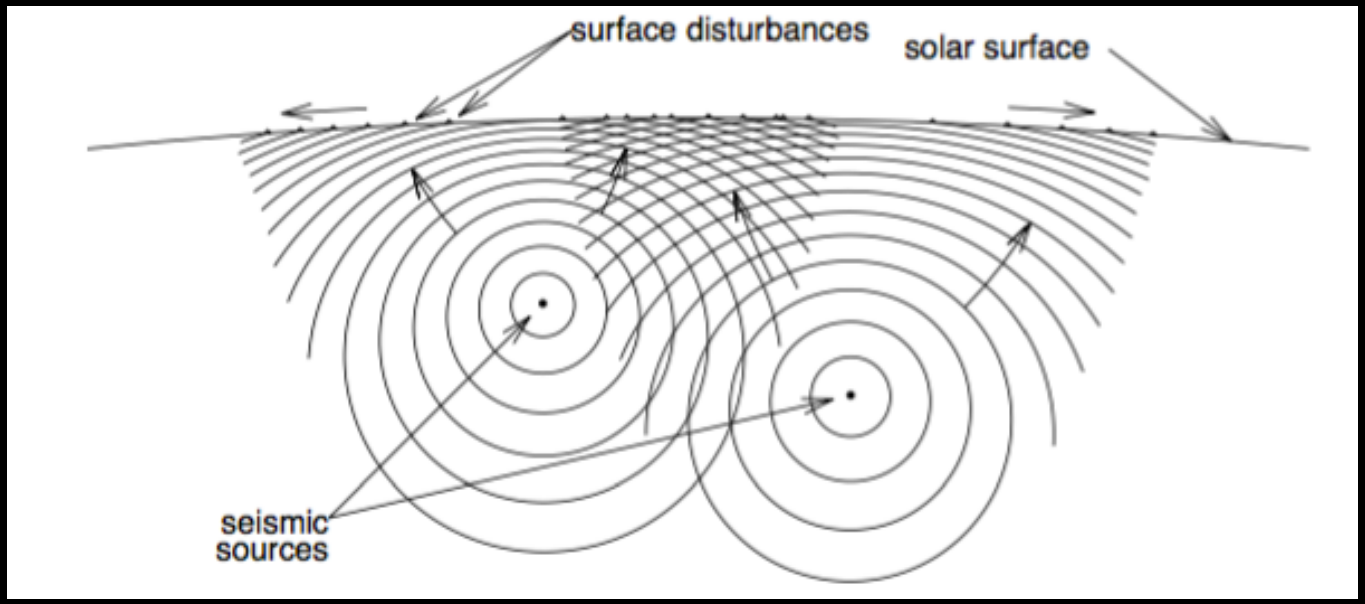

Figure: captiontext

1.2 The Basic Principle

The *phase-coherent* (what does this mean?) computational reconstruction of the *acoustic field* in the solar interior, so that *stigmatic images* (what are these?) of the sources of these disturbances can be produced.

Historical info here that might go in a pre-paper slide.