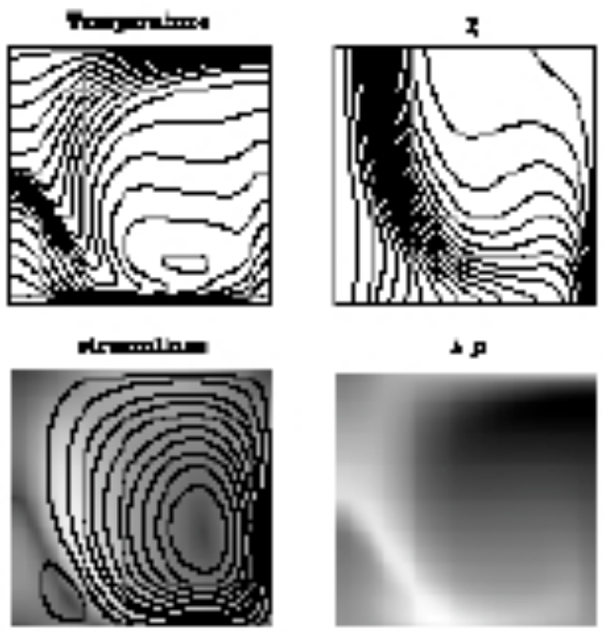
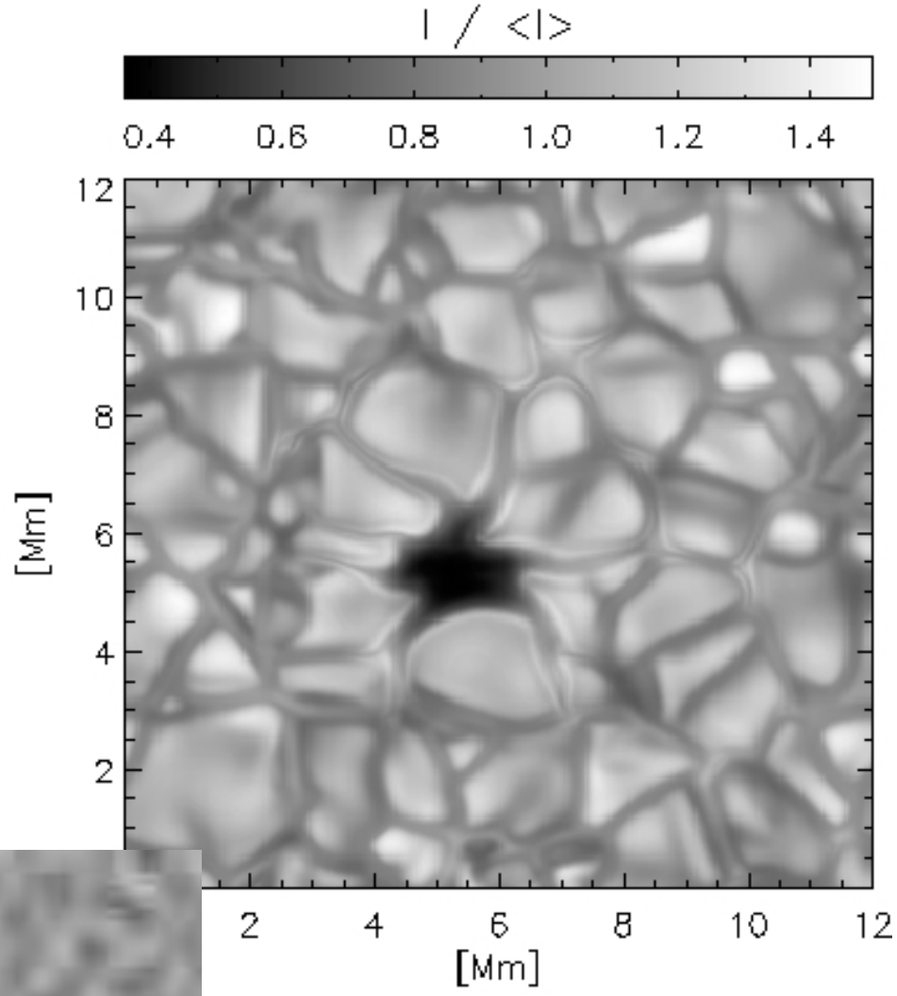
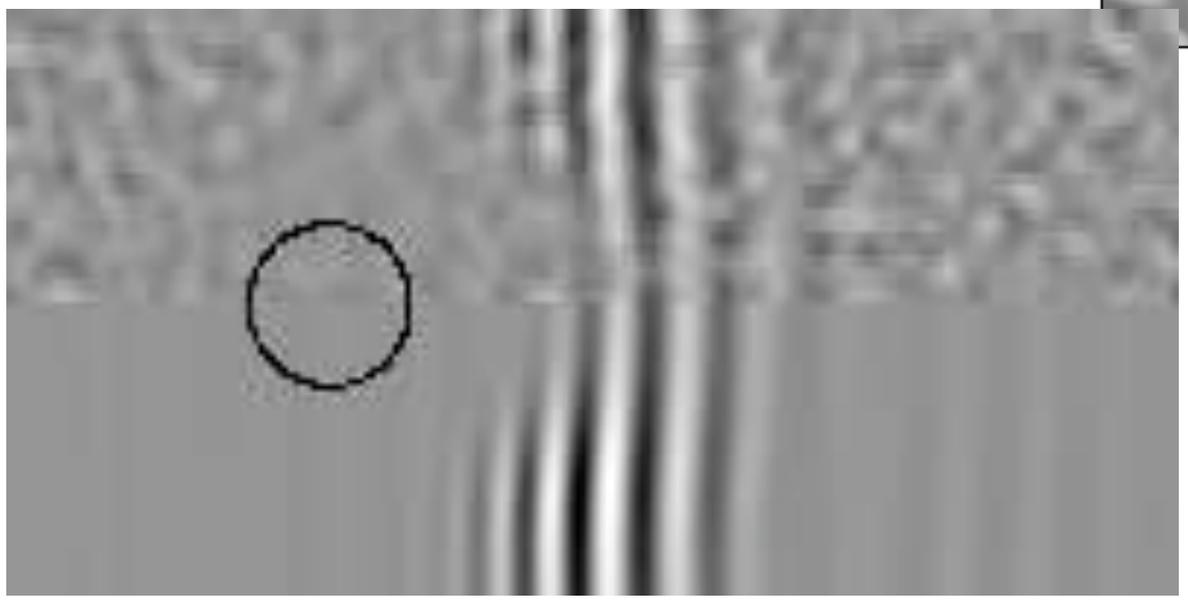
Local Helioseismology

Team 2: Numerical Simulations







Team Members

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Aim of simulations

- To understand the physics of what is going on
- To better understand the data
- To better understand what we actually see
- To understand the Sun

Types of analyses -- what to omit?

- Solve for all the physics: impractical
- "Realistic simulations" - includes radiative transfer, realistic EOS, but even here many "unrealistic" parameters etc.
- Non-linear simulations, eg magnetoconvection
- Linear wave propagation through arbitrary atmosphere
- Born approximation
- Ray tracing

Answer depends sensitively on the question being answered. All methods have different strengths and weaknesses.

This workshop?

- What do we have and what do we want to share?
- Sunspot models - what is available, which models exist and which can we code during the week.
- Nonlinear wave interaction with convection
- Radiative diagnostic tools

Sharing codes, models

- We should all individually think about what we are willing to share and under what restrictions. We will have a discussion on this.
- As a preliminary step, I am making a rather simple version of SLiM available. Probably I will make other versions available soon.
- Clearly not everyone can make things available (depends eg on institutional regulations, multi-author issues etc.)
- Hannah would like to collect things for HELAS.

Sharing ideas

- This seems to me to be a good idea, at least when papers are ready for publication.

Sunspot models

- Schlüter and Temesvary (1958) similarity solutions.
- Pizzo (1986) Use vector potential as coordinates. Prescribe gas pressure.
- Wegmann (1981), Schmidt and Wegmann (1983) Solve for free surface magnetopause separating potential field region from non-magnetic region.
- Jahn (1989) Free surface replaced by thick penumbra with volume currents and current sheet at edge of penumbra.
- Jahn (1992) Free surface peripatopause, free surface magnetopause, no volume currents.
- Rucklidge, Hurlburt etc (2000-??) Nonlinear idealized, axisymmetric magnetoconvection
- Cameron (2007) “realistic” simulation of a pore
- Vögler, Rempel, Schüssler (in prep), Nordlund, Stein (in prep) “realistic” magnetoconvective simulations.

Collaborations

- Good opportunity to get to know each other better