Appendix 1 Mid-Term Plan for the Japanese Antarctic Research Expedition (Extracts related to the Geographical Survey Institute)

1. 1st Five-Year Plan (1976–1980, the 18th–22nd Expedition)

Geography and topography

1) Control point survey

Control point surveys for the purpose of mapping mainly the coastal area covering between 30°E and 45°E will be conducted. In particular, during and after the summer period of the 20th JARE (1978) focusing on geoscientific survey, the team will be reinforced to ensure intensive and efficient research.

In addition, surveys of the inland area will be streamlined with the help of portable satellite observation equipment (for positioning).

2) Aerial survey

Although aerial surveys needed for mapping as specified in 1) have been nearly completed, supplementary photographs during JARE-20 (1978) and JARE-21 (1979) will be taken after reviewing the results of the aerial surveys.

3) Based on the results obtained in 1) and 2), topographic maps (at a scale of 1:25,000) mainly of the ice-free areas will be subsequently prepared.

Earthquake and gravity (Geographical Survey Institute and Japan Coast Guard)

2) In the context of research by the Geoscience Research Group, gravity surveys including marine gravity measurement will be conducted as needed.

2. 2nd Five-Year Plan (1981–1985, the 23rd–27th Expedition)

1) During the International Geophysical Year (1957), Japan was assigned with area observation covering between 30°E and 45°E. At present, only two maps at a scale of 1:250,000 have been prepared for the assigned area covering between 37°E and 45°E, which is half of the assigned area. Thus, for covering between 30°E and 37°E, two maps at a scale of 1:250,000 using satellite images from LANDSAT will be prepared.

2) As for the approximately 130 km coastline facing Lutzow-Holm Bay consisting mainly of Ongul Island where Syowa Station is located, a new topographic map series at a scale of 1:25,000 will be prepared in conformity with the new specification (5 minutes latitude and 19 minutes longitude). The new topographic maps will be prepared for the unsurveyed area and compiled for the area of existing 1:25,000 topographic maps. These materials will be systematically prepared and used as basic materials for efficient observation and research in Antarctica.

3) Geomagnetic surveys and gravity surveys with control point surveys will be conducted. Aeromagnetic surveys will be conducted as needed in collaboration with the Geoscience Research Group.

3. 3rd Five-Year Plan (1986–1990, the 28th–32nd Expedition)

1) Control point survey

Control point surveys and aerial surveys for preparing topographic maps will be conducted.

2) Gravity and other surveys

Gravity and geomagnetic surveys with control point surveys will be conducted, and aero magnetic and marine gravity surveys will be assisted as needed.

3) Preparation of topography

In the course of surveying as mentioned in 1) and 2), maps will be systematically prepared, such as 1:50,000 scale topographic maps for the Sor Rondane Mountains, small-scale topographic maps of the area from Riiser-Larsenhalvoya Peninsula to the surrounding area of Sor Rondane Mountains, and satellite image maps.

4. 4th Five-Year Plan (1991–1995, the 33rd–37th Expedition)

The recent development of new technologies including space geodesy technology facilitates the improvement of the global geodetic observation network. Syowa Station is positioned as the “Observatory for the New Geodetic Reference” in the 4th Five-Year Plan. Given this situation, geodetic observation programs and related observation programs that are assigned to the Geographical Survey Institute will be enhanced. The enhancements include the following plans:

1) Geodetic control point survey

(a) The existing control points around Syowa Station will be resurveyed with the Global Positioning System (GPS), to establish a precise geodetic network.
(b) New control points will be established as needed.
(c) The existing leveling routes will be resurveyed as needed.

2) Gravity and other surveys
(a) In preparation for compiling maps of gravity and geomagnetic anomalies, interannual geomagnetic fluctuation will be observed and aeromagnetic surveys will be conducted as needed, while conducting comparative high-precision gravity surveys and geomagnetic surveys at control points.
(b) In collaboration with other agencies, absolute gravity surveys at Syowa Station scheduled for the 4th Five-Year Plan will be conducted and GSI will cooperate in constructing the International Absolute Gravity Basestation Network (IAGBN).

3) Preparation of aerial color photos and color photo maps

In addition to taking aerial photos of the ice-free areas on the coast (Scale approx. 1: 12,000), large-scale color photo maps of Ongul Island, Langhovde, Skarvsnes, and Skallen will be prepared.

4) Preparation of topographic maps

The topographic maps of Sor Rondane Mountains at a scale of 1:50,000 will be prepared and published.

5. 5th Five-Year Plan (1996–2000, the 38th–42nd Expedition)

The recent development of new technologies including space geodesy technology facilitates the improvement of the global geodetic observation network. Given the situation that Syowa Station was positioned as the “Observatory for Space Technology and Precise Geodesy”, in the 4th Five-Year Plan, geodetic observations will be enhanced and the adaptability of geodetic-related technology to Antarctica will be considered. The following plan will be implemented:

1) Geodetic control point survey
(a) The existing control points around Syowa Station will be resurveyed with the Global Positioning System (GPS). Based on the results of the above surveys, maps will be revised and detection of crustal movement will be attempted.
(b) Participating in International GNSS Service (IGS), continuous GPS observation will be conducted in collaboration with geoscientific research observation at Syowa Station. Contributions to geoscientific research will be made through analysis of plate movement and earth rotation.
(c) New control points will be established as needed.
(d) The existing leveling routes will be resurveyed for the detection of crustal movement.

2) Gravity and other surveys

In preparation for compiling maps of gravity and geomagnetic anomalies, interannual geomagnetic fluctuation will be observed and aeromagnetic surveys will be conducted as needed, while conducting comparative high-precision gravity surveys and geomagnetic surveys at control points.

3) Preparation of aerial color photos and color photo maps

In addition to taking aerial color photographs of the ice-free areas on the coast, large-scale color photo maps of Ongul Island, Langhovde, Skarvsnes, and Skallen will be prepared.

4) Application of satellite-related technology to the Antarctic area

Using SAR data and image data from the earth resources satellite, JERS-1, research on detection of crustal movements and fluctuations of ice sheets, classification of landforms, and development of Digital Elevation Model will be attempted in order to support the Research Observation Programs in Antarctica.

6. 6th Five-Year Plan (2001–2005, the 43rd–47th Expedition)

With the development and application of new technologies including space technology, it has become important to organize geodetic observation and geographical information from a global point of view. Therefore, geodetic observation and preparation of geographical information on Antarctica will be conducted, while contributing to international activities in the field of geodetic and geographical information through surveys at Syowa Station and its vicinity.

1) Leveling survey
(a) Responding to the recommendation of the Working Group on Geodesy and Geographic Information

(WG-GGI) of the Scientific Committee on Antarctic Research (SCAR), the existing Geodetic Reference System 1967 will be replaced with the International Terrestrial Reference Frame (ITRF).

(b) Participation in the International GPS Service (IGS), GPS observation at Syowa Station will be continued.

(c) Continuous GPS observation in ice-free areas will be conducted.

(d) New control points will be established, and control points and leveling routes will be resurveyed.

2) Gravity and other surveys

(a) Absolute gravity surveys will be conducted.

(b) Geomagnetic surveys will be conducted.

3) Preparation of color photos and color photo maps

(a) As in the 5th Five-Year Plan, color photos of ice-free areas will be taken, and 1:10,000 scale photo maps for major parts of the ice-free areas and topographic maps will be prepared.

4) Development digital data

(a) Topographic maps will be digitized.

(b) Global Map of Antarctica will be developed with satellite images, aerial photos and the existing information.

7. 7th Four-Year Plan (2006–2009, the 48th–51st Expedition)

With the development and application of new technologies including space technology, it has become important to organize geodetic observation and geographic information from a global point of view. Responding to the recommendation of SCAR's Working Group on Geodesy and Geographic Information (WG-GGI), the existing Geodetic Reference System 1967 will be replaced with the International Terrestrial Reference Frame (ITRF). Various observations on geodesy and preparation of geographical information on Antarctica will be enhanced, while contributing to international activities in the field of geodetic and geographic information through observations at Syowa Station. In particular, observations using ALOS (PALSAR, PRISM, and AVNIR-2) scheduled to be introduced this year will be conducted in terms of the 7th Four-Year Plan under consideration of the lifespan of the satellite.

1) Geodetic survey

In addition to conducting GPS observation for the purpose of resurvey upon the International Terrestrial Reference Frame, SAR interferometry observations, GPS observations, leveling, and absolute gravity surveys for monitoring crustal movements and fluctuations of ice sheets will be conducted.

2) Preparation of topographic maps using satellite images

Development of Digital Elevation Model, revision of topographic maps, detection of changes of ice sheet edges, and updating of Global Map of Antarctica will be conducted using ALOS images. The possibility of observing detailed land surfaces using airborne LIDAR will be examined.

Appendix 2 Index maps and lists of maps

Fig.A2-1 Index map of topographic maps of Antarctica (Scale 1:500)

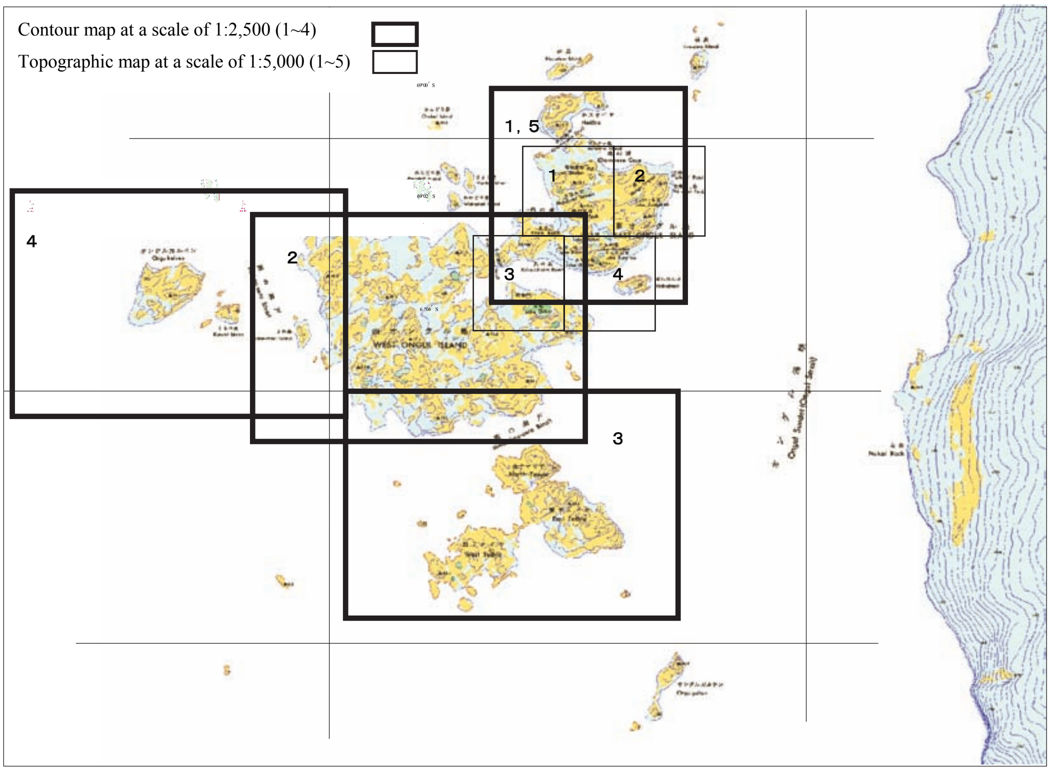
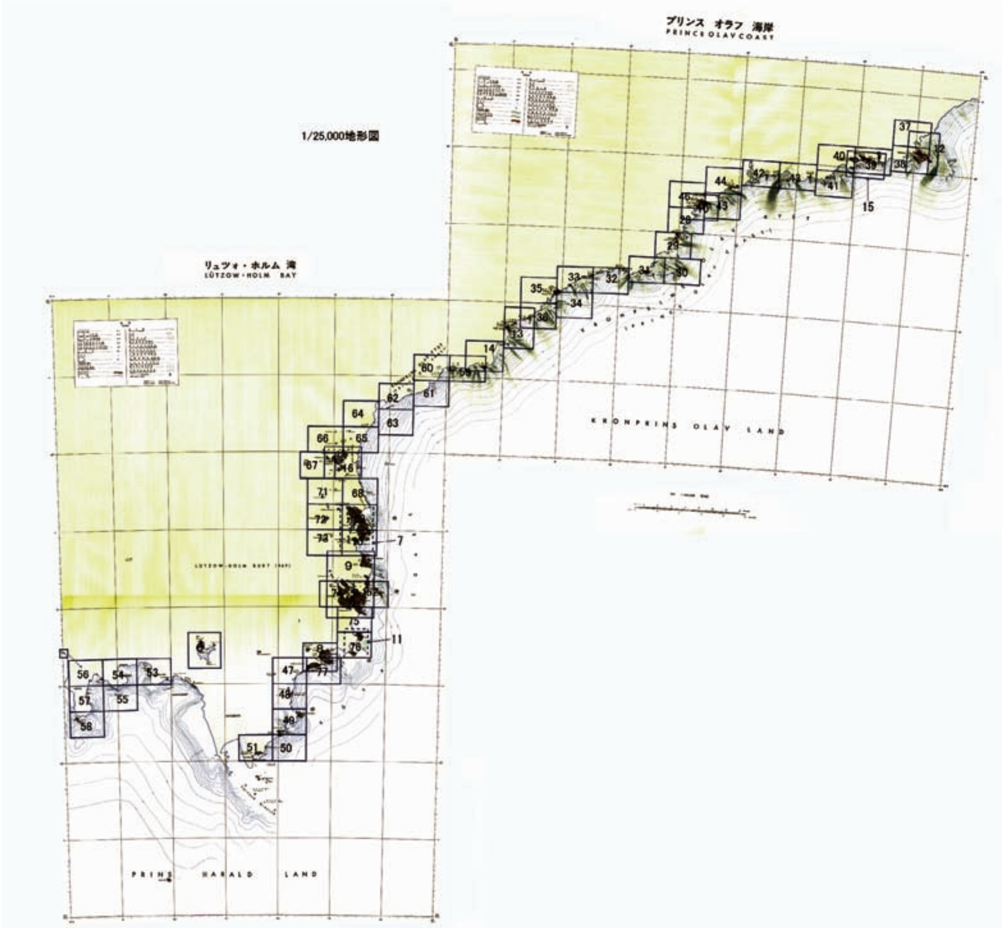


Fig.A2-2 Index map of topographic maps of Antarctica (Scale 1:2,500 and 1:5,000)



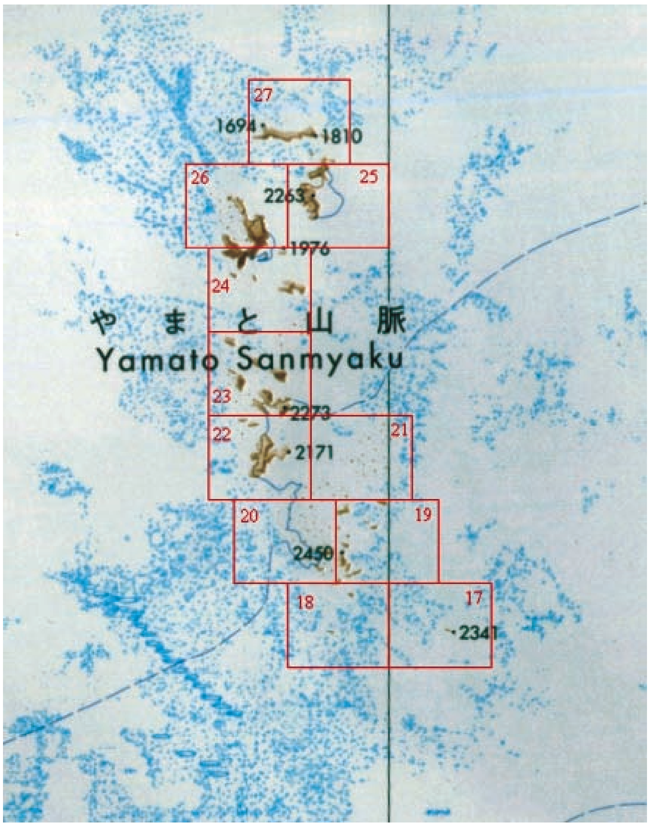


Fig.A2-3 Index map of topographic maps of Antarctica (Scale 1:25,000)

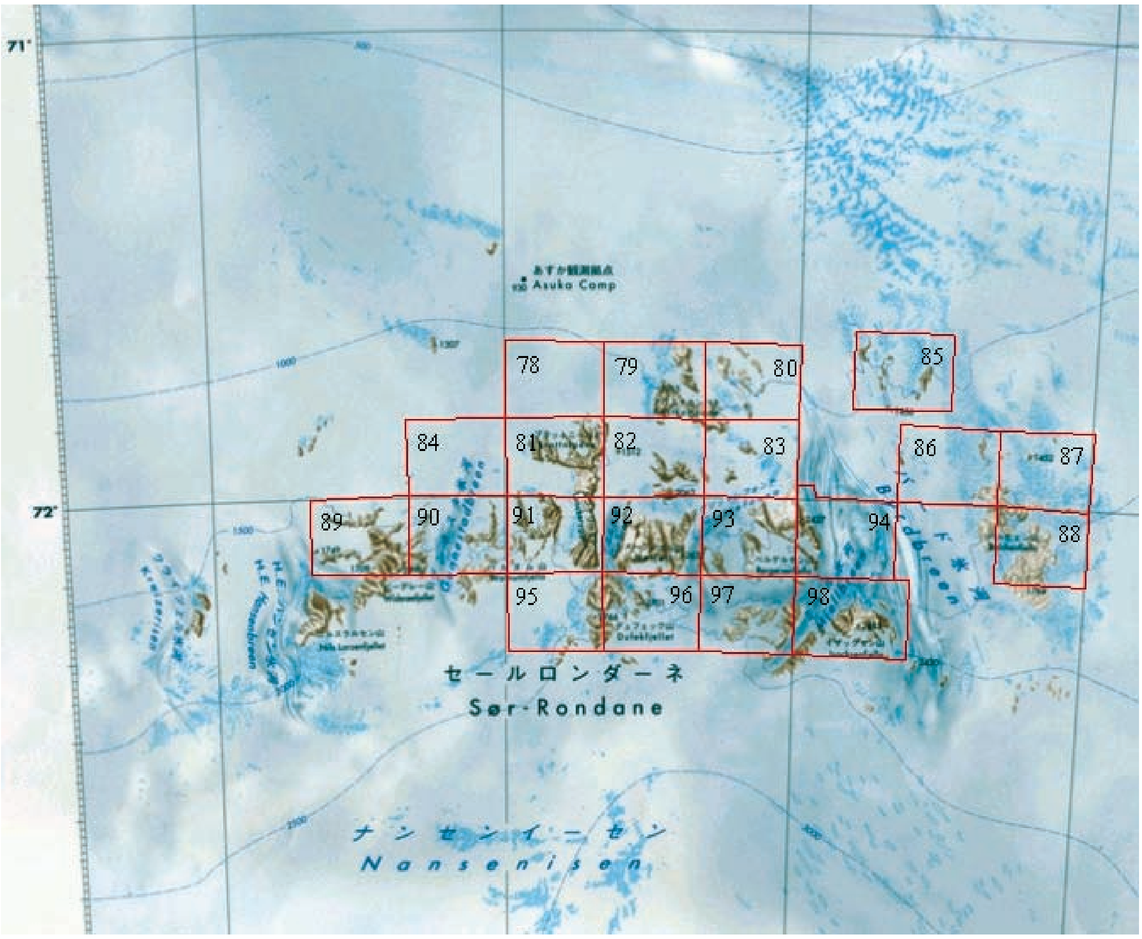


Fig.A2-4 Index map of topographic maps of Antarctica (Scale 1:50,000)

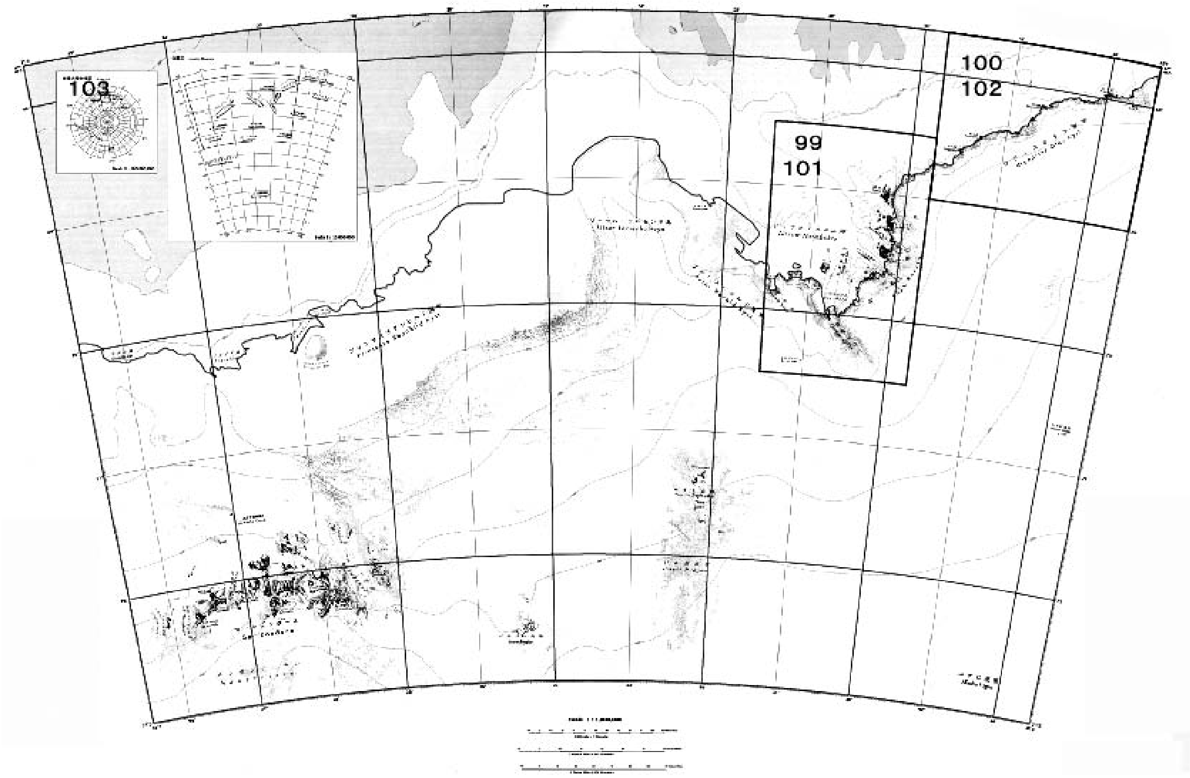
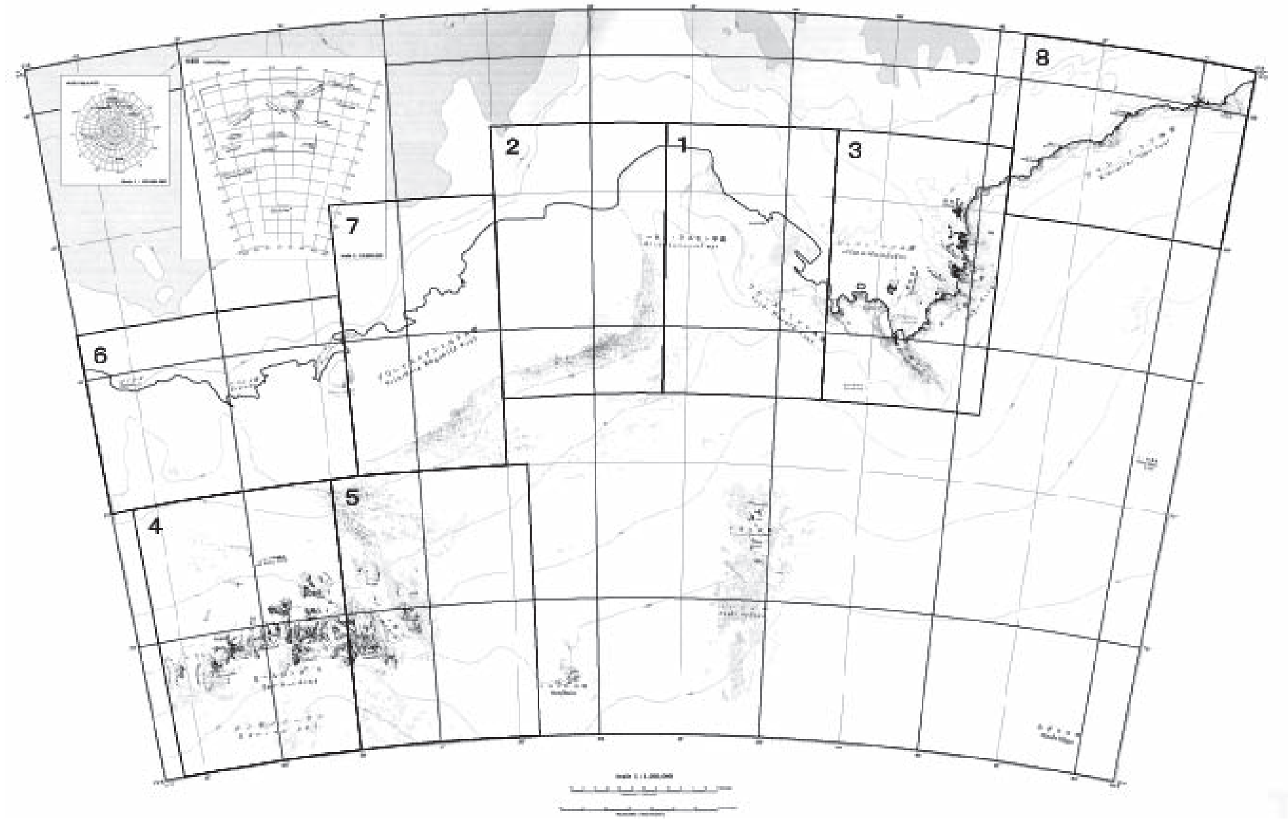


Fig.A2-5 Index map of topographic maps of Antarctica (Scale 1:250,000)



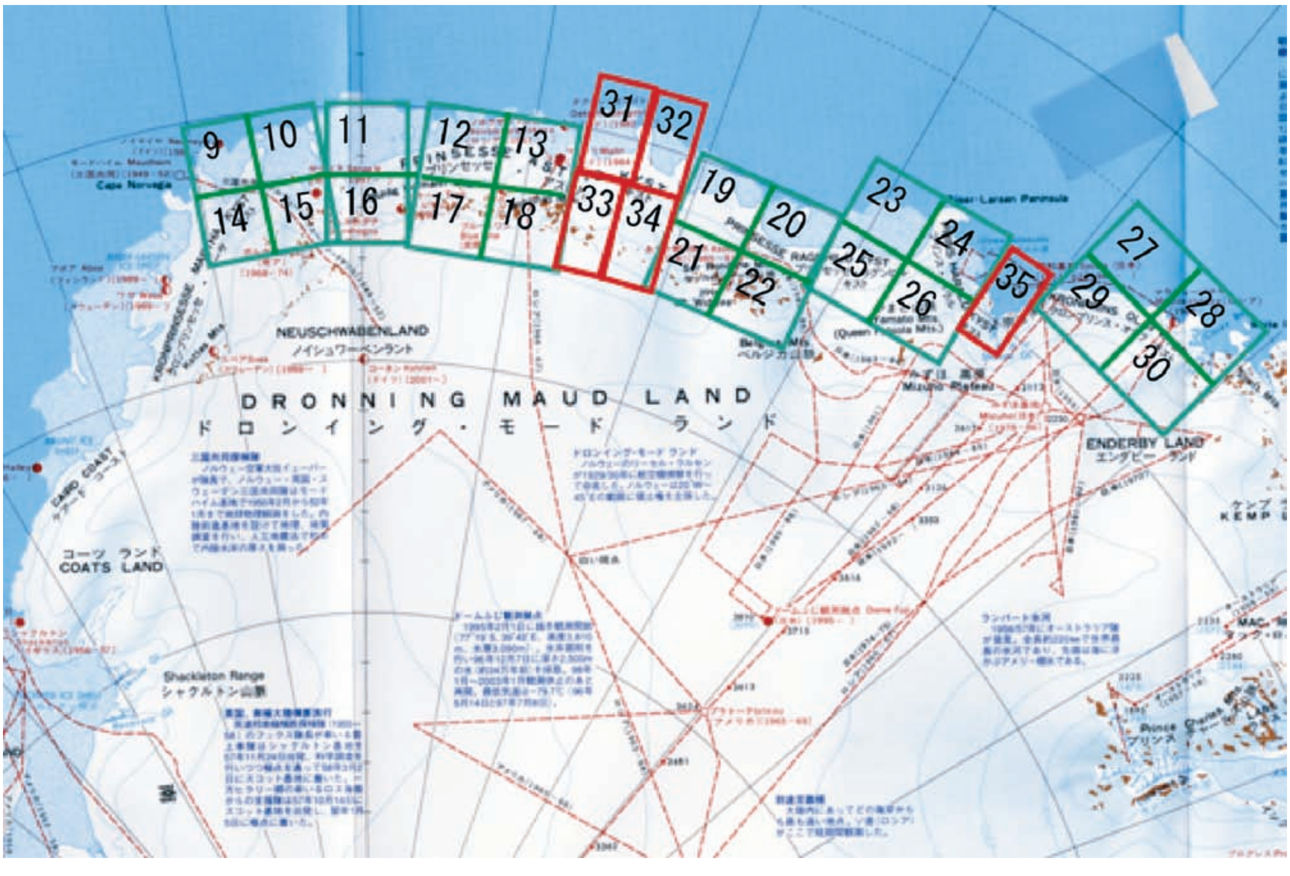


Fig.A2-6 Index map of satellite image maps of Antarctica (Scale 1:250,000)

Table A2-1 Lists of topographic maps (1)

Topographic Map (1:500)

No.	Scale	Name of topographic map	Produced (year)	Printed (year)	Color	Size	Contour interval	Map projection	Year of aerial photo used
1	1:500	Main part of Syowa Station	2000	2001	Unicolor	A1	1 m	Transverse Mercator	1991
2	1:500	Around the dorm of the 1st summer team at Syowa Station	2000	2001	Unicolor	A1	1 m	Transverse Mercator	1991
3	1:500	Around the dome antenna at Syowa Station	2000	2001	Unicolor	A1	1 m	Transverse Mercator	1991

Topographic Map (Contour map of 1:2,500)

No.	Scale	Name of topographic map	Produced (year)	Printed (year)	Color	Size	Contour interval	Map projection	Year of aerial photo used
1	1:2,500	Syowa Station	1995	1996	Four-color	A1	2 m	Universal Transverse Mercator	1991
2	1:2,500	Miharashi Peak	1995	1996	Four-color	A1	2 m	Universal Transverse Mercator	1991
3	1:2,500	Syowa Flat	1995	1996	Four-color	A1	2 m	Universal Transverse Mercator	1991
4	1:2,500	Polholmen	1995	1996	Four-color	A1	2 m	Universal Transverse Mercator	1991

Topographic Map (1:5,000–1:1,000,000)

No.	Scale	Name of topographic map	Produced (year)	Printed (year)	Color	Size	Contour interval	Map projection	Year of aerial photo used
1	1:5,000	Higashi-Ongul To	1957	1957	Three-color	B1	2.5 m	Transverse Mercator	1957
2	1:5,000	Nishi-Ongul To	1964	1964	Three-color	B1	2.5 m	Transverse Mercator	1962
3	1:5,000	Teoya	1965	1966	Three-color	B1	2.5 m	Transverse Mercator	1962
4	1:5,000	Ongulkalven	1965	1966	Three-color	B1	2.5 m	Transverse Mercator	1962
5	1:5,000	Higashi-Ongul To	1993	1993	Four-color	Duodecimo	5 m	Universal Transverse Mercator	1962
6	1:25,000	Padda	1962	1966	Three-color	A1	10 m	Lambert conformal projection	1962
7	1:25,000	Longhovde	1962	1968	Three-color	A1	10 m	Lambert conformal projection	1962
8	1:25,000	Skallen	1969	1973	Three-color	Masa	10 m	Lambert similar cone projection	1969
9	1:25,000	Skarvsnes	62, 69, 71	1974	Three-color	B1	10 m	Lambert similar cone projection	62, 69, 71
10	1:25,000	Hinode, Cape	1962	1975	Three-color	A2	10 m	Lambert similar cone projection	1962
11	1:25,000	Kjuka and Telen	62, 69	1975	Three-color	A2	10 m	Lambert similar cone projection	62, 69
12	1:25,000	Sinnan Rocks	1962	1977	Three-color	B2	10 m	Lambert similar cone projection	1962
13	1:25,000	Omega Misaki	59, 75	1981	Three-color	B2	10 m	Lambert conformal projection	59, 75
14	1:25,000	Oku-iwa	62, 75	1981	Three-color	B2	10 m	Lambert conformal projection	62, 75
15	1:25,000	Ryugu, Cape	1962	1981	Three-color	B2	10 m	Lambert conformal projection	1962
16	1:25,000	Ongul Island	69, 75	1981	Three-color	B2	10 m	Lambert conformal projection	69, 75
17	1:25,000	Motoi, Iwa	1975	1981	Three-color	Masa	10 m	Lambert conformal projection	1975
18	1:25,000	Taka-iwa	1975	1981	Three-color	Masa	10 m	Lambert conformal projection	1975
19	1:25,000	Mikazuki Iwa	69, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 75
20	1:25,000	Ogi-ga-hara	69, 70, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 70, 75
21	1:25,000	Kumon-no-taira Ice Field	69, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 75
22	1:25,000	Aka-Kabe Bluff	69, 70, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 70, 75
23	1:25,000	Tyo Mount	69, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 75
24	1:25,000	Hae Rocks	69, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 75
25	1:25,000	Torimai Dake	69, 70, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 70, 75
26	1:25,000	Fukushima Dake	69, 70, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 70, 75
27	1:25,000	Gyoten, Mount	69, 70, 75	1981	Three-color	Masa	10 m	Lambert conformal projection	69, 70, 75
28	1:25,000	Hinode, Cape: Southern Part	1962	1982	Three-color	Masa	10 m	Lambert conformal projection	1962
29	1:25,000	Niban Rock	1962	1982	Four-color	Masa	10 m	Lambert conformal projection	1962
30	1:25,000	Kasumi Glacier	1962	1982	Four-color	Masa	10 m	Lambert conformal projection	1962
31	1:25,000	Kasumi Rock	62, 81	1982	Four-color	Masa	10 m	Lambert conformal projection	62, 81
32	1:25,000	Gobanme Rock	1981	1982	Four-color	Masa	10 m	Lambert conformal projection	1981
33	1:25,000	Naga-iwa Rock	1981	1982	Four-color	Masa	10 m	Lambert conformal projection	1981
34	1:25,000	Akarui Point: Eastern Part	1981	1982	Four-color	Masa	10 m	Lambert conformal projection	1981
35	1:25,000	Akarui Point: Western Part	1981	1982	Four-color	Masa	10 m	Lambert conformal projection	1981
36	1:25,000	Daruma Iwa	59, 75, 81	1982	Four-color	Masa	10 m	Lambert conformal projection	59, 75, 81
37	1:25,000	Sinnan Rocks: Northern Part	1962	1983	Four-color	Masa	10 m	Lambert conformal projection	1962
38	1:25,000	Sinnan Rocks: Principal Part	1962	1983	Four-color	Masa	10 m	Lambert conformal projection	1962
39	1:25,000	Ryugu, Cape: Principal Part	1962	1983	Four-color	Masa	10 m	Lambert conformal projection	1962
40	1:25,000	Ryugu-Nisi Point	1962	1983	Four-color	Masa	10 m	Lambert conformal projection	1962
41	1:25,000	Rakuda Rock	62, 81	1983	Four-color	Masa	10 m	Lambert conformal projection	62, 81
42	1:25,000	Kani Rock	62, 81	1983	Four-color	Masa	10 m	Lambert conformal projection	62, 81
43	1:25,000	Kabuto Rock	62, 81	1983	Four-color	Masa	10 m	Lambert conformal projection	62, 81
44	1:25,000	Akebono Rock	62, 81	1983	Four-color	Masa	10 m	Lambert conformal projection	62, 81

NOTE A1: 594mm×841mm, A2: 420mm×594mm, B1: 728mm×1030mm, B2: 515mm×728mm, Duodecimo: 788mm×1091mm, Masa: 460mm×580mm

Table A2-1 Lists of topographic maps (2)

No.	Scale	Name of topographic map	Produced (year)	Printed (year)	Color	Size	Contour interval	Map projection	Year of aerial photo used
45	1:25,000	Akebono Glacier	62, 81	1983	Four-color	Masa	10 m	Lambert conformal projection	62, 81
46	1:25,000	Hinode, Cape: Principal Part	1962	1983	Four-color	Masa	10 m	Lambert conformal projection	1962
47	1:25,000	Sudare Rock	1962	1984	Four-color	Masa	10 m	Lambert conformal projection	62, 75
48	1:25,000	Berrodden	1975	1984	Four-color	Masa	10 m	Lambert conformal projection	75
49	1:25,000	Rundvagshetta	1975	1984	Four-color	Masa	10 m	Lambert conformal projection	75
50	1:25,000	Rundvagshetta: Southern Part	1975	1984	Four-color	Masa	10 m	Lambert conformal projection	75, 83
51	1:25,000	Strandnibba	1975	1984	Four-color	Masa	10 m	Lambert conformal projection	75, 83
52	1:25,000	Hannor, Oku-Iwa	1975	1984	Four-color	Masa	10 m	Lambert conformal projection	75
53	1:25,000	Austhovde	69, 83	1985	Four-color	Masa	10 m	Lambert conformal projection	69, 83
54	1:25,000	Veslestaffen	69, 83	1985	Four-color	Masa	10 m	Lambert conformal projection	69, 83
55	1:25,000	Neshrekka	1983	1985	Four-color	Masa	10 m	Lambert conformal projection	83
56	1:25,000	Vesthovde	69, 83	1985	Four-color	Masa	10 m	Lambert conformal projection	69, 83
57	1:25,000	Sata and Kista	1983	1985	Four-color	Masa	10 m	Lambert conformal projection	1983
58	1:25,000	Innhavde	1983	1985	Four-color	Masa	10 m	Lambert conformal projection	1983
59	1:25,000	Oku-iwa Glacier	1983	1986	Four-color	Masa	10 m	Lambert conformal projection	1983
60	1:25,000	Tama Point	1983	1986	Four-color	Masa	10 m	Lambert conformal projection	1983
61	1:25,000	Tama Glacier	1983	1986	Three-color	Masa	10 m	Lambert conformal projection	1983
62	1:25,000	Flattunga	1983	1986	Three-color	Masa	10 m	Lambert conformal projection	1983
63	1:25,000	Flaggunga: Southern Part	1983	1986	Three-color	Masa	10 m	Lambert conformal projection	1983
64	1:25,000	Tottuki Point	1983	1986	Three-color	Masa	10 m	Lambert conformal projection	1983
65	1:25,000	Mitu-iwa Rock	1983	1986	Three-color	Masa	10 m	Lambert conformal projection	1983
66	1:25,000	Ongul Islands: Northern Part	1983	1986	Three-color	Masa	10 m	Lambert conformal projection	1983
67	1:25,000	Ongul Islands: Western Part	69, 75	1987	Three-color	Masa	10 m	Lambert conformal projection	69, 75
68	1:25,000	Hazuki Glacier	62, 83	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 83
69	1:25,000	Langhovde: Northern Part	62, 83	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 83
70	1:25,000	Langhovde: Southern Part	62, 83	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 83
71	1:25,000	Rumpa	1982	1987	Three-color	Masa	10 m	Lambert conformal projection	1982
72	1:25,000	Ytre Hovdeholmen	62, 82	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 82
73	1:25,000	Systerflesene	1982	1987	Three-color	Masa	10 m	Lambert conformal projection	1982
74	1:25,000	Skarvsnes: Principal Part	62, 69, 71	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 69, 71
75	1:25,000	Trillingbukta	62,69,71,83	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 69, 71, 83
76	1:25,000	Telen Glacier	62, 69, 83	1987	Three-color	Masa	10 m	Lambert conformal projection	62, 69, 83
77	1:25,000	Skallevidhalsen	69, 83	1987	Three-color	Masa	10 m	Lambert conformal projection	69, 83
78	1:50,000	Brittnipane: Northern Part	1986	1989	Four-color	Kiku	20 m	Lambert conformal projection	1986
79	1:50,000	Austkampane	1986	1989	Four-color	Kiku	20 m	Lambert conformal projection	1986
80	1:50,000	Nordhaugen	1986	1989	Four-color	Kiku	20 m	Lambert conformal projection	1986
81	1:50,000	Brattnipane	1986	1989	Four-color	Kiku	20 m	Lambert conformal projection	1986
82	1:50,000	Menipa	1986	1989	Four-color	Kiku	20 m	Lambert conformal projection	1986
83	1:50,000	Strandrudfjellet	1986	1989	Four-color	Kiku	20 m	Lambert conformal projection	1986
84	1:50,000	Teltet	1986	1990	Four-color	Kiku	20 m	Lambert conformal projection	1986
85	1:50,000	Austhamaren	1986	1990	Four-color	Kiku	20 m	Lambert conformal projection	1986
86	1:50,000	Isrossene	1986	1990	Four-color	Kiku	20 m	Lambert conformal projection	1986
87	1:50,000	Hesteskoen	1986	1990	Four-color	Kiku	20 m	Lambert conformal projection	1986
88	1:50,000	Balchenfjella	1986	1990	Four-color	Kiku	20 m	Lambert conformal projection	1986
89	1:50,000	Vikinghogda	1986	1991	Four-color	Kiku	20 m	Lambert conformal projection	1986
90	1:50,000	Gunnestadbreen	1986	1991	Four-color	Kiku	20 m	Lambert conformal projection	1986
91	1:50,000	Lunkeryggen	1986	1991	Four-color	Kiku	20 m	Lambert conformal projection	1986
92	1:50,000	Mefjell	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
93	1:50,000	Bergersenfjella	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
94	1:50,000	Bavtoen	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
95	1:50,000	Dufekfjellet (Western)	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
96	1:50,000	Dufedfjillet (Eastern)	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
97	1:50,000	Langbogfzellet	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
98	1:50,000	Isachsenfzella	1986	1992	Four-color	Kiku	20 m	Lambert conformal projection	1986
99	1:250,000	Lutzow-Holm Bay	—	1963	4(6)-color	Duodecimo	50 m	Lambert similar cone projection	1957
100	1:250,000	Kronprins Olav Kyst	—	1963	4(6)-color	Duodecimo	50 m	Lambert similar cone projection	1962
101	1:250,000	Lutzow-Holm Bay	—	1989	Four-color	Duodecimo	50 m	Lambert similar cone projection	1962
102	1:250,000	Kronprins Olav Kyst	—	1990	Five-color	Duodecimo	50 m	Lambert similar cone projection	1962
103	1:100,000	Pronning Maud Land (Eastern)	–	1998	Seven-color	A1	50 m	Lambert conformal projection	1977

NOTE A1: 594mm×841mm, Duodecimo: 788mm×1091mm, Kiku: 636mm×939mm, Masa: 460mm×580mm

Talbe A2-2 List of Satellite Image Maps

Index No.	Scale	Name of topographic map	Publication	Size	Contour interval	Map Projection
1	1:250,000	Ruser-Larsenhalvoya	1982	Duodecimo	− m	Lambert conformal projection
2	1:250,000	PRINSESSE RAGNHILD KYST , EAST	1983	Duodecimo	− m	Lambert conformal projection
3	1:250,000	Lutzow-Holmbukta	1984	Duodecimo	− m	Lambert conformal projection
4	1:250,000	Sor-Rondane, Western	1984	Duodecimo	− m	Lambert conformal projection
5	1:250,000	Sor-Rondane, Eastern	1985	Duodecimo	− m	Lambert conformal projection
6	1:250,000	Prinsesse Ragnhild Kyst, Western	1986	Duodecimo	− m	Lambert conformal projection
7	1:250,000	Prinsesse Ragnhild Kyst, Central	1987	Duodecimo	− m	Lambert conformal projection
8	1:250,000	Olav Kyst	1988	Duodecimo	− m	Lambert conformal projection
9	1:250,000	KRONPRINSESSE MARTHA KYST , CENTRAL EAST	2005	A2	100 m	Lambert conformal projection
10	1:250,000	KRONPRINSESSE MARTHA KYST , CENTRAL	2005	A2	100 m	Lambert conformal projection
11	1:250,000	PRINSESSE ASTRID KYST , WEST	2005	Duodecimo	100 m	Lambert conformal projection
12	1:250,000	PRINSESSE ASTRID KYST , CENTRAL WEST	2005	Duodecimo	100 m	Lambert conformal projection
13	1:250,000	PRINSESSE ASTRID KYST , CENTRAL	2005	Duodecimo	100 m	Lambert conformal projection
14	1:250,000	EKSTROM ICE SHELF , SOUTH	2005	Duodecimo	100 m	Lambert conformal projection
15	1:250,000	AHLMANNRYGGEN	2005	Duodecimo	100 m	Lambert conformal projection
16	1:250,000	MULIG HOFFMAN MTS. , WEST	2005	Duodecimo	100 m	Lambert conformal projection
17	1:250,000	MULIG HOFFMAN MTS. , EAST	2005	Duodecimo	100 m	Lambert conformal projection
18	1:250,000	WOHLTHAT MTS. , WEST	2005	Duodecimo	100 m	Lambert conformal projection
19	1:250,000	PRINSESSE RAGNHILD KYST , WEST	2005	Duodecimo	100 m	Lambert conformal projection
20	1:250,000	PRINSESSE RAGNHILD KYST , CENTRAL	2005	Duodecimo	100 m	Lambert conformal projection
21	1:250,000	Sor-Rondane, Central	2005	Duodecimo	100 m	Lambert conformal projection
22	1:250,000	Sor-Rondane, Eastern	2005	Duodecimo	100 m	Lambert conformal projection
23	1:250,000	Ruser-Larsenhalvdya, Western	2005	Duodecimo	100 m	Lambert conformal projection
24	1:250,000	Ruser-Larsenhalvoya	2005	Duodecimo	100 m	Lambert conformal projection
25	1:250,000	PRINSESSE RAGNHILD KYST , EAST	2005	Duodecimo	100 m	Lambert conformal projection
26	1:250,000	Yamato Sammyaku, Northern	2005	Duodecimo	100 m	Lambert conformal projection
27	1:250,000	Kronprincs Olav Kyst, Northern	2005	Duodecimo	100 m	Lambert conformal projection
28	1:250,000	CASEY BAY , NORTH	2005	Duodecimo	100 m	Lambert conformal projection
29	1:250,000	Kronprins Olav Kyst, Southern	2005	Duodecimo	100 m	Lambert conformal projection
30	1:250,000	CASEY BAY , SOUTH	2005	Duodecimo	100 m	Lambert conformal projection
31	1:250,000	PRINSESSE ASTRID KYST , CENTRAL EAST	2005	Duodecimo	100 m	Lambert conformal projection
32	1:250,000	PRINSESSE ASTRID KYST , EAST	2005	Duodecimo	100 m	Lambert conformal projection
33	1:250,000	WOHLTHAT MTS. , EAST	2005	Duodecimo	100 m	Lambert conformal projection
34	1:250,000	Sor-Rondane, Western	2005	Duodecimo	100 m	Lambert conformal projection
35	1:250,000	Lutzow-Holmbuta	2005	Duodecimo	100 m	Lambert conformal projection
36	1:2,000,000	Dranning Maud	2005	B0	100 m	Lambert conformal projection

NOTE A2：420mm×594mm, B0：1030mm×1456mm, Duodecimo：788mm×1091mm

Appendix 3 Index maps and lists of color photo maps

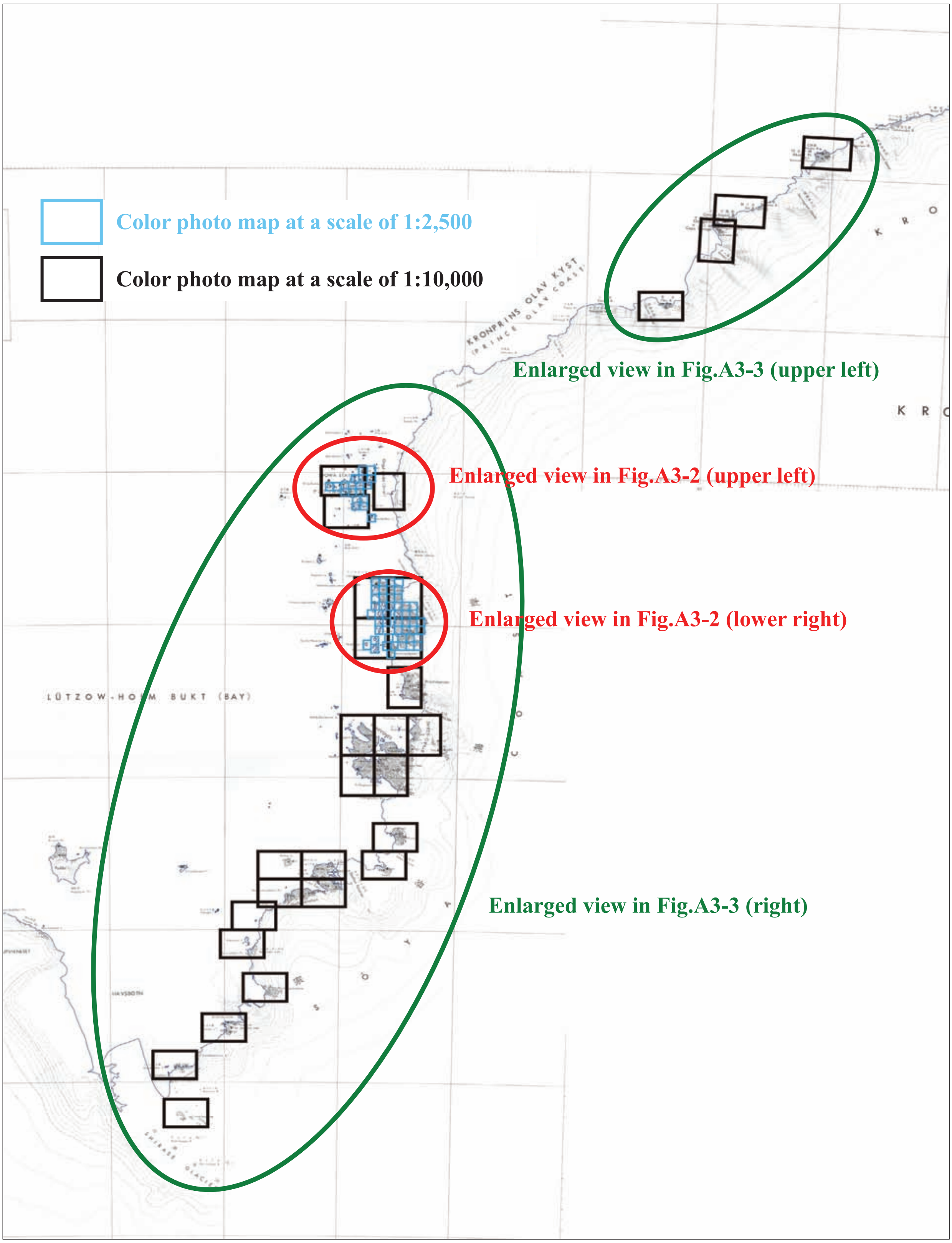
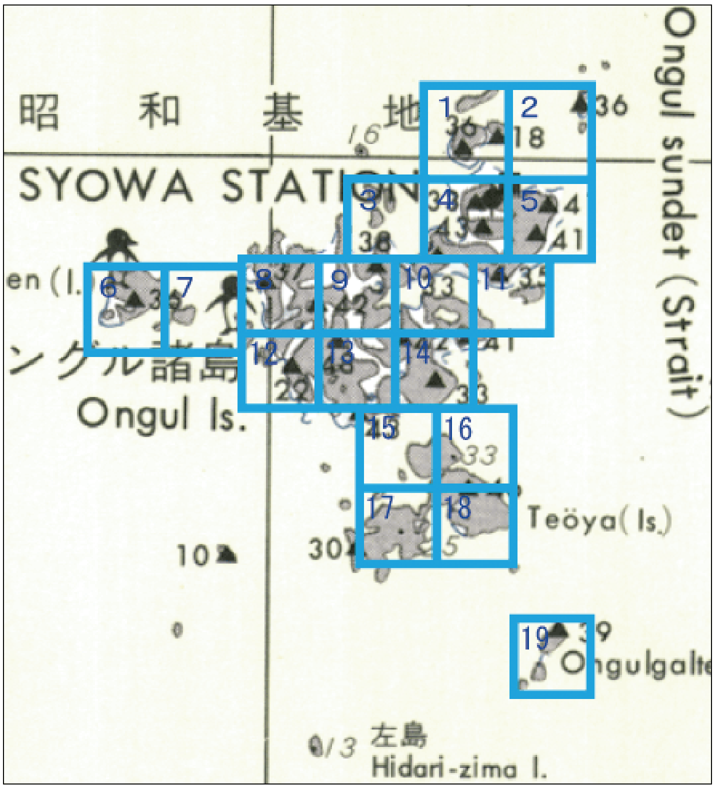


Fig.A3-1 Index of color photo maps of Antarctica (Entire area)



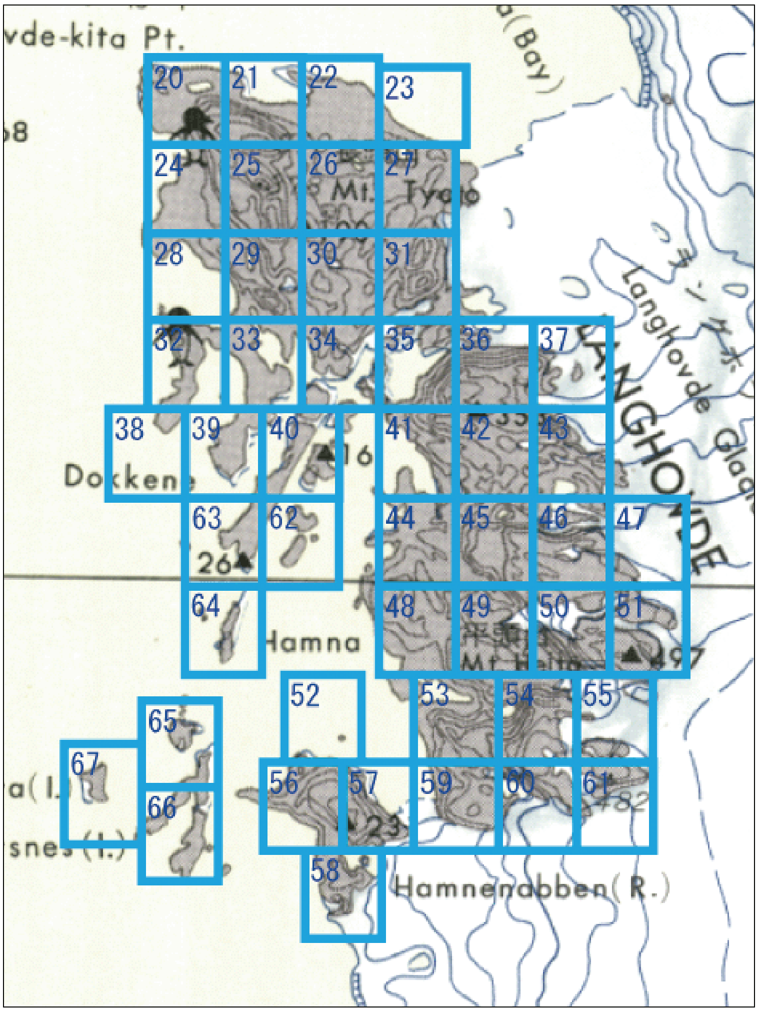


Fig.A3-2 Index of color photo maps of Antarctica (Scale 1:25,000)

Fig.A3-3 Index of color photo maps of Antarctica (Scale 1:10,000)

Table A3-1 List of color photo maps of Antarctica (Scale 1:25,000) (1)

No.	Name of photo map	Produced (year)	Printed (year)	Size	Contour interval	Aerial photo used (year)
1	Nesoya	1993	1994	Kiku	5m	1992
2	Iwa-zima	1993	1994	Kiku	5m	1992
3	Mendori Zima	1993	1994	Kiku	5m	1992
4	Syowa Kiti	1993	1994	Kiku	5m	1992
5	Miharashi Iwa	1993	1994	Kiku	5m	1992
6	Ongulkalven	1993	1994	Kiku	5m	1992
7	Kurumi Zima	1993	1994	Kiku	5m	1992
8	Nishi-Ongul To, Northwestern	1993	1994	Kiku	5m	1992
9	Nishi-Ongul To, Northern	1993	1994	Kiku	5m	1992
10	Syowa Daira	1993	1994	Kiku	5m	1992
11	Pollholmen	1993	1994	Kiku	5m	1992
12	Nishi-Ongul To, Southwestern	1994	1995	A1	5m	1992
13	Nishi-Ongul To, Southern	1994	1995	A1	5m	1992
14	Nishi-Ongul To, Southeastern	1994	1995	A1	5m	1992
15	North Teoya, Western	1994	1995	A1	5m	1992
16	North Teoya, Western	1994	1995	A1	5m	1992
17	West Teoya	1994	1995	A1	5m	1992
18	East Teoya	1994	1995	A1	5m	1992
19	Ongulgalten	1994	1995	A1	5m	1992
20	Zakuro Ike	1994	1995	A1	5m	1992
21	Ko-minato	1994	1995	A1	5m	1992
22	Ko-minato East	1994	1995	A1	5m	1992
23	Itiziku Ike	1994	1995	A1	5m	1992
24	Mizukuguri Ura	1995	1996	A1	5m	1992
25	Tyoto Zan	1995	1996	A1	5m	1992
26	Tyoto Zan, Eastern	1995	1996	A1	5m	1992
27	Futago Yama, Northern	1995	1996	A1	5m	1992
28	Fukuro Ura	1995	1996	A1	5m	1992
29	Akebi Ike	1995	1996	A1	5m	1992
30	Futago Yama, Western	1995	1996	A1	5m	1992
31	Futago Yama	1995	1996	A1	5m	1992
32	Fukuro Ura, Southern	1996	1997	A1	5m	1992
33	Nurume Ike	1996	1997	A1	5m	1992
34	Aogori Wan, Western	1996	1997	A1	5m	1992

Table A3-1 List of color photo maps of Antarctica (Scale 1:25,000) (2)

No.	Name of photo map	Produced (year)	Printed (year)	Size	Contour interval	Aerial photo used (year)
35	Aogori Wan	1996	1997	A1	5m	1992
36	Kanmuri Yama	1996	1997	A1	5m	1992
37	Kanmuri Yama, Eastern	1996	1997	A1	5m	1992
38	Koyubi Misaki	1996	1997	A1	5m	1992
39	Nakayubi Misaki	1996	1997	A1	5m	1992
40	Oyayubi Misaki, Northern	1996	1997	A1	5m	1992
41	Aogori Wan, Southern	1997	1998	A1	5m	1992
42	Kanmuri Yama, Southern	1997	1998	A1	5m	1992
43	Higashi-Yukidori Ike	1997	1998	A1	5m	1992
44	Yukidori Zawa, Western	1997	1998	A1	5m	1992
45	Yukidori Ike	1997	1998	A1	5m	1992
46	Yukidori Ike, Eastern	1997	1998	A1	5m	1992
47	Heito Zan, Northern	1997	1998	A1	5m	1992
48	Yotsuike Dani, Western	1998	1999	A1	5m	1992
49	Yotsuike Dani	1998	1999	A1	5m	1992
50	Yatsude Zawa	1998	1999	A1	5m	1992
51	Heito Zan	1998	1999	A1	5m	1992
52	Hamnenabben, Northern	1998	1999	A1	5m	1992
53	Shimo-Kama	1998	1999	A1	5m	1992
54	Kami-Kama	1998	1999	A1	5m	1992
55	Minami-heito Zan	1998	1999	A1	5m	1992
56	Hamnenabben, Western	1998	1999	A1	5m	1992
57	Hamnenabben, Eastern	1998	1999	A1	5m	1992
58	Hamnenabben, Southern	1998	1999	A1	5m	1992
59	Hamna Hyobaku	1998	1999	A1	5m	1992
60	Higashi-Hamna Ike	1998	1999	A1	5m	1992
61	Minami-heito ZanSouthern	1998	1999	A1	5m	1992
62	Oyayubi Zima, Eastern	1999	2000	A1	5m	1992
63	Oyayubi Misaki	1999	2000	A1	5m	1992
64	Oyayubi Misaki, Southern	1999	2000	A1	5m	1992
65	Revsnesoya, Northern	1999	2000	A1	5m	1992
66	Revsnesoya, Southern	1999	2000	A1	5m	1992
67	Nabboya	1999	2000	A1	5m	1992

NOTE The applied geodetic reference system, the ellipsoid and map projection are Geodetic Reference System 1967, Bessel and UTM for all maps.

Table A3-2 List of color photo maps of Antarctica (Scale 1:10,000) (1)

No.	Geodetic Datum	Name of photo map	Produced (year)	Printed (year)	Contour interval	Aerial photo used (year)
68	1967	Ongul Syoto	1995	1996	5m	1992
'68	ITRF	Ongul Syoto	2004	2004	20m	2000
69	1967	Langhovde, Northwestern	1996	1997	20m	1992
'69	ITRF	Langhovde, Northwestern	2005	2005	20m	1992
70	1967	Langhovde, Northeastern	1997	1998	20m	1992
'70	ITRF	Langhovde, Northeastern	2005	2005	20m	1992
71	1967	Langhovde, Southwestern	1999	2000	20m	1992
'71	ITRF-Tick	Langhovde, Southwestern		2004		
72	1967	Langhovde, Northeastern	1999	2000	20m	1992
'72	ITRF-Tick	Langhovde, Northeastern		2004		
73	1967	Skarvsnes, Northwestern	2000	2001	20m	2000
'73	ITRF-Tick	Skarvsnes, Northwestern		2004		
74	1967	Skarvsnes, Northeastern	2000	2001	20m	2000
'74	ITRF-Tick	Skarvsnes, Northeastern		2004		
75	1967	Honnor Oku-iwa Rock	2000	2001	20m	2000
'75	ITRF-Tick	Honnor Oku-iwa Rock		2004		
76	1967	Skarvsnes, Southwestern		2001	20m	2000
'76	ITRF-Tick	Skarvsnes, Southwestern		2004		
77	1967	Skarvsnes, Southeastern	2000	2001	20m	2000
'77	ITRF-Tick	Skarvsnes, Southeastern		2004		
78	1967	Kjuka	2002	2002	20m	2000
79	1967	Telen	2002	2002	20m	2000
80	1967	Skallen	2002	2002	20m	2000
'80	ITRF-Tick	Skallen		2004		
81	1967	Skallevika	2002	2002	20m	2000
'81	ITRF-Tick	Skallevika		2004		
82	1967	Hjartoy	2002	2002	20m	2000
'82	ITRF-Tick	Hjartoy		2004		
83	1967	Skallevikshalsen	2002	2002	20m	2000
'83	ITRF-Tick	Skallevikshalsen		2004		
84	1967	Sudare Rock	2002	2002	20m	2000
'84	ITRF-Tick	Sudare Rock		2004		
85	1967	Berrodden	2002	2002	20m	2000
'85	ITRF-Tick	Berrodden		2004		
86	ITRF	Breivagnipa	2003	2003	20m	1993

Table A3-2 List of color photo maps of Antarctica (Scale 1:10,000) (2)

No.	Geodetic Datum	Name of photo map	Produced (year)	Printed (year)	Contour interval	Aerial photo used (year)
87	ITRF	Rundvagskollane	2003	2003	20m	2000
88	ITRF	Rundvagshetta	2003	2003	20m	2000
89	ITRF	Strandnibba	2003	2003	20m	2000
90	ITRF	Instekleppane	2003	2003	20m	2000
91	ITRF	Teoyane	2004	2004	20m	2000 partly used in 1992
92	ITRF	Mukai Iwa	2004	2004	20m	2000
93	ITRF	Oku-iwa	2004	2004	20m	1992
94	ITRF	Omega Misaki	2005	2005	20m	2003
95	ITRF	Daruma Iwa	2005	2005	20m	2003
96	ITRF	Akarui Misaki	2005	2005	20m	2003

NOTE All map projections are UTM and all map sizes are A1.
Entries in the geodetic datum column have the following meanings:
1967: Combination of Geodetic Reference System 1967 and Bessel ellipsoid.
ITRF: Combination of ITRF2000 and GRS80 ellipsoid.
ITRF-Tick: “ITRF” ticks overprinted on the “1967” maps (printed year indicates overprinted year)

Appendix 4 History of JARE conducted by GSI

Expedition year	Names of members (* Indicates participation of wintering party)	Types of surveys (* indicates the first introduction of equipment)	Topics
1st 1956–1958	Topography Kozo Kaji Eiichi Inbe	Aerial photo (* Fairchild Williamson F-24), plane table surveying, astronomy, triangulation, baseline surveying	Syowa Station was constructed on East Ongul Island.(1957)
2nd 1957–1958	Topography, gravity Yoshimichi Harada Kozo Kaji Hiromichi Suzuki Shinichi Ohashi Geomagnetism, earthquakes, night glow, cosmic rays Seiichi Kakinuma Construct and Survey assist Zenziro Hamada Akira Kizima Ikuo Matumoto	Gravity (* Worden gravimeter), marine magnetism (* Proton magnetometer)	
Wintering was suspended.			
3rd 1958–1960	Geodesy, gravity, geophysics Yoshimichi Harada Geodesy Arao Yoshida Gravity, geophysics Seiichi Kakinuma Construct and Survey assist Ikuo Matumoto Haruo Sato	Aerial photo (*Zeiss RMK 11.5/18), gravity Marine magnetism	
4th 1959–1961	Geodesy, gravity Shinichi Ohashi Geodesy Eiichi Inbe Geophysics Seiichi Kakinuma	Astronomy, baseline surveying, control point (* microwave distance meter; Tellurometer) Gravity, marine magnetism	
5th 1960–1962	Geophysics Ichiro Murata	Astronomy, gravity, marine magnetism	Antarctic Treaty became effective. (1961)
6th 1961–1962 Syowa Station was closed.	Assistant leader Yoshimichi Harada Geodesy, gravity Arao Yoshida Seiichi Kakinuma Ichiro Murata	Aerial photo, astronomy, leveling, gravity (* GSI-type gravity pendulum) Marine magnetism	
7th 1965–1967	Geophysics Eiichi Inbe*	Triangulation	Observation ship *Fuji* was completed. Syowa Station was reopened.(1965)
8th 1966–1968	Gravity Minoru Tazima	Marine gravity (* LaCoste gravimeter), marine magnetism, aeromagnetism (* Proton magnetometer)	

9th 1967–1969	Geology Seiichi Kakinuma* Geophysics Mitsuo Yoshida*	Trip to the South Pole (navigation for trip by traversing position and height) Gravity, geomagnetism	Expedition of the 9th wintering party arrived at the South Pole. The 9th successful trip of this kind in history.(1968)
10th 1968–1970	Geodesy Shoji Hashizume Geophysics Minoru Masuda※	Aerial photo, astronomy, control point Gravity, marine magnetism, aeromagnetism	
11th 1969–1971	Geodesy Teruaki Hidaka Snow& ice Aiichiro Yoshimura*	Aerial photo (Wild RC-9), astronomy, control point Gravity, geomagnetism, aeromagnetism	Mizuho camp was set up. (now Mizuho Station) in 1970.
12th 1970–1972	Geodesy Hidenao Takahashi Geophysics Koji Kobayashi*	Aerial photo Control point	
13th 1971–1973	Geodesy Kokichi Kimura	Astronomy, control point (* electro-optical distance meter; Geodimeter), marine gravity	
14th 1972–1974	Geodesy Shoji Togashi Noboru Sato Geophysics Yoshiaki Abe*	Astronomy, control point, gravity, geomagnetism Control point	National Institute of Polar Research was established. (1973)
15th 1973–1975	Geodesy Aiichiro Yoshimura Masakatsu Abe Geophysics Hideki Kaneko*	Astronomy, control point, marine gravity, aerial photo Aeromagnetism	
16th 1974–1976	Geodesy Masao Ishihara Geophysics Mitsuhiro Manabe* Geodesy Kenji Nakajo*	Astronomy, control point Aeromagnetism Aerial photo	
17th 1975–1977	Geodesy Takehiko Gomi	Astronomy, control point	
18th 1976–1978	Geophysics Shigeo Otaki*	Aerial photo, astronomy, control point, gravity, geomagnetism	Syowa Station recorded its highest temperature of 10°C. (1977)
19th 1977–1979	Geodesy Toshio Kunimi	Astronomy, control point, gravity, geomagnetism, pricking, temporary tidal observation	Chartsof the geomagnetic distribution in the Antarctic region in 1978.(request of SCAR) (1979)
20th 1978–1980	Geodesy Hitoshi Tanaka*	Astronomy, triangulation, control point, gravity, geomagnetism, temporary tidal observation, pricking	Live relay TV broadcast via satellite was delivered from Syowa Station.
21st 1979–1981	Geodesy Kiyohiro Miyazaki	Astronomy, control point, gravity, geomagnetism, temporary tidal observation, pricking	

22nd 1980–1982	Geodesy Masayuki Osakabe	Aerial photo (* Wild RC-10), astronomy, control point, gravity, geomagnetism, pricking, temporary tidal observation	Pilatus Porter PC6 was installed.
23rd 1981–1983	Geodesy Shuichi Okuyama Geophysics Kaoru Abe*	Astronomy, control point, leveling, gravity, geomagnetism, pricking, aerial photo, Astronomy, control point, leveling, gravity, geomagnetism, pricking, aerial photo,	Observation ship *Shirase* was completed. (1981)
24th 1982–1984	Geodesy Tomoo Toyoda Snow ice Tamio Isobe*	Astronomy, control point (* NNSS), geomagnetism, temporary tidal observation, pricking Aerial photo, artificial satellite, control point	Syowa Station recorded its lowest temperature of -45.3°C.(1982)
25th 1983–1985	Geodesy Akifusa Itabashi	Artificial satellite, astronomy, control point, gravity, geomagnetism, pricking	
26th 1984–1986	Geodesy Akira Suzuki Geophysics Shoichi Matsumura*	Control point, gravity, magnetism, pricking Aurora, geomagnetism, earthquake, tide, geodesy	Asuka camp was set up.(1985) (now Asuka Station)
27th 1985–1987	Geodesy Takeji Kometani	Control point, geomagnetism, photogrammetric target	
28th 1986–1988	Geodesy Yukio Tanaka	Aerial photo, control point	
29th 1987–1989	Geodesy Yuzaburo Iimura Snow ice Takashi Hayashi	Control point, gravity, geomagnetism Aerial photo, pricking	Japan's first female member joined the summer party.(1987)
30th 1988–1990	Geodesy Hiroshi Abe	Control point (* GPS), gravity, geomagnetism, pricking	
31st 1989–1991	Geodesy Tamotsu Hayashi	Control point, gravity, geomagnetism, pricking	
32nd 1990–1992	Geodesy Yoritoshi Ebina Geodesy Sairo Nakajima*	Control point, gravity, geomagnetism, pricking Aerial photo, index point, photogrammetric target, control point, leveling	
33rd 1991–1993	Geodesy Kazuo Watanabe Geology Satoshi Fujiwara	Control point, leveling, SCAR GPS campaign Absolute gravity (* GA60) SCAR GPS campaign	
34th 1992–1994	Geodesy Kunihisa Namasu	Control point, aerial photo, gravity, geomagnetism, SCAR GPS campaign	
35th 1993–1995	Geodesy Hisataka Ikeda	Control point, gravity, geomagnetism, pricking	
36th 1994–1996	Geodesy Hiroaki Yamamoto Geology Kazushi Maruyama*	Absolute gravity (* FG5), control point Control point, installation of Continuous GPS Station (SYOG) at Syowa Station	Dome Fuj camp was constructed. (1995) (now Dome Observation Station)

37th 1995–1997	Geodesy Isao Kimura	Control point, gravity (* Scintrex gravimeter), geomagnetism, leveling, pricking	
38th 1996–1998	Geodesy Osamu Otaki	Control point, gravity, leveling, fluctuation survey of ice sheet continuous GPS observation	Bringing back waste from Syowa Station went into full-scale operation.
39th 1997–1999	Geodesy Akio Iwata	Control point, gravity, geomagnetism, fluctuation survey of ice sheet continuous GPS observation	Two female members joined the Japanese wintering party for the first time.(1998)
40th 1998–2000	Geodesy Hisashi Ando Geophysics Yoshihiro Fukuzaki*	Control point, gravity, geomagnetism, pricking, fluctuation survey of ice sheet VLBI observation, global tides, free vibration of the Earth, DORIS observation, continuous GPS observation	In the meeting of WG-GGI (SCAR) adoption of ITRF & GRS 80 was proposed to the members.(1999)
41st 1999–2001	Geodesy Toshihiro Tsutsui	Control point, fluctuation survey of ice sheet, installation of continuous GPS station "LANG" aerial photo, continuous GPS observation	The 26th SCAR meeting (Tokyo) (2000)
42nd 2000–2002	Geodesy Isao Kimura	Absolute gravity, control point, fluctuation survey of ice sheet, pricking, continuous GPS observation	Continuous GPS station (SYOG) was registered in IGS. (2001)
43rd 2001–2003	Geodesy Kenichi Matsuo	Control point, gravity, geomagnetism, fluctuation survey of ice sheet, leveling (* digital level), continuous GPS observation	
44th 2002–2004	Geodesy Yoshitake Yamamoto	Aerial photo, photogrammetric target, control point, fluctuation survey of ice sheet, continuous GPS observation	Total solar eclipse was observed from Dome Fuji Station and the entire southeast region of Antarctica. (2003)
45th 2003–2005	Geodesy Yoshifumi Hiraoka	Absolute gravity, aerial photo, control point, RTK-GPS examination, photogrammetric target for ALOS studies, fluctuation survey of ice sheet, continuous GPS observation	
46th 2004–2006	Geodesy Kazuyuki Morita	Control point, gravity, geomagnetism, leveling fluctuation survey of ice sheet, continuous GPS observation	
47th 2005–2007	Geodesy Seiji Okamura	Control point, geomagnetism, leveling, fluctuation survey of ice sheet, RTK-GPS examination, photogrammetric target for ALOS studies, continuous GPS observation	
48th 2006–2008	Geodesy Hiroki Shirai	Control point, geomagnetism, gravity, fluctuation survey of ice sheet, photogrammetric target for ALOS studies, continuous GPS observation	The 50-year anniversary of Japan Antarctic Research Expedition "50 years of antarctic research expeditions by the GSI" The Science Museum of Map and Survey (2006)

Appendix 5 Japanese Antarctic Research Expedition

The Japanese Antarctic Research Expedition (JARE) is a national project promoted by the government agencies responsible for each assigned operation such as research observation and transportation. The agencies work together under the initiative of the Ministry of Education, Culture, Sports, Science and Technology in accordance with the 1955 Cabinet decision on "Establishing the Headquarters for the Japanese Antarctic Research Expedition." JARE is premised on joint research under international cooperation, and participating countries are required in principle to observe information disclosure and exchange in consideration of the need for cooperative effort in conducting observations on the vast Antarctic continent.

The Ministry of Education, Culture, Sports, Science and Technology integrated and coordinated the operations of the Antarctic observation project, and set up the "Headquarters for the Japanese Antarctica Research Expedition" (General Manager: Minister of Education, Culture, Sports, Science and Technology) as the agency formulating basic national policies. The Chief of the Geographical Survey Institute has been a committee member since its foundation.

As the core agency planning and implementing Antarctic observations for the purpose of academic research, the National Institute of Polar Research, established in 1973, promotes integrated academic research in polar regions with cooperation from national universities and research agencies. At the same time, it is in charge of planning logistics (machinery, telecommunications, construction, civil engineering, food supply, medical services, air voyage, and environmental preservation, etc.) and implementing various training sessions.

The continuous monitoring observation programs are conducted under the respective authority of the National Institute of Information and Communications Technology for monitoring of the ionosphere; the Meteorological Agency for meteorological monitoring observations; the Geographical Survey Institute for geodetic and gravimetric monitoring observations; and the Hydrographic and Oceanographic Department of the Japan Coast Guard for physics and chemical oceanography monitoring observations.

The *Soya* (operated by the Japan Coast Guard) provided transportation from 1956, and was replaced by the *Fuji* (operated by the Defense Agency) in 1965. The *Shirase* (operated by the Defense Agency, now Ministry of Defense) succeeded the *Fuji* in 1983, and is currently in service. The Ministry of Defense also operates and maintains aircrafts.

Figure A5 shows the implementation structure of JARE, and Table A5 describes the roles assigned to agencies other than the Ministry of Education, Culture, Sports, Science and Technology.

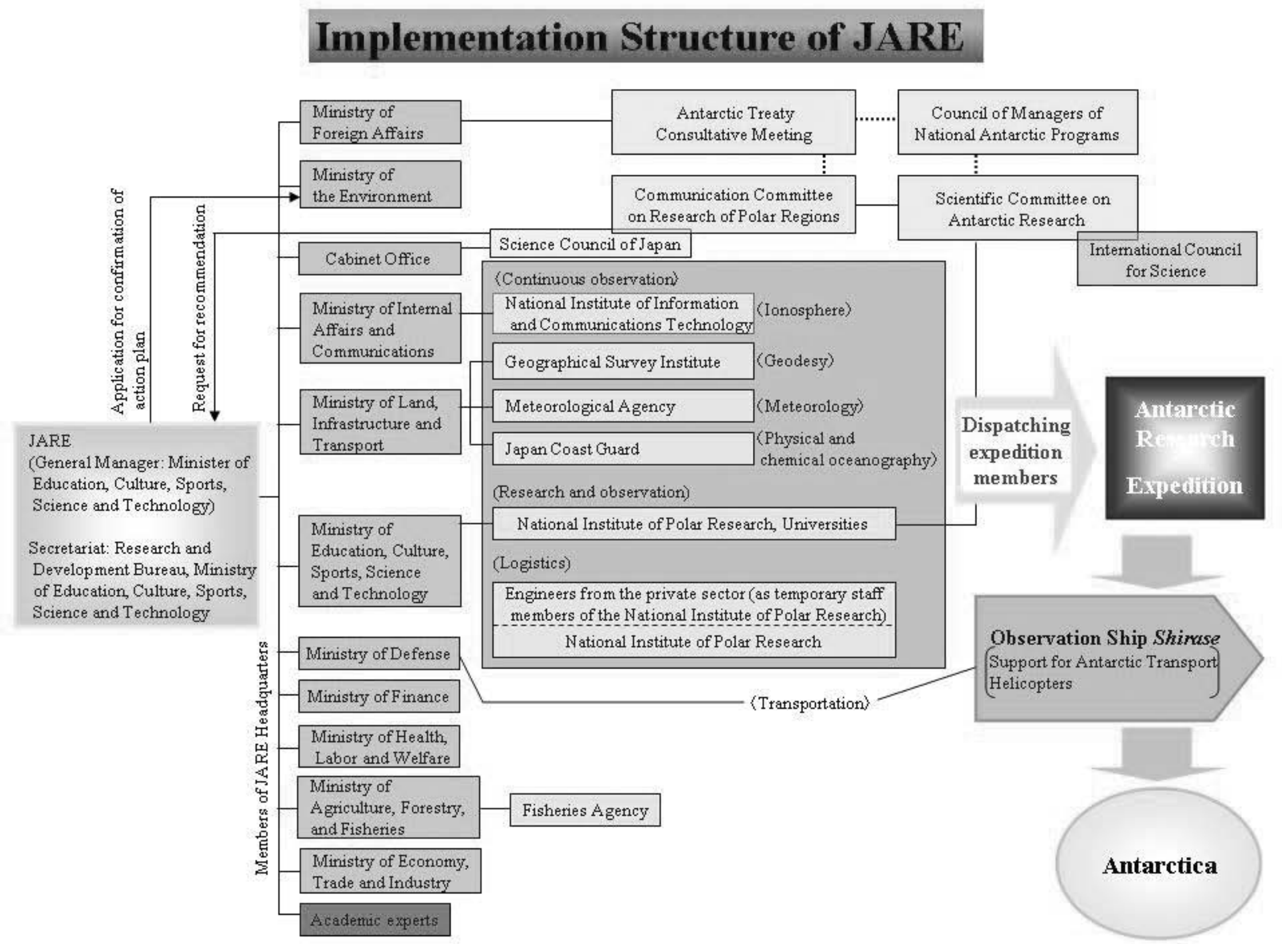

Implementation Structure of JARE
Ministry of Foreign Affairs
Ministry of the Environment
Cabinet Office
Ministry of Internal Affairs and Communications
Ministry of Land, Infrastructure and Transport
Ministry of Education, Culture, Sports, Science and Technology
Ministry of Defense
Ministry of Finance
Ministry of Health, Labor and Welfare
Ministry of Agriculture, Forestry, and Fisheries
Ministry of Economy, Trade and Industry
Academic experts
Fisheries Agency
Members of JARE Headquarters
Application for confirmation of action plan
Request for recommendation
JARE (General Manager: Minister of Education, Culture, Sports, Science and Technology)
Secretariat: Research and Development Bureau, Ministry of Education, Culture, Sports, Science and Technology
Antarctic Treaty Consultative Meeting
Council of Managers of National Antarctic Programs
Communication Committee on Research of Polar Regions
Scientific Committee on Antarctic Research
International Council for Science
Science Council of Japan
(Continuous observation)
National Institute of Information and Communications Technology
(Ionosphere)
Geographical Survey Institute
(Geodesy)
Meteorological Agency
(Meteorology)
Japan Coast Guard
(Physical and chemical oceanography)
(Research and observation)
National Institute of Polar Research, Universities
(Logistics)
Engineers from the private sector (as temporary staff members of the National Institute of Polar Research)
National Institute of Polar Research
(Transportation)
Dispatching expedition members
Antarctic Research Expedition
Observation Ship Shirase
Support for Antarctic Transport
Helicopters
Antarctica

Table A5 Agencies and their roles in JARE

Core agency	National Institute of Polar Research, incorporated information systems and research organization shared by universities	Core agency of JARE, implementation of the research observation programs, logistic support for JARE etc.
Agency for the Regular Observation Programs	Ministry of Internal Affairs and Communications (National Institute of Information and Communications Technology)	In charge of monitoring of the ionosphere including aurora
	Geographical Survey Institute	In charge of GPS observation and other geodetic surveys including mapping of Antarctica
	Meteorological Agency	In charge of meteorology such as ozone and upper-atmosphere observation
	Hydrographic and Oceanographic Department, Japan Coast Guard	In charge of physical and chemical oceanography such as observing ocean currents and water temperature, analyzing ocean water, improving marine charts, and tides such as observing the level of ocean water
Transport	Ministry of Defense	Transporting JARE members and supplies by ship and aircraft
Antarctic Treaty Notification and registration of Antarctic Place Names	Ministry of Foreign Affairs	Dealing with the Antarctic Treaty Consultative Meeting (ATCM) Notification and registration of the place names decided by Headquarters for JARE to the relevant countries and organizations
Environmental protection of Antarctica	Ministry of the Environment	Holds jurisdiction over the “Act on Environmental Protection in Antarctica” and governs the necessary procedures for sightseeing and visiting in Antarctica