

平成(29)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 (2017)

年 月 日
2018/06/20

申請者 Applicant	氏名 Name	Satoru Iguchi
	所属・職 Division・position	National Observatory of Japan Mitaka Professor and East Asia ALMA Project Manager
研究課題名 Research Title	Revealing the center of NGC 6958 with ALMA and MUSE	
研究場所 Place	National Observatory of Japan Mitaka	
共同研究者 氏名・所属・職名 Joint researcher's Name・ Institution・Position/ Graduate Student year	Sabine Thater Leibniz-Institute for Astrophysics Potsdam PhD student	
1. 研究概要 (Summary of research)		
<p>Massive black hole masses can be measured by analyzing the kinematics of different tracers which follow the gravitational potential of the black hole. In my research project at NAOJ I will compare the black hole mass estimates using two independent mass measurement methods. One is the most widely used method of stellar dynamical modeling, while the other is a novel method based on molecular gas dynamics, pioneered by the group of this project's NAOJ host Satoru Iguchi. The comparison will be performed on an ideal target, a regular elliptical galaxy NGC6958, hosting a molecular disc.</p> <p>The purpose of my visit to NAOJ is to deepen my knowledge on the analysis and measure the central black hole of NGC 6958 based on molecular gas using ALMA data. In a second measurement attempt I will determine the black hole mass based on stellar kinematics using MUSE data. The comparison of the two measurement methods will provide a better understanding of the measurement errors, specifically, the systematics associated with the dynamical methods, and the general accuracy of black hole mass measurements. Evaluating the accuracy of black hole masses is crucial for improving the understanding of the interplay between the central black holes and their host galaxies.</p>		

2. 研究成果(Research achievements)

During my stay at NAOJ, I have successfully reduced the ALMA data of NGC 6958, for both the low- and high resolution data, combined them and build preliminary models in order to measure the massive black hole mass. A second constituent for the dynamical models is the knowledge of the luminosity distribution of the galaxy. I derived a luminosity models based on multi-gaussian expansion and analyzed different effects such as dust masking and using different images.

It was my goal to deepen my understanding of the measurement method. I learned about the single processes of the data reduction, the cleaning process, obtaining a good balance between sensitivity and resolution and the KinMS model to finally measure the MBH mass. Therefore, I got great support by the second student of this Joint Research Dieu Nguyen and I visited a collaborator in Ehime, Kyoko Onishi. During my stay in Ehime, I also presented my research in a seminar talk.

In the meantime, I also started to apply the stellar kinematics measurement on the reduced MUSE data and build Jeans model to derive the black hole mass from the stellar kinematics. First results suggest that the different dynamical methods are not consistent with each other. I am currently working on better understanding the systematics and find out what are the major drivers of the different black hole masses.

Furthermore, I am currently preparing a publication on the comparison of the two methods in Monthly Notices of the Royal Astronomical Society, a refereed journal. I expect this publication to be published by the end of this year/beginning of the next year. A second goal for the coming year is to prepare an ALMA proposal to apply the knowledge, I have gained in this project, to a number of additional galaxies.

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】)

The NAOJ joint-research program was a great opportunity for me to strengthen my international collaborations and learn about the ALMA data. It was especially from great value that we were two students being sponsored by this grant, as we could help and support each other in our projects.

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】)

5. 共同研究者の滞在日程(Joint research period)

氏名・所属 (Name・Institution)	National Observatory of Japan, Mitaka	
滞在日程 (Period of stay)		日数(days)
年 月 日 ~ 年 月 日 2018/01/15 ~ 2018/03/30		75 日間(days)
年 月 日 ~ 年 月 日 YYYY/MM/DD ~ YYYY/MM/DD		日間(days)
合 計 (Total)		75 日間(days)