Small JASMINE

Data Analysis

Minutes of the SJ #1 meeting

---

prepared by: Y. Yamada
reference: SJ-MN-KU-YY-002-01
issue: 1
revision: 0
date: 2016-08-18
status: Issued

Document History

Issue	Revision	Date	Author	Comment
1	0	2016-08-18	YY	First issue for Livelink.

Contents

Attendees

Naoteru Gouda (NG) NAOJ
Taihei Yano (TY) NAOJ
Yukiyasu Kobayashi (YK) NAOJ
Shin Utsunomiya (SU) NAOJ
Shingo Kashima (SK) NAOJ
Satoshi Yoshioka (TUM)
Yoshiyuki Yamada (KU)
Michael Biermann (MB)
Wolfgang Löffler (WL)

1 Introduction

1.1 Venue

The meeting took place in NAOJ on 2–4 Aug 2016.

1.2 Agenda

The following is the agenda as on the immediately before the meeting.

Tuesday 2 Aug 2016
09:30 NG: Welcom
09:35 NG: Overview
10:25 TY: number of stars
13:30 YY: Analysis concepts

Wednesday 3 Aug 2016
09:00 Discussion on Calibration

Thursday 4 Aug 2016
09:00 Discussion on Calibration
Discussion on Polytical issue

End of meeting

2 NG: Welcome

Welcome to all! Logistical arrangements are explained.

3 NG: Meeting objectives, overview of small JASMINE

See handout of the Gouda's presentation.

Our (JASMINE team) task is to prove or verify the achievement of 20 micro arcseconds precision.

Numerical simulation and experiments on the ground have been done. We should show the acceptable development plan.

Final decision of the mission selection will be done in 2 years from now on.

Q.For the precision of proper motion, 50 micro arcsecond / yr(P. 3) and 200 micro arcsecond / yr (P. 10) are confusing.

A.For mission requirements, we chose 200 micro arcsecond / yr, which is lead from scientific requirements. And if we achieve the parallax precision of 20 micro arcsecond, 50 micro arcsecond / yr may be automatically achieved.

4 TY: Number of stars

See handout of the Yano's presentation

The color magnitude diagram in the presentation shows K - (J-K). 2MASS has also H magnitudes. We can plot H vs (J - H) diagram. The results will be more secure if we plot H vs (J-H).

What is the reason of the magnitude limit 12.5. → Magnitude 12.5 means the lowest magnitude which we will achieve 20 micro arcsecond. Download limit will be defined by telemetry later.

Gaia has observed in G band. JASMINE will observe in H band. Do both mission see the same centroid position for common stars? If they has low temperature companion, is there some problem for comparing them? → If there are many such stars, the effect may be random. We will check the effect by simulation.

5 YY: Observing strategy and method of data analysis

On the estimation of computational performance of matrix inversion, ODAS has $20\mathrm{k} \times 20\mathrm{k}$ size matrix, and Fortran LAPAC package is used, and it takes 2 hours. Package can be applied for any size of matrix (Java 8), but for matrix size n, required computational time is roughly n^3. It is tough tasks. For being quicker, parallelize is needed. JASMINE team plan to collaborate with Maple software team. They have plan to development of software for treating big size matrix.

For H4RG, can we measure the pixel size? $\rightarrow$ We can't measure the pixel size in 1/20000 pixel level. We can measure in 0.1 micron level.

Stellar trajectory has curvature in the central region of the galaxy. $\rightarrow$ Acceleration may be negligible. JASMINE team will provide qualitative estimation.

Use GPS russian ??(GLONASS?) (Please add comment if any, Wolfgang.)

6 All: small-scale calibration

pixel on the sky is 540mas.
Target position precision = 10 micro arcsec.
Centroid accuracy = 3.5mas

We are discussing the small scale calibration. Also MB and WL discuss with BAS. We conclude that "the accuracy of small scale calibration should be better than end of mission accuracy" is wrong. The accuracy of small scale calibration should be better than single observation accuracy. Gaia is operating in the same concept as shown above.

PSF has several pixels, and have information of more than 1 pixel.

A star is observed at different points, and position errors of each observation has no correlation.

In Gaia, there occur unexpected attitude disturbances. Careful attitude modeling will be needed. Crancks(Please fix appropreate English word, Michael) will be less often in JASMINE than that in Gaia because the Small-JASMINE is small satellite. (Please add comments, Wolfgang)

For cross-match, 1.5 arcsecond is Gaia's cross match radius. If the separation of cirtain star pair is shorter than 1.5 arcsecond, cleverer cross match algorithm will be needed.

7 All: Polytical issue

Both JASMINE team and Heidelberg team will apply available fund. For example, we will check possibility of JSPS fund application.

8 All: error budget etc.

Budget tables are reviewed.

- Centroid-Mirror-Design-aberration: By heating mirror for removing contamination, focus adjustment has been needed in Gaia case. In Jasmine, telescope is operated in 5 °C. Survival heater is needed for keeping the temperature. In the temperature, mirror will not be contaminated. So, the situation is different in Jasmine. Only one performance of focus adjustment is enough.
- "Measurement limit" means that the requirement of mirror surface preciseness is enough larger than the limit.
- For secular changes, Clearceram may be creep just after it is made. We use aged material.
- For measuring flat (zero level?), Gaia get empty stellar window. This is not true flat field, but Gaia will subtract it. (I heard "flat", but do you means sky?, Wolfgang)
- For calibrating diffuse objects, confusion, binary, etc., data which have large residual will be removed from the primary stars in Gaia case.

9 End of meeting

All participants are thanked for their contributions and the NAOJ staffs for the perfect (!) local organization.

A Actions

Id	Actionee	Due Date	Action
SJ-1	MB	2016-08-31	Ask someone hwo to estimate the PSF shape from the observed data.
SJ-2	WL	2016-08-20	Make document for small scale calibration by discussing with Uli,
SJ-3	TY	2016-08-20	send number of Gaia stars and its spacial distribution to Heidelberg team.
SJ-4	TY	2016-09-10	Do simulation for multiple pair centroid estimation test.

B Acronyms

The following table has been generated from the on-line Gaia acronym list:

Acronym	Description
ARI	Astronomisches Rechen-Institut (part of ZAH, Zentrum für Astronomie der Universität Heidelberg)
BAS	Urlich Bastian
DPAC	Data Processing and Analysis Consortium
KU	Kyoto University
NAOJ	National Astronomical Observatory of Japan
TUM	Tokyo University of Marine Science and Technology

C References