

ISSI International Team on
3D RECONSTRUCTION METHODS FOR THE STEREO MISSION
(ISSI, 12-15 April 2005, Kickoff meeting)

Minutes of meeting

Participants : Bernd Inhester, Jean-Pierre Wuelser, Antoine Llebaria, Jean-François Hochedez, Thierry Dudok de Wit.

1 Agenda

Introduction (1/2 day)

- Introduction to ISSI (Goetz Paschmann)
- Status of STEREO (Jean-Pierre-Wuelser). Spacecraft will be ready by March 2006; needs to be launched before May 2006.
- Objectives of the team and points to be addressed during the meeting (Thierry Dudok de Wit) followed by individual presentation of team members. Two participants will not attend this team : Fabrice Portier-Fozzani quits space physics and Albert Bijaoui is too busy.
- short presentation by team from Madrid (by Xavier Pacheco), which intends to work on Stereo together with LAS, Marseille.

Contributions to Stereo by each team member and his laboratory (1 day)

- Status of tool development for Stereo, based on Secchi website + various presentations (Thierry Dudok de Wit, see also Fig. 1)
- *Bernd Inhester* : FETOC code for tomography with magnetic field constraints + geometric (epipolar) constraints + potential field models for magnetic field extrapolation (with T. Wiegmann).
- *Antoine Llebaria* : electron density restitution in current sheet by forward modelling + sinogram analysis of plumes.
- *Jean-Pierre Wuelser* : together with M. Aschwanden, analysis of EIT and TRACE images with automated feature recognition (OCM method) + multispectral analysis + 1 to 5D models.
- *Jean-François Hochedez* : velocity map reconstruction by optical flow methods (Velociraptor) + automated CME detection (CACTus) + image enhancement/denosing by continuous wavelet transform.
- *Thierry Dudok de Wit* : multispectral enhancement + SVD for tomography + velocity map reconstruction by local correlation.

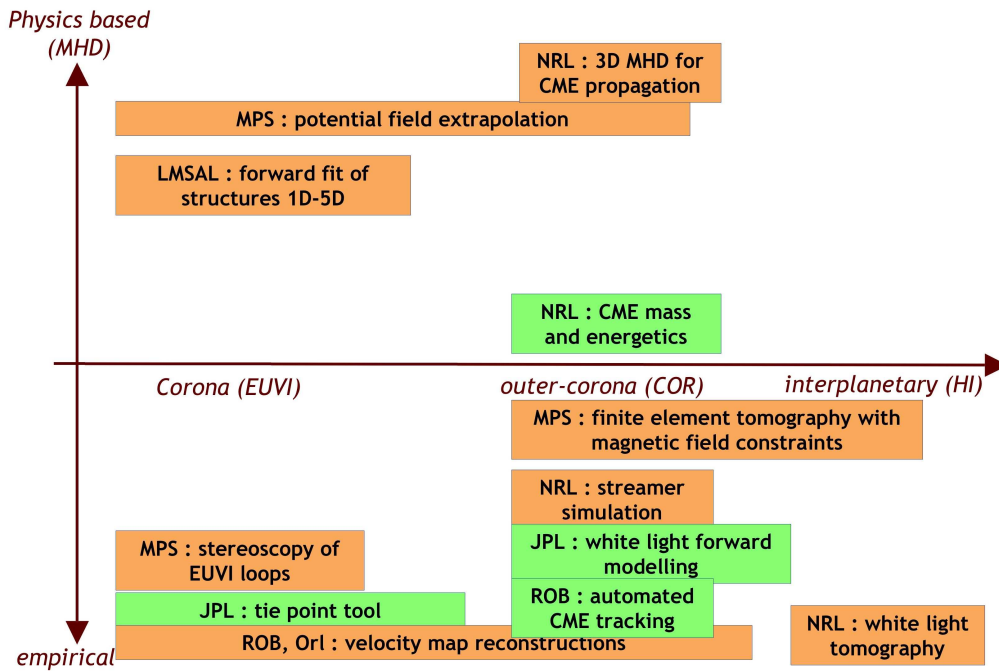


Figure 1: Techniques developed for 3D reconstruction purposes. Green = ready, Orange = under development.

Discussion (1 day)

- objectives of this team
- deliverables
- participants

2 Objectives of this team

- since the contributions to Stereo are mostly made by individuals or by individual teams, there remains an important need to increase the interaction between teams. Two niches for this team are :
 - determine how various tools can be used concurrently for a given physical problem, e.g. plumes.
 - consider examples where multi-instrument studies can be important (e.g. Secchi and SWAVES).
- this team has not been empowered to coordinate the 3D reconstruction initiatives. It will provide guidance, stimulate interactions and focus on key problems in stereoscopy. In doing so, it will inevitably contribute to improving the coordination. That should be done in close cooperation with the Secchi 3D team.
- our team will consist of a "core team" of 5 members + invited scientists at each meeting.

3 Outputs

- Given the tight agenda, a website seems most appropriate for quickly disseminating information. A few regular scientific papers between members of the team are also foreseen. There remains a need for review papers on 3D reconstruction - no decision yet on this.
- Contents of the website :
 - test case for loops observed in EUVI images, with results from various methods
 - test case for CMEs from onset until interplanetary medium (EUVI-COR-HI), with results from various methods
 - links to relevant literature
 - seek a user-oriented approach : what techniques are appropriate for what situation ?
- Test case nr 1 : synthetic data set to test the reconstruction of various methods for EUVI images. Data set consists of solar surface (from J-F Hochedez) and existing set of twisted loops (from M Aschwanden). Preprocessing issues such as flatfield correction should not be considered but Poisson noise + cosmic ray hits are important. Data set must be ready for next team meeting (June 2005).
- Test case nr 2 : synthetic data set based on white light reconstruction from 3D lasco data (after K. Dere et al.). To be discussed at next meeting.
- a Wiki interface will allow team participants to upload/download relevant literature on 3D reconstructions. Website will be located at ISSI and will be accessible from the web page of our team once the results are validated (to be discussed in June).

Practical points to be discussed at next meeting : lifetime of the website, who can contribute to it, etc.

4 Various points of interest

- insist of the importance of epipolar geometry for constraining the solutions, e.g. in flow reconstruction. There is need for a tutorial on this subject.
- it is essential to have a 3rd vantage point (SDO, TRACE, Coronas, ...) to remove the ambiguities inherent to a 3D reconstruction. Multi-instrument approaches therefore are a must.
- good spatial resolution is important for properly disentangling loops : better to take image of partial Sun a high resolution than full Sun at low resolution
- also consider practical aspects such as : observation strategy during the mission (which instruments, which resolution), need for improving data compression (can this still be changed ?)
- Can Stereo help constrain the estimation of the α parameter used in magnetic field extrapolations models ?
- How can SWAVES contribute to enhance the localisation of CME's in HI ?
- removal of the F-corona in LASCO data using information from multiple wavelengths
- 3D reconstruction of plumes using multi-instrument studies : an objective that seems within reach with presently existing methods (forward modelling)
- Interesting test cases : 3D loop reconstruction, CME propagation using multiple instruments, motion tracking in solar images, denoising, data compression.
- preprocessing aspects such as cosmic hit removal should not be discarded

5 Actions

all : upload on website relevant papers discussed during the meeting

JF Hochedez and JP Wuelser : build synthetic data set with loops

JP Wuelser : inform Russ Howard about the outcome of our team

T Dudok de Wit : ask B. Bentley to have stereo session at next SIP

T Dudok de Wit : contact attendants of next meeting while at Hamburg SEE meeting

6 Next meetings

Second meeting : 2.5 days between June 20 and July 8, 2005. That meeting will focus on the multi-instrument observation of CMEs (EUVI, COR and HI).

To be invited : Russ Howard and Angelos Vourlidas (NRL), Paulett Liewer or Eric de Jong (JPL), Frédéric Auchère (IAS).

Third meeting : late 2005, possibly in conjunction with SIP workshop in London.

Fourth (last) meeting : after launch of Stereo.

7 Website

Our website is at : <http://www.issi.unibe.ch/teams/Stereo/>

(s)Ftp access : <ftp://Stereo@ftp.issi.unibe.ch/>