

Potential for the Development of Astronomical Tourism in Kumano City, Mie Prefecture, Japan



Takumi Isono and Nobunari Itoh

Abstract This study discusses the potential for the development of astronomical tourism in Kumano City. An analysis is conducted not only of tourism development efforts undertaken by the local government and the tourist association, but also of astronomy-related tourist behaviors and tourists' opinions about stargazing activities. Astronomical tourism in Kumano City is regarded as the creation of new tourism consumption opportunities, given the lack of existing night tourist attractions. However, it is necessary to differentiate the contents of stargazing activities from other areas to attract tourists because Kumano City has not been recognized as a popular astronomy-related destination yet. Overall, astronomical tourism tends to focus strongly on features of educational tourism, such as explanations of constellations by specialists. On the other hand, tourists who are interested in astronomy in Kumano City are attracted by leisure or comfort in the context of stargazing activities. Therefore, to promote astronomical tourism, it is necessary to not only improve human resource development, by providing interpreters for stargazing, but also create warm spaces and environments where one can comfortably watch the starry sky in Kumano City and engage in academic activities. Isono (The Tourism Studies 31:5–18, 2019) explains that such lighthearted stargazing products can produce child-friendly opportunities to enjoy peaceful night-time activities, even though the starry sky itself is unlikely to be a major tourist attraction. Thus, it is necessary to create stargazing programs related to the strengths of Kumano City such as the scenic natural landscape or warm winter climate.

Keywords Astronomical tourism · Regional revitalization · Peripheral area · Hiddentourism geography · Kumano city

T. Isono (✉) · N. Itoh
Faculty of Education, Mie University, Tsu, Japan
e-mail: takumi.i_freedom@hotmail.com

N. Itoh
e-mail: nitoh@edu.mie-u.ac.jp

1 Introduction

1.1 Research Background

Light pollution (increased night brightness) is a major obstruction to astronomical observation. Satellite images show that the night sky in developed countries and BRICs (Brazil, Russia, India, and China) is steadily increasing in brightness (Itoh et al. 2018). Falchi et al (2016) noted that 80% of Americans and 70% of Japanese live in areas where the Milky Way cannot be seen. Thus, the opportunity to watch the sparkle sky is becoming a rare experience for urban residents (Longcore and Rich 2004).

Under these circumstances, discussions on tourism development in relation to the dark night sky have become more active in Japan and abroad. The International Dark-Sky Association, established in 1988, designates International Dark-Sky Places where one can experience educational activities addressing light pollution, such as stargazing and astronomical observation tours. Collison and Poe (2013) explained that astronomical tourism offers attractions for tourists to visit places where the dark sky is free from light pollution. National parks and reserve authorities have been collaborating to create stargazing programs for tourists, especially in Western countries (Rodrigues et al. 2015).

Due to the rapid decline of traditional industries, many peripheral cities and towns have sought to revitalize their regions by tourism development. Depopulated regions without notable tourist attractions have joined the astronomical tourism movement as a means of regional development (Narita and Ueda 2013). Local governments have attempted to create unique attractions to draw tourists (Murakami 2001), as regional night-time resources present excellent options to differentiate one tourist location from another. Peripheral areas in particular offer abundant natural elements that are limited in urban areas, and thus can offer exciting one-of-a-kind experiences such as night safaris (e.g., Kawanami 2016; Hosaka et al. 2017) and stargazing activities (e.g., Uda and Isono 2019). In addition, astronomical tourism is an effective strategy for regional development as it can create a demand for long-term stays where perhaps only day trips have been common. Thus, astronomical tourism is likely to develop as a new type of sustainable tourism and has been drawn attention as one of the hidden tourism geography topics such as the above studies.

The promotion of astronomical tourism has been steadily improving the environment since 1988. The Ministry of the Environment has held events to not only increase awareness for the environmental protections about light and air pollution, but also to promote the utilization of starry sky for education and tourism. Astronomers have organized a group that trains and certifies astronomical guides to lead tours at night-time attractions. (Tomita and Okyudo 2009). Furthermore, in 2008, the Japan Tourism Agency declared that *sora tourism*¹ (which includes astronomical tourism) is a successful and increasingly popular facet of the country's tourism industry.

¹ For more information about sora tourism: <https://soratourism.com/>.

Some peripheral areas that have been successful in astronomical tourism were studied as examples of destination-based tourism. Nagai (2016) explored the background and development process of astronomical tourism in a Japanese rural area which had suffered from a decreasing number of tourists to its hot springs. Uda and Isono (2019) described the characteristics of business operators who conduct stargazing activities for tourists in Ishigaki City, which is famous for nature-based tourism. However, few studies have focused on the tourists' perspectives. A demand assessment for astronomical tourism is needed. Collison and Poe (2013) noted that astronomy-related tourists are often overnight tourists; however, they analyzed only the very basic attributes of astronomy-related tourists. Therefore, the specific characteristics of tourists' behaviors, motivations, and needs remain unclear. It is necessary to form a process for selecting astronomy-related tourist destinations to ensure an astronomical tourism industry with a stable supply and demand balance.

1.2 Objective and Methodology

This study discusses the potential for the development of astronomical tourism in Kumano City (Mie Prefecture in Japan). An analysis is conducted not only of tourism development efforts undertaken by the local government and the tourist association, but also of astronomy-related tourist behaviors and tourists' opinions about stargazing activities. To achieve the purpose of this study, fieldwork based on interviews was conducted during March and April 2019. The staffs of the Kumano City Office and the Kumano City Tourist Association were interviewed about the current situation of astronomical tourism promotion. To understand the characteristics of astronomy-related tourist behaviors and their opinions, a web questionnaire survey which the authors commissioned to Macromill, Inc. was conducted for 209 overnight tourists who had stayed at least one night in Kumano City since 2014 (see Sect. 4 for the detailed information).

2 Study Area

2.1 Overview of Kumano City

Mie Prefecture is divided into five regions (Hokusei, Chunansei, Ise-Shima, Iga, and Higashi-Kishu), and Kumano City is located in the Higashi-Kishu region (Fig. 1). Kumano City is blessed with a rich natural environment, but it has a low habitable area ratio (12.3%) due to the overall mountainous terrain. The warm current (Kuroshio) flows off the coast of the Higashi-Kishu region, making it a mild climate in Mie Prefecture, especially in winter (Fig. 2).

Fig. 1 Study area. *Source* Author

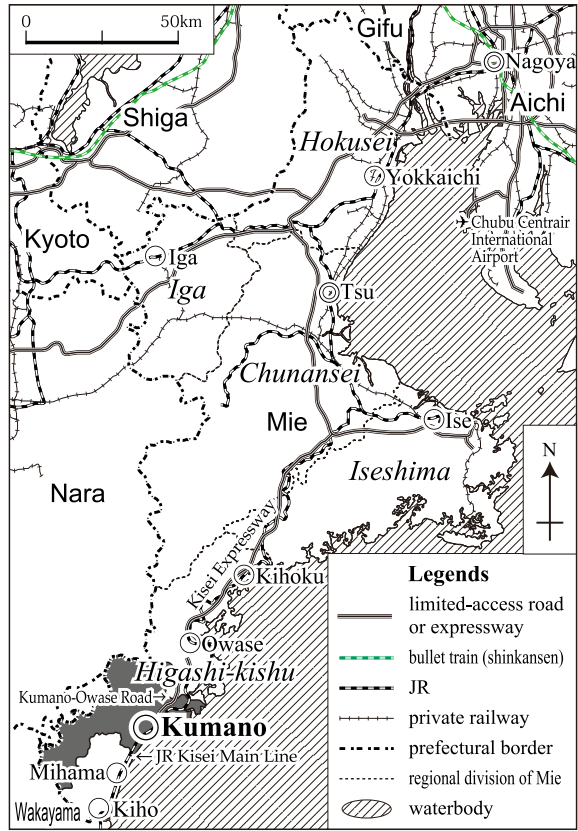
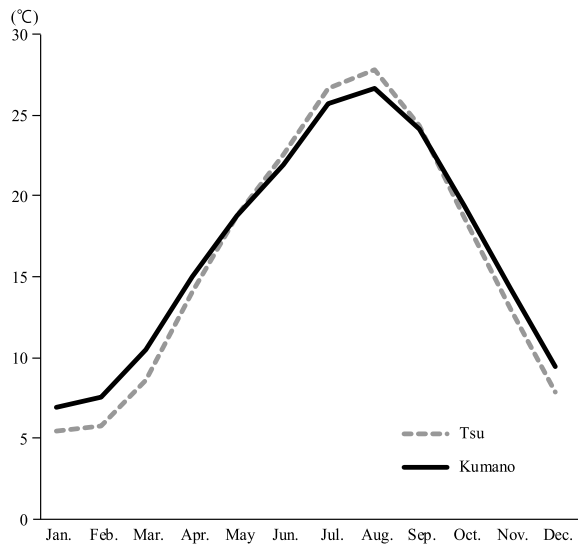


Fig. 2 Average temperature per month in Tsu and Kumano City (1985–2019). *Source* Japan Meteorological Agency



The Higashi-Kishu region, including Kumano City, is far from urban areas, such as Nagoya, Osaka, Yokkaichi (Hokusei), and Tsu (Chunansei) cities, which caused delays in the development of transportation infrastructure. As for road traffic, accessibility from urban areas has been improved since 2006 because of the gradual development and expansion of the Kisei Expressway and the Kumano-Owase Road. This led to a declining population and limited employment opportunities. According to the national census (2015), the population of Kumano City greatly decreased from 1960 (39,150) to 2015 (17,322). The elderly population ratio rose substantially from 1960 (7%) to 2015 (42%). This shows the current situation of fewer children and aging society in Kumano City. Regarding the ratio of employed persons to occupation types in Kumano City, primary industries account for 7.9% of the workers, secondary industries for 17.3%, and tertiary industries for 74.8%. Therefore, it can be pointed out that Kumano City has a high proportion of primary and tertiary industries because the average ratios of Mie Prefecture are 4.0% for primary industries, 33.6% for secondary industries, and 62.4% for tertiary.

2.2 Kumano City as a Tourist Destination

The Higashi-Kishu region is situated in a part of the World Heritage sites known as the Sacred Sites and Pilgrimage Routes in the Kii Mountain Range, so designated in 2014, and in the Yoshino-Kumano National Park. Thus, there are a variety of natural and cultural tourist resources in the Higashi-Kishu region. The Kumano-Kodo, a network of pilgrimage trails partially recognized as a World Heritage site, is one of the most famous and popular tourist attractions in the Higashi-Kishu region, and Kumano City has various local resources related to the Kumano-Kodo (Fig. 3). After the World Heritage certification, the number of tourists to the Kumano-Kodo is increasing on a continuing basis (Fig. 4). However, the Higashi-Kishu region is located far from major urban areas and, as such, has experienced a delay in public transportation development. Thus, compared to other regions, the number of tourists in the entire Higashi-Kishu region has been very small despite being certified as a World Heritage site (Fig. 5). In addition, half the tourists to the Higashi-Kishu region are from Mie Prefecture, and the remaining 40% are from Aichi or Osaka Prefectures. On the other hand, the number of tourists from Tokyo is extremely small. Thus, it can be pointed out that the tourists' residential area in the Higashi-Kishu region is limited to the small, that is, prefectural area.

As for the tourist attractions in Kumano City, cultural resources related to the Kumano-Kodo and natural resources like the Yoshino-Kumano National Park are widely distributed. The number of tourists and tourist attractions (e.g., Onigajo and Hanano-iwaya Roadside Station), which are located in a coastal area, are larger than those in mountainous areas because they are more easily accessible by road traffic (Fig. 6). In addition, Maruyama Senmaida, Yunoguchi Spa, Seiryu-so (Ryokan), and Dorokyo Gorge, which are distributed along national roads 311 and 169 in mountainous areas, are regarded as main tourist attractions for good accessibility by



Fig. 3 Matsumoto Toge (one of the Kumano-Kodo sites related the World Heritage) (Source Taken by the author, June 2019)

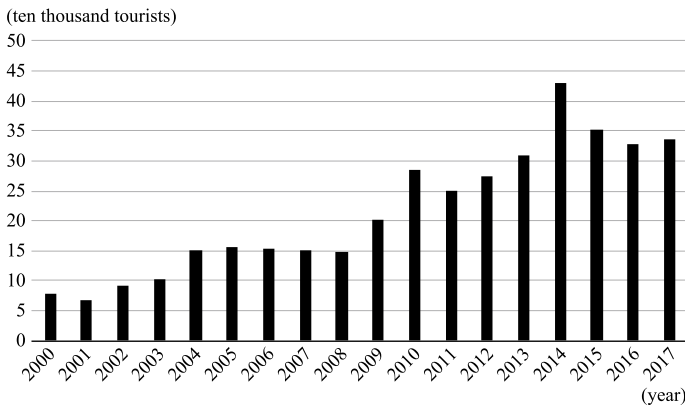


Fig. 4 The number of tourists to visit the Kumano-Kodo in Mie Prefecture (2000–2017) (Source Higashi-Kishu Chiikishinko Kousha)

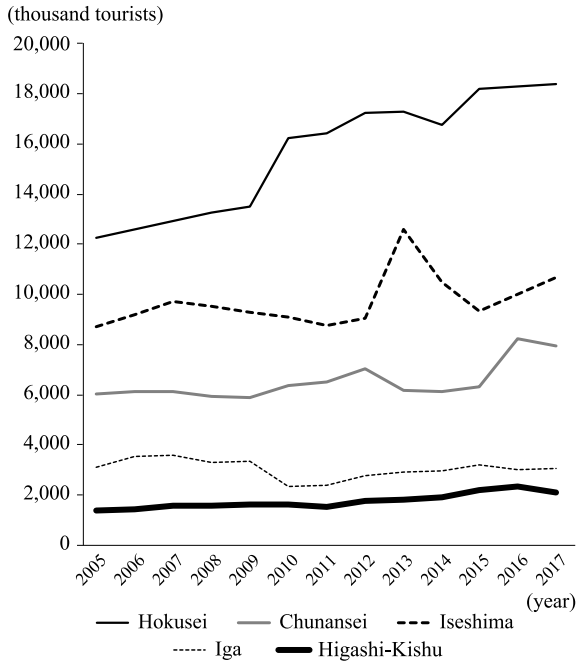


Fig. 5 The number of tourists of each region in Mie Prefecture (2005–2017) (Source Mie Prefecture)

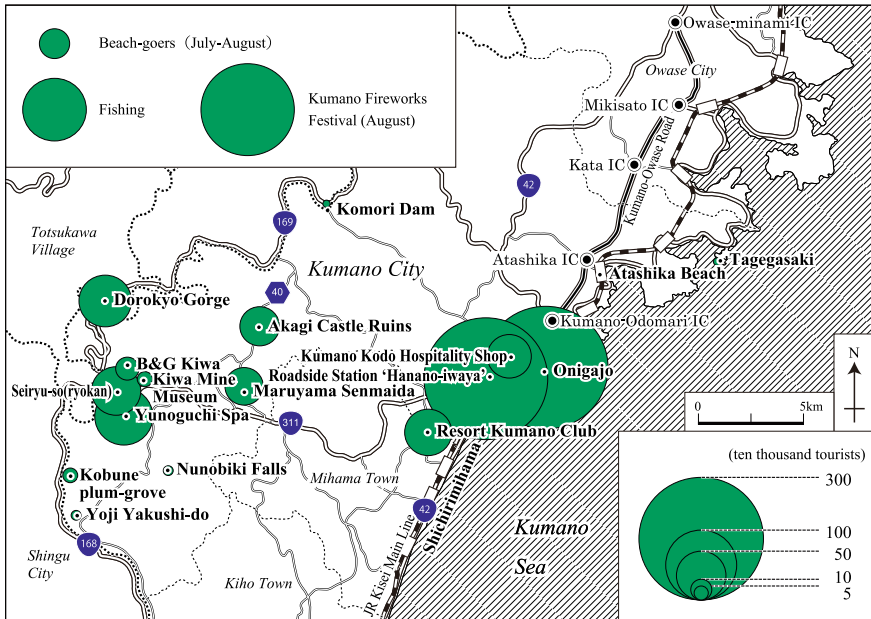


Fig. 6 The number of tourists at the major tourist attractions in Kumano City (2018) (Source Kumano City)



Fig. 7 A scene of the Kumano fireworks festival (2017) (Source Kumano City Tourist Association)

car. However, the absolute number of tourists in mountainous areas is much lower than that in coastal areas with good access from urban regions.

As for night-time activities, the Kumano Fireworks Festival, held every August 17th, is one of the biggest firework events in Japan with 10,000 fireworks being launched (Fig. 7). The famous fireworks capitalize on Kumano's rich nature and are launched into the night sky over the Kumano Sea, and include such notable displays as the one at Onigajo and the self-destructing fireworks on the water's surface. Figure 8 shows that the number of tourists is by far the largest in August. In addition, the Maruyama Senmida Torch Procession is held every June as a night event in Kumano City (Fig. 9). The torch procession was held every year to drive away crop-eating insects until 1953; it was then revived in 2004 when the Kumano-Kodo was recognized as a World Heritage site. Thus, summer is regarded as the most important tourist season in Kumano City.

However, the Higashi-Kishu region, including Kumano City, needs to develop and promote new tourist attractions in the context of the World Heritage site and national park. This is because it is relatively less competitive than other regions, such as Wakayama Prefecture. However, it has been suggested that night tourist attractions in Kumano City need to be improved. Itoh et al. (2018) clarified that Kumano City has favorable conditions for starwatching, as the night sky as seen in the mountainous areas of Kumano City is as dark as that of Mauna Kea (the highest point in the state of Hawaii, America). In response to this, promoting astronomical tourism increased and an industry–government–academia collaboration project was established by the Kumano City Office, the Kumano City Tourist Association, and Mie University in 2018. The following section will describe how dark the night is in Kumano City and how the industry–government–academia collaboration has evolved.

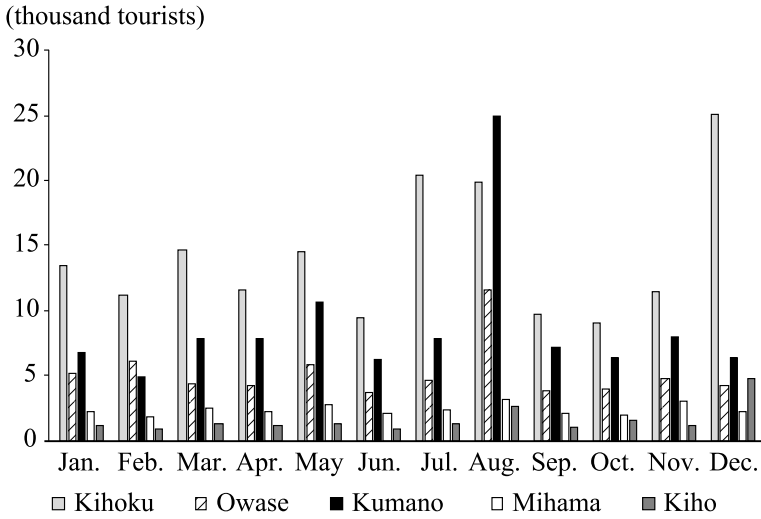


Fig. 8 The number of tourists in each city or town per month in the Higashi-Kishu region (2018) (Source Mie Prefecture)



Fig. 9 A scene of the Maruyama Senmida torch procession (2019) (Source Kumano City Tourist Association)

3 Night-Time Environment in Kumano City

3.1 Night Sky Brightness in Kumano City and the Surrounding Area

The visibility of a starry sky depends on various conditions, even in the same region, such as starwatching time, local weather conditions, the altitude of the observation point, and the moon phase. The most essential condition for a star-filled night sky is the brightness of the sky. In this section, the results of the measurement of night sky brightness around Kumano City are discussed.

It is necessary to use common indices to compare sky brightness at various observation points. There are two main methods to evaluate sky brightness. The first is the observation from space using satellites, which make it possible to continuously observe light pollution around the world. The second method is from the ground. Falchi et al. (2016) summarized recent results regarding light pollution observed by satellites as the light pollution map (Fig. 10), and people can easily know observed values on arbitrary points in the world. The values in the map indicate radiance, emitted energy per unit time, area, and solid angle ($\text{Wcm}^{-2} \text{str}^{-1}$) from the ground,

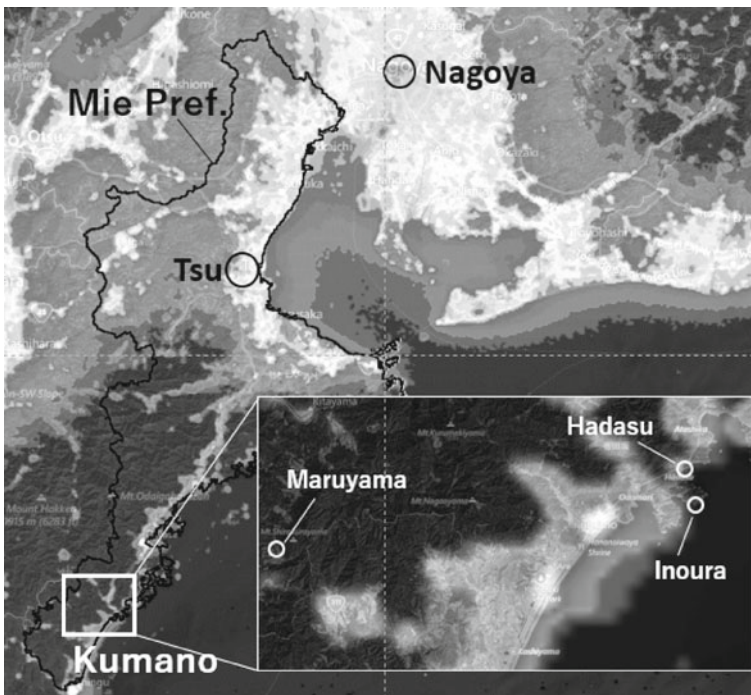


Fig. 10 Light pollution map (Source <https://www.lightpollutionmap.info/> [Cited: 2020/04/08])

Table 1 Comparison of radiances

Location	Radiance ($\text{Wcm}^{-2} \text{str}^{-1}$)
Ginza/Tokyo	153.92
Mie University/Tsu City	7.21
Kumano Station/Kumano City	5.21
Ichiura/Kumano City	0.20
Maruyama Senmaida/Kumano City	0.23
Mauna Kea/Hawaii	0.08

and the map is very useful to determine dark areas around the world. For example, Table 1 shows the situation of light pollution at several representative locations. It is clear that Ginza, the central area of Tokyo, is approximately 2,200 times brighter than the Mauna Kea Summit, where many large telescopes are located for astronomical research, and it is also found that we can get the dark sky as well as in Hawaii within 10-min driving distance from the city center in Kumano.

On the other hand, night sky brightness observed from the ground could differ from values observed by satellites, because night sky brightness on the ground is composed of stellar light, zodiacal light, airglow, scattered light from airglow, and zodiacal city light, while radiance observed by satellites is mainly due to misdirected city light. Therefore, it is necessary to investigate night sky brightness from the ground to access the visibility of a starry sky.

In general, there are three ways to measure the night sky brightness, that is, by the naked eye, dedicated devices such as a Sky Quality Meter (SQM), and a digital camera. The night sky images taken by digital cameras help us to investigate not only night sky brightness but also night sky color, which cannot be measured by both the naked eye and SQM, because digital cameras take images with RGB colors. In addition, people can calibrate the characteristics of a camera at any time by capturing images of the same stars in every shot. The detailed procedure to measure night sky colors can be found in the study by Itoh et al. (2018).

Night sky brightness is generally expressed by the magnitude per unit square arcsecond, and the measurement results of night sky brightness in Kumano City are reported in Table 2. The results of other areas are also listed for comparison. It is necessary to note that sky brightness becomes darker as numerical values in the table increase. The measurements were taken at an effective wavelength of 545 nm, which is almost the same wavelength as the most sensitive range of human eyes (Bessell 2005). The number of visible stars decreases as night sky brightness increases. Our rough estimate indicates that the number of visible stars in Kumano City is more than 30 times (in order of magnitude) larger than in Nagoya. It was also found that night sky brightness at Hadasu-jinja Shrine and Inoura Park is almost at the same value as in the Mauna Kea, one of the most preferred sites for astronomical observations. These results show that the quality of the starry sky in Kumano City is superior to that of Hawaii.

Table 2 Measured night sky brightness

Location		Night sky brightness (mag arcsec ⁻²)
Maruyama Senmaida	Kumano City, Mie, Japan	20.4
Hadasu-jinja Shrine		21.1
Ichiura Park		21.2
MieUniversity	Tsu City, Mie, Japan	18.2
Shirakawa Park	Nagoya City, Japan	16.3
Mauna Kea	Hawaii, USA	21.1

3.2 Industry–Academic–Government Project

The development of astronomical tourism has been started for promoting regional activation in several communities of Japan. Although the main drivers of the projects are local governments and private sectors, academic organizations participate in the projects in certain cases. Mie University, a national university in Mie Prefecture, has a mission to contribute to regional development via research outcomes and provides financial support to promote cooperation between businesses, local governments, and the university. The project to promote public relations activities relating to the starry sky in Kumano City was started in cooperation with Kumano City Office and Mie University in 2018. The academic staff of this project majors in astronomy, and the main bodies associated with the project from Kumano City are the tourism division of the City Office and the Kumano Tourist Association.

The staffs conducted site surveys to evaluate the quality of the starry sky in Kumano City and its surrounding areas, as aforementioned in the first project year. In the second year, the staffs started to investigate tourist demand for night-time tours, including astronomical tourism. They also created a flyer titled Kumap (a combination of Kumano and map) which listed preferable sites to watch skies with beautiful starry photographs (Fig. 11). On the other hand, it is necessary to promote private companies' participation in this project to maintain continuous activities. To this end, it is indispensable to cultivate human resources in addition to the demand generation for astronomical tourism.

4 Analysis of Tourists' Motivations for Visiting and Behaviors

This chapter explains the characteristics of tourists' motivation for visiting and behaviors to evaluate the demand for astronomical tourism in Kumano City through an analysis of a web questionnaire commissioned by Macromill, Inc. in March 2019.



Fig. 11 Kumap (Source Kumano City Tourist Association)

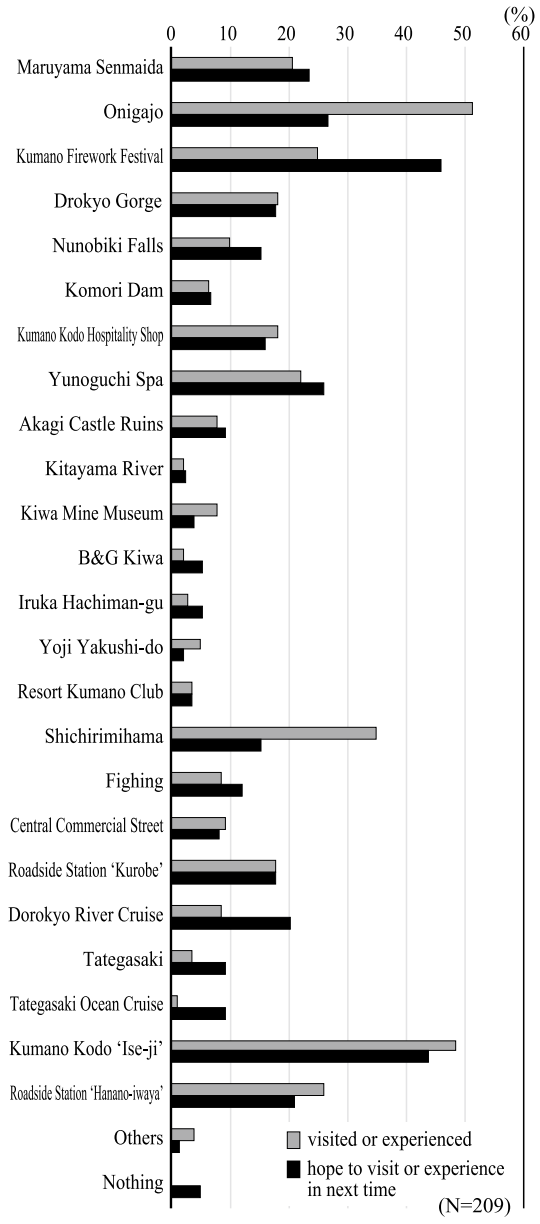
The respondents, 209 residents of Kumano City since 2014, were asked about basic attributes such as gender, age, origin, and visit frequency to Kumano City (responses are detailed in Table 3). This questionnaire also included questions about tourist motivations and behaviors, such as places visited, willingness to revisit Kumano City, the way to spend the night, intention to participate in night activities, and so on, to evaluate the demand for astronomical tourism in Kumano City.

Figure 12 reveals that many tourists visited the World Heritage site of Onigajō (51.2%), Kumano-Kōdo (48.3%), and Shichirimihama (24.9%), which were easy to access by car. In addition, Maruyama Senmāida (20.6%), Yunoguchi Spa (22.0%),

Table 3 Basic attributes of the web questionnaire respondents (2019) (Source Web questionnaire)

Gender	Male: 57.9% Female: 42.1%
Age	20–24: 4.3% 25–29: 7.2% 30–34: 8.1% 35–39: 9.1% 40–44: 8.1% 45–49: 12.0% 50–54: 15.3% 55–59: 10.5% 60–: 25.4%
Origin	Mie: 45.5% Aichi: 20.1% Osaka: 7.2% Chubu (Gifu, Shizuoka): 8.1% Kinki (Nara, Wakayama, Shiga, Kyoto): 19.1%
Visit Frequency	1st: 42.6% 2nd: 31.1% 3rd: 9.1% 4th: 2.9% 5th: 1.4% 6th–: 12.9%

Fig. 12 Visited or experienced ratio and hope to visit or experience ratio it next time in Kumano City (2019) (Source Web questionnaire)

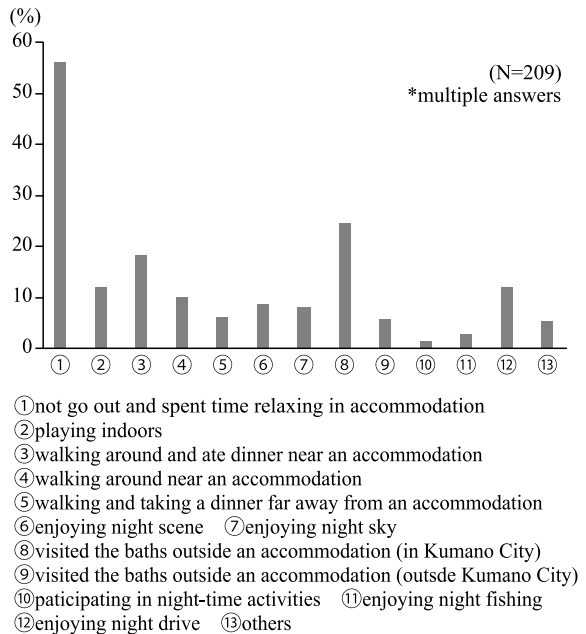


and Dorokyo Gorge (18.2%) emerged as popular tourist attractions symbolizing Kumano City. Similar to results reported in Fig. 6, it was found that most tourists visited Kumano City by car and stayed at roadside stations such as Hanano-iwaya (25.8%) and Kurobe (17.7%). In terms of places or experiences that the tourists hoped to visit the next time, a majority of responses included the Kumano Firework Festival (45.9%) and Kumano-Kodo (44.0%). Compared to the actual visit rate, tourists were more interested in the Dorokyo River Cruise (experienced: 8.6%, hope to experience it next time: 20.1%) and the Tategasaki Ocean Cruise (experienced: 1.0%, hope to experience it next time: 9.1%), which are both activity-based tourist attractions, and highlight the need to improve consumption opportunities to acquire repeat visitors.

As seen in Fig. 13, which describes night tourist behaviors, 55.0% of tourists did not go out at night and spent time relaxing in their accommodations as they conversed with companions or watched TV. Although some tourists visited the baths outside in Kumano City (24.4%) or walked around and ate dinner near their accommodation (18.2%), a few enjoyed outdoor activities that involved observing the night life and the night sky. Furthermore, only 1.4% of tourists participated in night-time activities, indicating that very few tourists enjoyed experiential consumption in Kumano City at night.

Figure 14 shows tourists' intentions to join stargazing activities if conducted. Most tourists indicated an interest in stargazing activities wherein they could leisurely see the starry sky, such as while lying on a reclining chair (42.1%), relaxing at a foot spa (34.0%), or enjoying dinner under the stars (34.0%). Activity-based tourist experiences such as stargazing on night cruises (28.2%) were also found to be attractive.

Fig. 13 The way of spending night-time (after 17) of respondents (2019) (Source Web questionnaire)



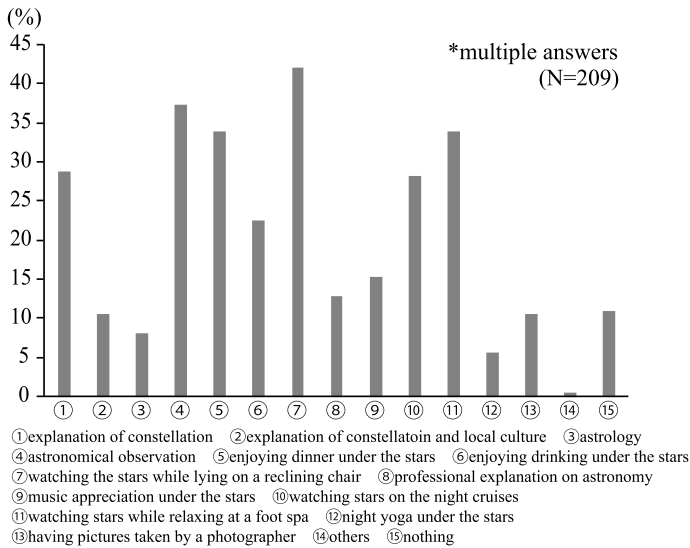


Fig. 14 Respondents' intentions to join stargazing activities if conducted (2019) (Source Web questionnaire)

Moreover, respondents indicated the need for astronomical observation (37.3%) and explanation of constellation (28.7%). On the other hand, there was low demand for academic content such as explanations of relationships between astronomy and local culture (10.5%) like the legend and stories of Xu Fu or some anthology of waka poems and professional explanations of astronomy (12.9%).

To summarize the results, the astronomy-related tourists tended to be interested in leisure-oriented stargazing activities, such as looking up at the starry sky while sitting on reclining chairs or taking footbath and dining out under the stars. On the other hand, it did not show such high expectations of the experts' explanation of stars or the relationship between astronomy and the local culture, although there was a certain demand for astronomical tourism. Most tourists visited Kumano City for vacations and enjoyed natural tourist attractions, such as the World Heritage sites, the national park sites, and hot spring facilities by car. In addition, although almost all the tourists were interested in stargazing activities, they rarely participated in these as they tended to not engage in any activities and relax after dinner.

5 Discussion and Conclusion

Tourists tend to visit the various attractions related to the World Heritage or the national park that are broadly distributed throughout Kumano City. However, according to the web questionnaire, few tourists enjoy experiential consumption in

Kumano City. To be conducive to revisits, it is necessary to prepare new tourism contents. Moreover, Kumano City is located far from the urban area, and tourists are apt to stay there. Hence, the Kumano City Office was faced with the need to enhance certain night tourist attractions and opportunities. In the context of night tourist attractions, there are famous events such as the Maruyama Senmaida Torch Procession in June and the Kumano Firework Festival in August, held on a particular day each summer. However, it has been suggested that night tourist attractions in Kumano City be improved.

In these circumstances, motivation to promote astronomical tourism has increased, and an industry–government–academia collaboration project was established by the Kumano City Office, the Kumano City Tourist Association, and Mie University in 2018. The Kumano City Office and Kumano City Tourist Association later undertook the development of astronomy-related materials for tourism such as a night map for stargazing, while Mie University organized stargazing parties. Tomita and Okyudo (2009) explain the importance of industry–government–academia collaborations as well as human resource development for the promotion of astronomical tourism such as astronomy-related guides. In the future, human resource development through industry–government–academia collaboration will be necessary for Kumano City.

Astronomical tourism in Kumano City is regarded as the creation of new tourism consumption opportunities, given the lack of existing night tourist attractions. However, it is necessary to differentiate the contents of stargazing activities from other areas to attract tourists because Kumano City has not been recognized as a popular astronomy-related destination yet. Overall, astronomical tourism tends to focus strongly on features of educational tourism, such as explanations of constellations by specialists. On the other hand, tourists who are interested in astronomy in Kumano City are attracted by leisure or comfort in the context of stargazing activities. Therefore, to promote astronomical tourism, it is necessary to not only improve human resource development, by providing interpreters for stargazing, but also create warm spaces and environments where one can comfortably watch the starry sky in Kumano City and engage in academic activities. Isono (2019) explains that such lighthearted stargazing products can produce child-friendly opportunities to enjoy peaceful night-time activities, even though the starry sky itself is unlikely to be a major tourist attraction. Thus, it is necessary to create stargazing programs related to the strengths of Kumano City such as the scenic natural landscape or warm winter climate.

Recently, interest in night-life tourism and night-time economy promotion has been increasing in Japan because it leads to new large economic impacts through long-stay or accommodation demands. Certain large cities, especially Tokyo and Osaka, are immensely involved in developing night-life tourism because of increasing inbound demand. On the other hand, some peripheral areas also work positively to enrich night tourism contents such as astronomical tourism as one of the regional revitalization measures. Therefore, it is highly possible that tourist destinations based on the starry sky will face stiff competition in the future. Thus, it is necessary for some peripheral areas seeking to promote the dark sky as a tourist attraction to discuss

how to discover and capitalize on regionality in the overall concept and strategy of astronomical tourism.

As for the previous geographical studies in Japan, astronomical tourism has not been much controversial ever because most tourism-related activities are implemented in the daytime. However, as mentioned above, some depopulated regions without notable tourist resources have paid attention to the starry sky as one of the regional attractions. Therefore, it can be pointed out that astronomical tourism will become a noteworthy research topic as the hidden tourism geography in the future.

Acknowledgements We would like to be grateful to the Kumano City Office and the Kumano City Tourist Association staffs for supporting our field survey. A part of this study was presented at the EUROGEO 2019 (at Ljubljana, Slovenia). This research is financially supported by the Grant-in-Aid for Young Scientists (No. 19K20566, 2019–2023, Representative: Takumi ISONO) and the Mie University Regional Contribution Activities (2019–2021, Representative: Nobunari ITOH).

References

- Bessell, M.S. 2005. Standard photometry system. *Annual Review of Astronomy and Astrophysics* 43: 293–336.
- Collison, F.M., and K. Poe. 2013. Astronomical tourism: The astronomy and dark sky program at Bryce Canyon National Park. *Tourism Management Perspectives* 7: 1–15.
- Falchi, F., P. Cinzano, D. Duriscoe, C.C.M. Kyba, and C.D. Elvidge. 2016. The new world atlas of artificial night sky brightness. *Science Advances* 2 (6): e1600377. <https://doi.org/10.1126/sciadv.1600377>.
- Hosaka, T., M. Kurimoto, and S. Numata. 2017. Entomological culture and insect-related tourism in Japan. *The International Journal of Tourism Science* 10: 57–64.
- Isono, T. 2019. Development of guided night tours for foreign tourists in Shibuya City, Tokyo. *The Tourism Studies* 31 (1): 5–18.
- Itoh, N., M. Koshimura, T. Hagihara, and A. Kato. 2018. Night sky brightness measurement in Kumano: Relation between night sky brightness and sky color. *Bulletin of the Faculty of Education Mie University* 69: 31–37.
- Kawanami, T. 2016. Changes in tourists in the Ogasawara Islands after registration as a world heritage site. *Geographical Review of Japan Series A* 89: 118–135.
- Longcore, T., and C. Rich. 2004. Ecological light pollution. *Frontiers in Ecology and the Environment* 2 (4): 191–198.
- Murakami, K. 2001. Tourism and local community. In *Introduction to tourism*, ed. N. Okamoto, 287–308. Tokyo: Yuhikaku Publishing Co., Ltd. (Title etc. translated by the author)
- Nagai, T. 2016. *Let's sell the starry sky*. Tokyo: KADOKAWA (Title etc. translated by the author)
- Narita, K., and H. Ueda. 2013. Production of the “Starry Sky Video Camera” for the awareness campaign of light pollution. *Memoirs of Faculty of Education and Human Studies, Akita University* 68: 17–22.
- Rodrigues, A.L.O., A. Rodrigues, and D.M. Peroff. 2015. The sky and sustainable tourism development: A case study of a dark sky reserve implementation in Alqueva. *International Journal of Tourism Research* 17: 292–302.

- Tomita, A., and M. Okyudo. 2009. Starting the training course for astronomy guide at Wakayama University. *Faculty of Education Wakayama University, Bulletin of the Center for Educational Research and Training* 19: 99–104.
- Uda, T., and T. Isono. 2019. A study on constructing process of starry sky as tourism resources in Ishigaki Island, Okinawa Prefecture. *Geographical Space* 12: 277–294.