VIRGO Science Proposal
2D inversion of internal solar rotation.

Main Investigator

T.Corbard

Co-Investigators

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Objectives

This project concerns the determination of internal solar rotation using a 2D least square inversion code with emphasis on the convective/radiative transition zone and on the structure of the core using the VIRGO data.

Work plan

A 2D regularized least square inversion code of the rotational splittings to obtain the internal rotation of the Sun has been developed in Nice (OCA). It has been applied to the rotational splitting data of Libbrecht et al. (poster at Monterey Conference in April 1995).

We propose to combine the SOI data with the VIRGO one, with hopefully g modes and low frequency p modes splittings, to derive the internal rotation from the surface to the core. We intend to study more specifically the behavior of the rotation at the basis of the convection zone and to determine the size of the transition zone between the quasi-rigid rotation of the radiative interior and the differential rotation in the convection zone. We are looking at the possibility of introducing in the code non linear inversion schemes like the edge-preserving regularization algorithms developed for image processing.

Outstanding problems

We are looking to the influence of the form of the regularizing terms on the inversed rotation and to the constraints that can be imposed at the surface and at the center.

In our inversion code the rotation profile is approximated by a 2D tensorial product of piecewise polynomials of arbitrary order; in each direction they are expressed by the development on their B-splines basis. We are studying how to take advantage of the properties of B-splines mainly for improvement of the regularization procedure, restoration of eventual discontinuities and description of the boundaries.

Responsabilities and Management

T.Corbard will be responsible for the overall management. He will also be responsible for inverting the data, together with J.Provost and G.Berthomieu. T.Appourchaux and T.Toutain will be responsible for providing the LOI splittings. An MDI person will be responsible for providing the MDI splittings.