

# Paired comparison evaluation of night skies and other nightlife tourism resources for the general public in Japan

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## Abstract

The number of studies focusing on nightlife tourism (NT) have been increasing over the past few decades. However, most research have been conducted in within urban cities and contexts. This study aims to explore the preferences of astrotourism (AT) by comparing it with other NT offerings in Japan, focusing on the perspective of the general public. Survey results suggested that 'Illuminations', 'Firefly watching', and 'Going to live concerts' generate interest levels comparable to stargazing. Additionally, men generally showed more interest in astrotourism than women, while younger people tended to be more inclined towards astrotourism than older generations. Notably, a higher proportion of men in their 20s and 30s expressed a willingness to engage in astrotourism over 'Firefly watching', 'Illuminations', and 'Nightscape viewing'. Conversely, women tended to be more likely to participate in light-based activities than in astrotourism. This study provides a starting point in understanding Japanese general public's preferences of NT activities and the potential of developing AT further.

## Keywords

Astrotourism  
Nightlife tourism  
Nighttime  
General public in Japan

## Introduction

In recent years, the nighttime economy has contributed increasingly to the economies of cities, regions, and nations worldwide (Zhang & Zhang, 2022). Nightlife tourism (NT), which encompasses economic and cultural activities generally conducted between 6pm and 6am, has transformed nighttime destinations into core tourism attractions, fostering novel and unique tourism experiences (Evans, 2011; Zhang & Zhang, 2022). Related sectors include shopping, dining, entertainment, education, fitness and leisure. NT, traditionally recognized as a daytime activity, can now be understood as a diverse and complex phenomenon that extends into the night (Edensor, 2015). In European cities, nighttime has become a significant aspect of marketability and a focal point in tourism development strategies (Nofre, 2021). NT also drives tourism economies in regions such as China and Southeast Asia, exemplified by the popularity of night markets (Chuang et al., 2014). Since the late 2000s, academic attention to NT have continued expanding towards a greater trajectory (Ikeda, 2017). Recent development in research within this topic area can offer valuable insights into how tourists live, experience, manage, and enjoy night spaces (Eldridge & Smith, 2019). Nonetheless, current NT research commonly centre on urban areas (Eldridge, 2019), with limited exploration of its importance in rural settings. As such, this short communication paper with explore the different NT offerings and tourists' preferences.

## Nighttime Tourism and Astrotourism

Over the past few years, one form of NT has recently gauged the interest of researchers, i.e., Astrotourism (AT) (Jacobs et al., 2020). AT is defined as travels for the purpose of observing celestial bodies and starry skies (Sawada & Okyudo, 2022). Interestingly, AT is experienced differently in different contexts. Specifically, Japanese AT, differs from Western AT. For example, Western AT primarily attracts niche or special interest tourism (SIT), such as amateur astronomers (Soleimani et al., 2018). Meanwhile, Japanese AT generally attracts the broader public to participate, many of whom may not be familiar with astronomy (Agata, 2023). This widespread group of target audience is suggested to be attributed to Japan's extensive astronomical infrastructure, such as planetariums and public astronomical observatories. Thus, making AT widely accessible (Sawada et al., 2024). In contrast, AT in the USA is typically more developed in remote locations such as National Parks (Collison & Poe, 2013). Therefore, astronomy-related activities in Japan are more accessible as casual, leisure experiences rather than activities catered to special-interest groups (Sora Tourism Council, 2019).

In general, the development of AT is suggested to positively contribute towards sustainable tourism development, particularly towards economic benefits in local communities (Sawada et al., 2023b). As highlighted by Mitchell & Gallway, (2019), their recent study on the Colorado Plateau forecasted that astro-tourists could contribute \$5.8bn in spending over the next decade, while supporting over 10,000 jobs annually in the region (Mitchell &

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Gallaway, 2019). Furthermore, AT is also considered to provide greater positive and cognitive impacts (Collison & Poe, 2013). While most studies on AT have been conducted within the western context, far less research has explored the Japanese context. Therefore, specifically for this short communication paper, AT within the Japanese context will be a key focus.

As previously mentioned, AT is considered one form of NT. Within NT literature, studies have commonly examined tourists' attitudes and satisfaction with NT. Jing and Hong (2023) examined the relationship between the perceived value of NT and Generation Z tourists' attachment to their destinations while Yin (2011) considered popular NT activities among domestic tourists in Beijing. Yin's (2011) research focused on the relationship between tourists' characteristics and activity preferences. In Japan, NT has briefly been touched upon within academic research. One government report was conducted by the Tokyo Metropolitan Government which merely surveyed NT preferences among international tourists (Bureau of Industrial and Labor Affairs of Tokyo Metropolitan Government, 2019). However, most of the studies exploring offerings of NT are predominantly focused on urban settings and have not adequately addressed NT activities in rural areas, particularly the potential of AT. Few studies have examined AT in relation to other forms of NT (Matos, 2017). Therefore, this study aims to examine preferences towards AT compared to other NT offerings, focusing on the Japanese general public.

## Method

This study used a paired comparison evaluation method to analyse preferences within the general Japanese public towards AT and NT activities. It should be noted that AT in this study refers to outdoor stargazing activities and does not include visits to indoor facilities like planetariums. Paired comparison evaluation involves collecting data and making judgments by simultaneously comparing two items. Specifically, the study conducted paired comparisons between AT and ten summer NT activities in Japan:

- Fireworks viewing
- Firefly watching
- Illuminations (including projection mapping)
- Restaurants (including pubs and bars)
- Watching films in cinema
- Nightscape viewing
- Spectating sports at a stadium
- Going to live concerts
- Shopping
- Spending time at home

A seven-point Likert scale was adopted, where 1 indicated 'strongly agree to participate in AT' and 7 indicated 'strongly agree to participate in the NT option', with midpoint values representing varying levels of agreement for each activity. Respondents indicated their preference and intensity of interest when comparing AT with each NT activity. Thus, they responded on a comparative scale rather than indicating their standalone interest in AT.

Additionally, while this study primarily used the comparative Likert scale, another question in the survey, independent of the scale, found that approximately half of the respondents ( $n=1,000$ ) expressed interest in participating in AT over other NT options. Lower scores indicated a stronger preference for AT over NT options. An 'unknown' category was also available for respondents. Multiple comparison tests were conducted to assess differences across items, as well as by gender and age. As previous studies have reported that interest in AT varies by gender and age (e.g. Sora Tourism Council, 2019; Sawada et al., 2024), this study incorporated these demographic comparisons.

The survey was conducted online by Cross Marketing, Inc., a

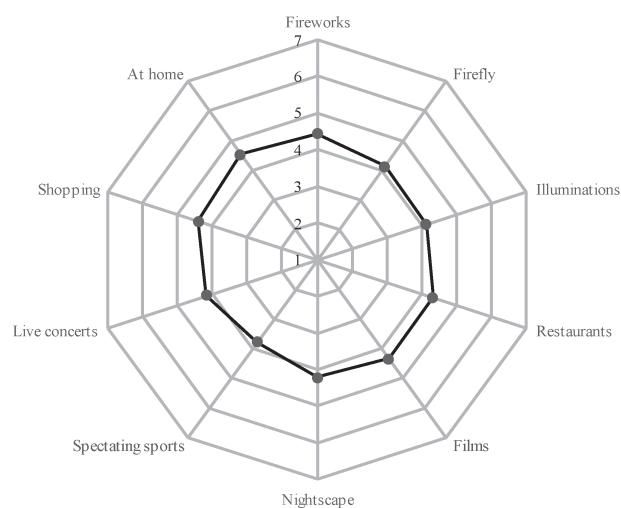
Japanese research company, over four days from 17-20 February 2023. Responses were collected from 2,000 people aged 20-69, selected to reflect Japan's demographic and regional distributions. Survey items for the general public included sociodemographic variables and questionnaire responses. For further details on survey items, see Takanashi et al. (2024).

## Result

Respondents who selected 'unknown' for any item were excluded from the analysis, resulting in 1,054 valid responses (men = 527, women = 523, others = 4). As previously noted, the value of participation in AT was not directly measured; instead, respondents evaluated AT relative to their participation in various nightlife NT activities.

Figure 1 presents the means of the paired comparisons between AT and each NT resource. As illustrated, 'Spectating sports at a stadium' ( $M = 3.77$ ,  $SD = 1.69$ ) demonstrated a superiority of AT. Table 1 summarises the results of the multiple comparison tests for each item using Fisher's least significant difference method. Welch's analysis yielded significant results  $p < .001$  ( $F$  value = 16.96). The findings indicate that 'Spectating sports at a stadium' had a significant advantage over all other items. Notably, 'Illuminations', 'Firefly watching', and 'Going to live concerts' were also significant, suggesting that these options were almost as advantageous as AT. Conversely, 'Shopping', 'Fireworks viewing', and 'Spending time at home' were not significant, indicating these items were less favourable compared to AT.

The superiority of AT over other NT resources was further examined across gender and age groups. Respondents identifying their gender as 'other' were excluded, resulting in 1,050 valid responses. Table 2 presents the results of multiple comparison tests by gender and age, using Fisher's least significant difference method, with only statistically significant items listed. Welch's analysis of variance showed no significant differences in 'Restaurants', 'Watching films at cinema', 'Spectating sports at a stadium', and 'Spending time at home'.



**Figure 1.** Average AT values and paired comparisons with each item ( $n=1,054$ )  
The scale in Figure 1 refers to the following points: 1: 'strongly agree to participate in AT', 2: 'agree to participate in AT', 3: 'slightly agree to participate in AT', 4: 'equally agree to participate in AT and the option', 5: 'slightly agree to participate in the option', 6: 'agree to participate in the option', 7: 'strongly agree to participate in the option'.

**Table 1.** Multiple comparison test results using Fisher's least significant difference method

Comparison		Mean Differences	SE	df	t - value	p - value
Fireworks $M = 4.43$ $SD = 1.69$	Firefly	0.29	0.07	9.0	3.96	$p < .01$
	Illuminations	0.31	0.07	9.0	4.29	$p < .01$
	Restaurants	0.12	0.07	9.0	1.58	0.11
	Films	0.11	0.07	9.0	1.47	0.14
	Nightscape	0.24	0.07	9.0	3.22	$p < .01$
	Spectating sports	0.67	0.07	9.0	9.09	$p < .01$
	Live concerts	0.28	0.07	9.0	3.80	$p < .01$
	Shopping at home	0.03	0.07	9.0	0.43	0.67
Firefly $M = 4.15$ $SD = 1.56$	Fireworks	0.29	0.07	9.0	3.96	$p < .01$
	Illuminations	0.02	0.07	9.0	0.34	0.74
	Restaurants	0.17	0.07	9.0	2.38	$p < .05$
	Films	0.18	0.07	9.0	2.48	$p < .05$
	Nightscape	0.05	0.07	9.0	0.74	$p < .01$
	Spectating sports	0.38	0.07	9.0	5.13	$p < .01$
	Live concerts	0.01	0.07	9.0	0.16	0.88
	Shopping at home	0.26	0.07	9.0	3.53	$p < .01$
Illuminations $M = 4.12$ $SD = 1.62$	Fireworks	0.31	0.07	9.0	4.29	$p < .01$
	Firefly	0.02	0.07	9.0	0.34	0.74
	Restaurants	0.20	0.07	9.0	2.71	$p < .01$
	Films	0.21	0.07	9.0	2.82	$p < .01$
	Nightscape	0.08	0.07	9.0	1.07	0.28
	Spectating sports	0.35	0.07	9.0	4.80	$p < .01$
	Live concerts	0.04	0.07	9.0	0.49	0.62
	Shopping at home	0.28	0.07	9.0	3.86	$p < .01$
Restaurants $M = 4.32$ $SD = 1.79$	Fireworks	0.12	0.07	9.0	1.58	0.11
	Firefly	0.17	0.07	9.0	2.38	$p < .05$
	Illuminations	0.20	0.07	9.0	2.71	$p < .01$
	Films	0.01	0.07	9.0	0.10	0.92
	Nightscape	0.12	0.07	9.0	1.64	$p < .05$
	Spectating sports	0.55	0.07	9.0	7.51	$p < .01$
	Live concerts	0.16	0.07	9.0	2.22	$p < .05$
	Shopping at home	0.08	0.07	9.0	1.15	0.25
Films $M = 4.33$ $SD = 1.73$	Fireworks	0.11	0.07	9.0	1.47	0.14
	Firefly	0.18	0.07	9.0	2.48	$p < .05$
	Illuminations	0.21	0.07	9.0	2.82	$p < .01$
	Restaurants	0.01	0.07	9.0	0.10	0.92
	Nightscape	0.13	0.07	9.0	1.74	0.08
	Spectating sports	0.56	0.07	9.0	7.61	$p < .01$
	Live concerts	0.17	0.07	9.0	2.33	$p < .05$
	Shopping at home	0.08	0.07	9.0	1.05	0.30
Nightscape $M = 4.20$ $SD = 1.58$	Fireworks	0.24	0.07	9.0	3.22	$p < .01$
	Firefly	0.05	0.07	9.0	0.74	$p < .01$
	Illuminations	0.08	0.07	9.0	1.07	0.28
	Restaurants	0.12	0.07	9.0	1.64	$p < .05$
	Films	0.13	0.07	9.0	1.74	0.08
	Spectating sports	0.43	0.07	9.0	5.87	$p < .01$
	Live concerts	0.04	0.07	9.0	0.58	0.56
	Shopping at home	0.20	0.07	9.0	2.79	$p < .01$
Spectating sports $M = 3.77$ $SD = 1.69$	Fireworks	0.67	0.07	9.0	9.09	$p < .01$
	Firefly	0.38	0.07	9.0	5.13	$p < .01$
	Illuminations	0.35	0.07	9.0	4.80	$p < .01$
	Restaurants	0.55	0.07	9.0	7.51	$p < .01$
	Films	0.56	0.07	9.0	7.61	$p < .01$
	Nightscape	0.43	0.07	9.0	5.87	$p < .01$
	Live concerts	0.39	0.07	9.0	5.29	$p < .01$
	Shopping at home	0.64	0.07	9.0	8.66	$p < .01$
Live concerts $M = 4.16$ $SD = 1.72$	Fireworks	0.28	0.07	9.0	3.80	$p < .01$
	Firefly	0.01	0.07	9.0	0.16	0.88
	Illuminations	0.04	0.07	9.0	0.49	0.62
	Restaurants	0.16	0.07	9.0	2.22	$p < .05$
	Films	0.17	0.07	9.0	2.33	$p < .05$
	Nightscape	0.04	0.07	9.0	0.58	0.56
	Spectating sports	0.39	0.07	9.0	5.29	$p < .01$
	Shopping at home	0.25	0.07	9.0	3.37	$p < .01$
Shopping $M = 4.41$ $SD = 1.70$	Fireworks	0.03	0.07	9.0	0.43	0.67
	Firefly	0.26	0.07	9.0	3.53	$p < .01$
	Illuminations	0.28	0.07	9.0	3.86	$p < .01$
	Restaurants	0.08	0.07	9.0	1.15	0.25
	Films	0.08	0.07	9.0	1.05	0.30
	Nightscape	0.20	0.07	9.0	2.79	$p < .01$
	Spectating sports	0.64	0.07	9.0	8.66	$p < .01$
	Live concerts at home	0.25	0.07	9.0	3.37	$p < .01$
at home $M = 4.54$ $SD = 1.77$	Fireworks	0.10	0.07	9.0	1.33	0.18
	Firefly	0.39	0.07	9.0	5.29	$p < .01$
	Illuminations	0.41	0.07	9.0	5.62	$p < .01$
	Restaurants	0.21	0.07	9.0	2.91	$p < .01$
	Films	0.21	0.07	9.0	2.80	$p < .01$
	Nightscape	0.33	0.07	9.0	4.55	$p < .01$
	Spectating sports	0.76	0.07	9.0	10.42	$p < .01$
	Live concerts	0.38	0.07	9.0	5.13	$p < .01$
	Shopping	0.13	0.07	9.0	1.76	0.08

Source: made by authors

**Table 2.** Multiple comparison tests result in gender and age using Fisher's least significant difference method (significant items only).

	Comparison		Average		Mean Differences	SE	t - value	p - value	
	Item 1	Item 2	Item 1	Item 2					
Fireworks	men/20s	men/50s	4.03	4.55	0.52	0.23	2.23	p < .05	
	men/20s	women/30s	4.03	4.64	0.61	0.24	2.57	p < .05	
	men/20s	women/40s	4.03	4.64	0.61	0.23	2.68	p < .01	
	men/20s	women/50s	4.03	4.88	0.85	0.23	3.64	p < .01	
	men/30s	women/40s	4.19	4.64	0.45	0.23	1.99	p < .05	
	men/30s	women/50s	4.19	4.88	0.69	0.23	2.97	p < .01	
	men/40s	women/30s	4.13	4.64	0.51	0.22	2.32	p < .05	
	men/40s	women/40s	4.13	4.64	0.51	0.21	2.44	p < .05	
	men/40s	women/50s	4.13	4.88	0.75	0.22	3.47	p < .01	
	women/20s	women/50s	4.39	4.88	0.49	0.24	2.02	p < .05	
Firefly	men/20s	men/50s	3.66	4.33	0.67	0.21	3.13	p < .01	
	men/20s	men/60s	3.66	4.51	0.85	0.23	3.76	p < .01	
	men/20s	women/40s	3.66	4.13	0.47	0.21	2.25	p < .05	
	men/20s	women/50s	3.66	4.54	0.88	0.22	4.08	p < .01	
	men/20s	women/60s	3.66	4.33	0.67	0.22	3.03	p < .01	
	men/30s	men/60s	3.98	4.51	0.53	0.23	2.33	p < .05	
	men/30s	women/50s	3.98	4.54	0.56	0.22	2.58	p < .01	
	men/40s	men/60s	3.99	4.51	0.51	0.21	2.44	p < .05	
	men/40s	women/50s	3.99	4.54	0.54	0.20	2.72	p < .01	
F = 3.26	men/60s	women/20s	4.51	3.94	0.57	0.23	2.42	p < .05	
	women/20s	women/50s	3.94	4.54	0.60	0.22	2.66	p < .01	
	women/30s	women/50s	4.08	4.54	0.46	0.21	2.18	p < .05	
	women/40s	women/50s	4.13	4.54	0.41	0.20	2.04	p < .05	
	Illuminations	men/20s	women/30s	3.88	4.47	0.59	0.23	2.60	p < .01
		men/20s	women/50s	3.88	4.50	0.63	0.22	2.78	p < .01
		men/30s	women/20s	3.78	4.26	0.48	0.24	2.00	p < .05
		men/30s	women/30s	3.78	4.47	0.69	0.23	3.01	p < .01
		men/30s	women/40s	3.78	4.23	0.45	0.22	2.05	p < .05
men/30s		women/50s	3.78	4.50	0.72	0.22	3.20	p < .01	
men/40s		women/30s	3.90	4.47	0.57	0.21	2.68	p < .01	
men/40s		women/50s	3.90	4.50	0.60	0.21	2.88	p < .01	
men/60s		women/50s	4.03	4.50	0.47	0.23	2.05	p < .05	
Nightscape	men/20s	men/50s	3.79	4.26	0.46	0.22	2.14	p < .05	
	men/20s	men/60s	3.79	4.41	0.61	0.23	2.68	p < .01	
	men/20s	women/30s	3.79	4.30	0.50	0.22	2.27	p < .05	
	men/20s	women/40s	3.79	4.32	0.53	0.21	2.50	p < .05	
	men/20s	women/50s	3.79	4.60	0.81	0.22	3.69	p < .01	
	men/30s	men/60s	3.84	4.41	0.56	0.23	2.45	p < .05	
	men/30s	women/30s	3.84	4.30	0.45	0.22	2.04	p < .05	
	men/30s	women/40s	3.84	4.32	0.48	0.21	2.26	p < .05	
	men/30s	women/50s	3.84	4.60	0.76	0.22	3.45	p < .01	
F = 2.54	men/40s	women/50s	4.05	4.60	0.55	0.20	2.73	p < .01	
	Live concerts	men/20s	women/20s	3.93	4.45	0.53	0.25	2.07	p < .05
		men/20s	women/30s	3.93	4.50	0.57	0.24	2.37	p < .05
		men/20s	women/40s	3.93	4.40	0.47	0.23	2.07	p < .05
		men/20s	women/50s	3.93	4.71	0.78	0.24	3.30	p < .01
		men/30s	women/20s	3.94	4.45	0.51	0.25	2.03	p < .05
		men/30s	women/30s	3.94	4.50	0.56	0.24	2.33	p < .05
		men/30s	women/40s	3.94	4.40	0.46	0.23	2.02	p < .05
		men/30s	women/50s	3.94	4.71	0.77	0.24	3.25	p < .01
men/40s		women/20s	3.78	4.45	0.67	0.24	2.84	p < .01	
F = 4.04	men/40s	women/30s	3.78	4.50	0.72	0.22	3.22	p < .01	
	men/40s	women/40s	3.78	4.40	0.62	0.21	2.95	p < .01	
	men/40s	women/50s	3.78	4.71	0.93	0.22	4.24	p < .01	
	men/50s	women/20s	3.95	4.45	0.51	0.24	2.07	p < .05	
	men/50s	women/30s	3.95	4.50	0.55	0.23	2.38	p < .05	
	men/50s	women/40s	3.95	4.40	0.45	0.22	2.07	p < .05	
	men/50s	women/50s	3.95	4.71	0.76	0.23	3.35	p < .01	
	men/60s	women/20s	3.81	4.45	0.64	0.26	2.49	p < .05	
	men/60s	women/30s	3.81	4.50	0.68	0.24	2.80	p < .01	
Shopping	men/60s	women/40s	3.81	4.40	0.59	0.23	2.52	p < .05	
	men/60s	women/50s	3.81	4.71	0.90	0.24	3.72	p < .01	
	women/20s	women/60s	4.71	4.22	0.49	0.24	2.08	p < .05	
	men/20s	men/50s	4.08	4.59	0.51	0.23	2.18	p < .05	
	men/20s	women/20s	4.08	4.58	0.50	0.25	1.98	p < .05	
	men/20s	women/30s	4.08	4.79	0.71	0.24	2.97	p < .01	
	men/20s	women/50s	4.08	4.72	0.63	0.24	2.70	p < .01	
	men/30s	women/30s	4.22	4.79	0.57	0.24	2.40	p < .05	
	men/30s	women/50s	4.22	4.72	0.50	0.24	2.12	p < .05	
F = 2.62	men/40s	women/30s	4.27	4.79	0.52	0.22	2.37	p < .05	
	men/40s	women/50s	4.27	4.72	0.45	0.22	2.07	p < .05	
	men/50s	men/60s	4.59	4.07	0.53	0.24	2.22	p < .05	
	men/60s	women/20s	4.07	4.58	0.52	0.26	2.03	p < .05	
	men/60s	women/30s	4.07	4.79	0.72	0.24	3.00	p < .01	
	men/60s	women/50s	4.07	4.72	0.65	0.24	2.73	p < .01	
	women/30s	women/60s	4.79	4.22	0.57	0.24	2.42	p < .05	
	women/50s	women/60s	4.72	4.22	0.50	0.23	2.14	p < .05	



## Conclusion

This study explored the preferences of Japanese general public towards AT compared to other NT activities. The findings suggest that 'Illuminations', 'Firefly watching', and 'Going to live concerts' generated interest levels comparable to stargazing. In contrast, activities such as 'Shopping', 'Fireworks viewing', and 'Spending time at home' appeared to hold more appeal than AT.

Gender and age comparisons indicated distinct preferences among respondents. Overall, men tended to show greater interest in AT than women and younger people were generally more interested in AT than older people. Notably, a higher proportion of men in their 20s and 30s expressed a willingness to participate in AT over activities like 'Firefly watching', 'Illuminations', and 'Nightscapes viewing'. This trend indicates that women may have a stronger preference for light-based activities over AT. While the Sora Tourism Council (2019) identified young Japanese women as potential astrotourists, this study highlights that young Japanese men might also represent a significant AT demographic. Additionally, a greater proportion of young women (in their 20s and 30s) demonstrated a stronger preference for shopping over AT than other demographic groups.

Due to space limitations, this study focused on the survey's overall findings, along with age and gender-based analysis. However, other variables – such as interest in science and technology, previous AT experience, and place of residence – may also influence the results (Sawada et al., 2023a). Furthermore, respondents may have considered AT as part of a broader tourism experience, such as dining at a restaurant before engaging in AT. Consequently, some NT activities could not be fully evaluated for AT's competitive advantage within the paired comparison evaluation framework. While ten NT activities were assessed compared to AT, other potentially relevant options, such as karaoke, remain to be explored. Further research is needed to address these limitations and deepen understanding of AT's competitive positioning within NT.

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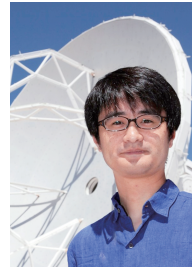
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