

平成(30)年度国立天文台滞在型共同研究報告書
Activity Report for NAOJ Visiting Joint Research in FY (2018)

2019年 4月 9日

YYYY/MM/DD

申請者 Applicant	氏名 Name	Hanaoka, Yoichiro 花岡 庸一郎
	所属・職 Division・position	Solar Science Observatory Associate Professor
研究課題名 Research Title	Cross-Comparison of Full-Disk Solar Magnetic Fields Measurements Obtained with Japanese, Russian and Other Observatories: Instrumental and Solar Physics Issues	
研究場所 Place	NAOJ, Mitaka campus.	
共同研究者 氏名・所属・職名 Joint researcher's Name・ Institution・Position/ Graduate Student year	Demidov M.L. Institute of Solar-Terrestrial Physics SB RAS, Irkutsk, Russia Deputy Director	
1. 研究概要 (Summary of research)		
<p>Solar synoptic magnetic flux maps, showing a distribution of magnetic fields over the whole surface of the Sun, are the fundamental basis of all models for calculations of heliosphere and space weather parameters. One of the uncertainties in such charts is caused by differences in the full-disk magnetograms, provided by different instruments. It is a reason, why a cross-comparison of the these primary sources of synoptic maps is an important scientific issue. There are plenty of studies devoted to this problem. Because relatively recently (since 2010) the full-disk magnetograms are started to be provided by infrared spectro-polarimeter (IRmag) at NAOJ/Mitaka, a comparison of this new data set with measurements made in other observatories, is an extremely important task. To do such work was the goal of this Visiting Joint Research. At present stage a statistical analysis of some quasi-simultaneous magnetograms obtained at Mitaka and at SDO/HMI, GONG, and STOP (Sayan solar observatory, Russia) was made. It is shown that a rather good correlation of IRmag's data with other ones takes place, but the result depends on which IRmag line is used. The question of systematic differences (regression coefficients), closely connected with issue of calibration of polarization signals, is also investigated. A conclusion about importance of planned continuation of investigations, including addition of new data sets (SOLIS, WSO, Hinode), as well as studying of spatial and temporal variations of correlation-regression results, is made. A process for preparation of scientific paper and talk for presentation at the international scientific conference has been started.</p>		

2. 研究成果(Research achievements)

1. The question of calibration (conversion from polarization signals to magnetic field strength in Gauss) of IRmag measurements in different spectral lines (FeI 1564.8 nm, SiI 1082.7 nm, HeI 1083.0 nm) is explored from theoretical and practical points of view. The calibration coefficients for different parts of spectral lines (distance of pixels from the spectral line center) were determined.

2. A quantitative analysis of full-disk IRmag magnetograms, including for the first time the weak back-ground magnetic fields, is made for comparison between simultaneous IRmag observations in three spectral lines, and between IRmag magnetograms with ones from SDO/HMI, GONG, and STOP SSO (Sayan solar observatory, Russia). It is shown that there is perfect correlation between observations in FeI 1564.8 nm and SiI 1082.7 nm spectral lines, but not so good with HeI 1083.0 nm. Most probably it is caused by different formation depths of these lines. Correlation of IRmag magnetograms in SiI 1082.7 nm line and SDO/HMI, GONG, and STOP ones as good as 0.70-0.90, depending on combination.

3. There are significant systematic differences (linear regression coefficients) between different data sets (up to the factor by 3). A possible reasons for that could be: (1) uncertainties in the inversion of the observed Stokes parameters, (2) different formation depth of spectral lines, (3) different spatial resolution of analyzed data sets, (4) other sources of unknown nature.

3. 本制度に対する意見、要望など【申請者記載欄】
(Any comments on this program【For applicant】)

4. 本制度に対する意見、要望など【本事業で来訪した共同研究者記載欄】
(Any comments on this program【For joint researcher】)

Joint researcher is deeply appreciated to the Applicant and to the NAOJ Solar Science Observatory staff for hospitality and providing a perfect conditions for scientific work. One month is not enough time to complete the whole planned investigations, so processing of data and analysis of the results will be continued.

5. 共同研究者の滞在日程(Joint research period)

氏名・所属 (Name・Institution)	M. Demidov, Institute of Solar-Terrestrial Physics SB RAS, Irkutsk, Russia
滞在日程 (Period of stay)	日数(days)
2019年 2月 10日 ~ 2019年 3月 12日 YYYY/MM/DD ~ YYYY/MM/DD	31日間(days)
年 月 日 ~ 年 月 日 YYYY/MM/DD ~ YYYY/MM/DD	日間(days)
合計 (Total)	31日間(days)

(記載要領) (notes)

※ 記入欄は必要に応じ適宜スペースを拡張して記入のこと。

Fill out extending the entry columns as necessary

※ 共同研究者の滞在日程は、必要に応じ行を追加して記入、複数人招へいしている場合には、表をコピーして各人ごとに記載すること。

Fill out adding extra lines as necessary. If you invited multiple joint researchers, complete a copy of the table for each person.

※ 報告書の公開にあたり支障を生ずるおそれがある場合は、当該部分とその理由を明記すること。

When there is concern that making parts of this report public might cause difficulties, please indicate which parts and the reasons.

【お願い(Request)】

滞在終了1年後、当該共同研究によって出版された論文等の成果の提出を依頼させていただきますので、その際にご協力ください。

After a year following the completion of the research, we will send you a request to submit a list of papers and other results that have been produced by this research collaboration. We appreciate your cooperation.