Table

Table 1-1 General characteristics of GMS.

Items	Contents	
Location and Altitude	140°E and ca. 35,800 kms	
Frame Time	25 minutes	
Type of Sensor	Visible and Infrared Spin Scan Radiometer (VISSR)	
Sensor	Visible	Infrared
Detector	PMT	Hg Cd Te
Wave Length (μ m)	0.55 - 0.75	10.5 - 12.5
IFOV (μ rad)	35×31	140×140
Subsatellite Resolution	1.25 kms	5 kms
Scan Line	10,000	2,500
Data (bit)	6	8
Measurement Range	0 — 95% (albedo)	+30°C — -80°C (infrared radiance)
Observation Time*	14 times a day (routinely) 00, 03, 06, 09, 10, 10:30, 11, 12, 16, 18, 21, 22, 22:30 and 23 GMT	

* : Image-taking time of the whole globe. Scanning begins about 25 minutes before these times.

Table 2-1 Summary of volcanic eruptions which occurred in the field of view of GMS during late-1977-1985 based on the SEAN Bulletin and the Bulletin of Volcanic Eruptions. The activity stands for the intensity of explosive activity. G, M and L denote occurrence of great, medium and small-sized eruptions, respectively. Numerals denote the maximum height of eruption clouds by ground observation in km and MAX means the highest altitude of eruption clouds in km of the respective volcano in the year. - means absence of numerical data.

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
1977													
Ukinrek			7.5	>4									7.5
Bezymianny			5-10										10
Kleuchevskoi								L	M	M	M	M	-
Usu								12			0.4		12
Azuma												0.6	0.6
Aso				L	L	L	1.5				0.3	L	1.5
Sakurajima	1.8	2.1	2.0	2.7	2.5	2.7	3.3	2.8	2.8	2.5	2.2	2.0	3.3
Suwanosejima	L	L	0.7	3	2	3	4	3	3	2	2	L	4
Taal										0.5	0.5		0.5
Mayon											L		-
Api Siau	0.9	L	L	L	L	L	L	L	0.9	L	L	0.9	0.9
Lokon			1.0	0.3	0.3	1.0	0.8	0.3	0.5	L	0.4	0.4	1.0
Marapi	0.3	L	0.4	0.5	0.5	L	L	L	0.5	0.3	0.6	0.5	0.6
Merapi	0.8	L	0.6	0.6	0.9	0.8	0.4	0.6	0.8	0.6	0.5	0.8	0.9
Semeru	0.6	0.8	L	0.5	L	0.7	0.8	1	0.7	0.8	0.7	0.8	1
Raung						1.5							1.5
Manam	L		L	L	L	L	L	L	L	L	L	L	-
Langila	L			L	L	L	L	L	L	L	L	L	-
Kavachi	L						L-M						-
Gaua				M									-
Yasur	M	L	L	L	L	L	L	L	2	2	2	L	2
Ambrym	2												2
Lopevi		L											-
White Island			M	M	M	M	M	M	M	M	2	M	2
Ruapehu											2		2
1978													
Kleuchevskoi	L	L	M				L						-
TiaTia							0.6						0.6

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
Tarumae					L							0.2	0.2
Usu	0.5	1.2	L	L	1.0	2	2	2	2.5	L			2.5
Azuma	0.5												0.5
Aso	L			L	L	L							-
Kirishima												L	-
Sakurajima	1.9	1.7	2.5	1.5	2.5	2.4	2.5	3.4	2.5	2.7	1.0	2.2	3.4
Suwanosejima	L		1	3	0.5	0.5	3	3	3	5	0.7	0.3	5
Iwojima												L	-
Didicus	L												-
Mayon			L		3		L	L					3
Bulusan							1.5	3					3
Canlaon						1.5	0.7	1.4	L				1.5
Api Siau		0.8	0.7					0.7		0.8		0.9	0.9
Dukono							10						10
Lokon												0.7	0.7
Marapi	0.5	0.5			0.4	L	L	0.4	1.5	L	L	0.2	1.5
Krakatau							0.5	0.5	L	0.4			0.5
Merapi	1.0	0.6	0.8	0.5	0.6	0.7	L	0.8	0.7	L	L	L	1.0
Semeru	0.7	1.0	0.7	0.6	0.8	0.8	0.7	0.9	0.6	0.5	0.8	0.9	1.0
Manam	L	L	L			L	L	L	L	M	M	M	-
Raung			L	0.5	0.2	0.5	0.1	L	0.4		0.2	0.9	0.9
Karkar								L					-
Langila	L	1.2	L-M	M	M	M	L	L	L	L	L	L	1.2
Ulawun					2.5								2.5
Bagana									L				-
Kavachi						0.4	0.4						0.4
Lopevi											L		-
Yasur								L	L	L	L		-
White Island	L	1.5	4.5	4.5	3	0.6	4.5					3	4.5
Ruapehu			0.6			L			M	L			0.6
1979													
Bezymianny		L											-
Karymsky							1	L	L	L	L	L	1
Chirinkotan				L	>3	L	L	L	L	L	L	L	>3
Tarumae	L	L	L	L	0.5								0.5
Ontake										2.0	L	0.1	2.0
Aso						2	M	M	0.7	L	1.5		2
Kirishima	L	L	L	L									-

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
Sakurajima	2.8	2.5	>2.5	1.8				1.5	2.8	2.5	2.7	2.4	2.8
Suwanosejima		0.5	0.5			0.5	0.2		2.0			1.5	2.0
Bulusan												1	1
Api Siau					0.6								0.6
Dukono								M					-
Lokon						0.7							0.7
Marapi	1.5	L	L	L	L	L	1.5	L	0.7				1.5
Krakatau							0.2		2	L			2
Dieng		M											-
Merapi	M	L	L	L	L	L	L	L	L	L	L	L	-
Semeru	L	L	L	L	L	L	L	L	L	L	L	L	-
Manam								0.3		L			0.3
Raung						0.6							0.6
Karkar	L	L	M	0.2	>2	0.8	L	0.8					>2
Langila	L	L	L	L	M	M	M	M	M	L	L	L	-
Ambrym		L				M					L		-
Lopevi		M	L				L		L				-
Yasur	L	L	L	L	L	L	L	L	L	L	1	L	1
Tafahi					0.1								0.1
Late Iki					L	1.5	L						1.5
White Island	2	2	2	2	5	M	1	M	2	M	M	M	5
Ruapehu	L					L	L						-
1980													
Sheveluch								L	L	L	L	L	-
Gareloi								10.5	6				10.5
Kleuchevskoi	0.7		1.5										1.5
Bezymianny				6				1.5					6
Karymsky	L	L	1	1	L	L	L	L	L	L	L	L	1
Gorely Khrebet						L	5	L	L				5
Chirinkotan	3	L	L	3	L				M				3
Ontake	0.2	L	L	0.5									0.5
Aso	M		L						0.8				0.8
Sakurajima	2.5	2.7	0.8	2.8	2.5	2.7	3	2	1.8	2.0	2.5	1.8	3
Kuchinoerabujima									2				2
Suwanosejima		1.5	1.0	1.5	1.8	0.5	L	1.5	2.0	0.5	1.5		2.0
Iwojima			L										-
Mayon												0.2	0.2
Bulusan	0.5	6	0.7	4		L	6	7	L				7

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
Malinao							0.2						0.2
Api Siau			0.2				L-M	L-M	1.2				1.2
Gamalama									2	L			2
Marapi			0.7										0.7
Krakatau			1.0	M	L	L			1.5	L	L	L	1.5
Merapi	L	L	L	L	L	L	L	L	L	L	L	L	-
Semeru	L	L	L	L	M	L	L	L	L	L	L	L	-
Bromo						1.5	1.5	L	L				1.5
Paluweh											1	L-M	1
Manam	L-M	L	L	L	L	L	L-M	L	L-M	L	L-M	1.0	1.0
Karkar	L		L				L		L				-
Langila	5	L	L	L	0.7	L	L	L	L	5	L	L	5
Ulawun										20			20
Bagana	L	L	L	L	L	L	L	L	L	L	L	L	-
Kavachi										L	0.3		0.3
Gaua	L						L			L			-
Ambrym					L-M		15	15					15
Lopevi				L			L	5					5
Yasur	L	L	L	L	L	L-M	L	L	L	L	L	L	-
White Island	L-M	0.5	L-M	0.7	L-M	1	3	L-M	L-M	L-M	M	M	3
Ruapehu	L	L	L								L	L	-
1981													
Kleuchevskoi												L	-
Bezymianny						8							8
Alaid				12	10	L							12
TiaTia						L	L						-
Tarumae		L											-
Aso						L							-
Sakurajima	2.1	1.2	2	0.8	1.3	2.5	1.3	2.5	2.6	2.3	3	3.1	3.1
Suwanosejima	1	1	1	1.5	0.5	1.5	2.4	2.7			1.5	0.5	2.7
Pagan					20	M					1.5		20
Bulusan				8									8
Gamkonara			1				1						1
Krakatau				L		L	L			1			1
Merapi	L	L	L	L	L	L	L	L	L	L	L	L	-
Semeru	0.6	L	1	0.7	0.7	L	L	L	L	L	L	L	1
Paluweh	1	L	L	L	L	L	L	L	1				1
Manam	L	L	L	L	L	L	L	L	L	M	M	1	1

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
Langila	L	L		L	L	L-M	0.4	L-M	L-M	7	7	L-M	7
Bagana	1	1	1	1	1	1	1	1	1	L	1	1	1
Kavachi	0.2	L											0.2
Gaua							L						-
Ambrym		L	L		M				M				-
White Island	0.8	L	L						L	L	L	L	0.8
Ruapehu										L	L	0.5	0.5
1982													
Gareloi	9												9
Kleuchevskoi			L	L	L					L		L	-
Bezymianny						1.5							1.5
Alaid			L										-
Kusatsu-Shirane										0.1		0.7	0.7
Asama				4.5						L			4.5
Sakurajima	1.5	1.6	2.7	2.7	>2.5	3.0	>1.9	>2.9	1.2	1.4	3.0	2.3	3.0
Suwanosejima	1.5	1	1	1	1			1	0.5	0.5	0.5	1.0	1.5
Iwojima			L								L		-
Pagan	L	L							L	L	L	L	-
Soputan								15	14		5		15
Galunggung				16.5	G	13.5	16	15	G	8	5	5	16.5
Merapi		L	L										-
Iliboleng											1		1
Manam	L	L	7	1.5	L	L	L	L	L	1	L	L	7
Raung							6						6
Langila	L	7	L	L	4	L	L	6	M	3.5	3	9	9
Ulawun												L	-
Lopevi										6			6
White Island							L						-
Ruapephu	L	L	L										-
1983													
Kleuchevskoi			L	L	L	L							-
Bezymianny					6	L							6
Niigata-Yakeyama				L									-
Kusatsu-Shirane							L				L	L	-
Asama				5									5
Miyakejima										10			10
Sakurajima	3.8	3.0	2.7	3.0	4.4	3.0	3.5	3.2	3.0	2.5	2.5	2.7	4.4
Suwanosejima	1	1	1	0.5	0.2	1.5	0.5		1.5	1	0.5	0.5	1.5

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
Pagan			L				L		6				6
Bulusan						1.2							1.2
Gamalama								6					6
Una Una							15	12	2	0.7			15
Galunggung	2												2
Iliboleng									L				-
Manam	L	L	L	1	0.6	L	L	L	L	L	L	L	1
Langila	M	4	L	8	7	M	L	L	L	L		2.7	8
Ulawun			L	L	0.6						L	L	0.6
Bagana			2									L	2
Hunter Island		L	L										-
White Island												L	-
1984													
Sheveluch					1								1
Kleuchevskoi			L	L	L	L	L	6			4	4	6
Bezymianny		L							L	5	L		5
Gorely Khrebet												3.5	3.5
Aso									L	L	L	0.2	0.2
Sakurajima	1.8	2.3	>2.0	2.3	3.1	>4.0	>4.0	1.7	2.0	2.4	>2.6	2.8	>4.0
Suwanosejima	0.5		L	1.0	L	L		L	L	L			1.0
Kaitoku Sea Mount			L										-
Pagan			1.8	L	4								4
Mayon									15	1.7			15
Api Siau	L	L	L	L	1.5	L	L	4	4				4
Soputan					4			6					6
Marapi											0.4		0.4
Galunggung	L												-
Merapi						6							6
Semeru	L	L	L	L	L	L	L	L	L	L	L	L	-
Manam	3.5	8	L	0.5	2	1.5	L	2	L	L	L		8
Langila	2.5	3	L	5	L	L	L	L	L	L	L		5
Ulawun	2		2					0.5	L			L	2
Bagana	L	L	L	L	L	L	L			L	L	L	-
Tinakula						5-6							5-6
Home Reef			12										12
White Island	L	1.5											1.5
1985													
Cleveland												0.4	0.4

Volcano \ Month	1	2	3	4	5	6	7	8	9	10	11	12	MAX
Kleuchevskoi	L							1.0	1.0	1.0	3.0	5.2	5.2
Bezymianny						M	M						-
Karymsky					L								-
Gorely Khrebet	L												-
Aso	0.6	L	L	L	1.2	L	L						1.2
Sakurajima	2.4	4.0	2.8	4.0	1.5	3.5	>4.0	>3.5	4.0	2.8	3.0	2.6	>4.0
Suwanosejima							2.5						2.5
Farallon de Pajaros								L	L				-
Pagan				2.5	L								2.5
Canlaon			0.7							0.8			0.8
Api Siau		0.4									1.5		1.5
Soputan					4.0								4.0
Tankubanpurahu											L		-
Semeru	L	L	L	L	L	L	L	L	L	L	L	1.0	1.0
Sangeang Api							6.5	2.5	1.0	1.0	1.2	L	6.5
Manam			L	L		L	L	L	L		L	L	-
Raung											L		-
Langila		4.0	L			1.0	L	L	L	1.5	0.3	L	4.0
Ulawun	L										2.0	L	2.0
Bagana	L	L	L							L	L	L	-
Kavachi												0.3	0.3
Tinakula						L							-
Niuafóou			L										-
Solomon Islands			P*										-
Ruapehu					L	0.1							0.1

P* : pumice raft on sea-surface

Table 2-2 Observational data of eruption clouds from volcanoes detected by GMS images. Latitude, longitude and altitude above sea level of each volcano are also shown. Time is GMT. W (width), L (length) and DIR (drifting direction) of individual eruption cloud are mainly measured on infrared image photographs. T and H denote the lowest temperature (in °C) of the surface of eruption cloud and its highest altitude above sea level (in km) estimated from air-temperature profiles based on radio-sounding data at nearby stations or atmospheric model by using T_{BB}values of GMS data.

*: disturbed by atmospheric cloud, extent obscure owing to its thinness.

?: not certain whether it is eruption cloud or not.

( ): detached from volcano.

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
SHEVELUCH (Kamchatka, U.S.S.R.. 56.783°N, 161.583°E, 3,395m)								
1981								
JUNE	17	18	?	30	80	NE		
		21	?	100	420	ESE		
		22:30	?	70	300	ESE		
	18	00	?	40	600	ESE		
KLEUCHEVSKOI (Kamchatka, U.S.S.R.. 56.18°N, 160.78°E, 4,850m)								
1980								
MAR.	4	12	*	40	250	ESE		
	5	09		50	310	W		
		10:30		50	520	W		
		12		60	660	WSW		
		16		(50)	(750)	W		
		18		(50)	(780)	W		
	7	22:30		20	110	W		
	8	00		20	120	W		
		03		20	110	W		
		06		30	70	NW		
		09		40	90	NW		
		10:30		40	120	NW		
		12	*	(40)	(130)	NW		
		16	*	(40)	(120)	NW		
		21	*	(30)	(90)	W		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		22:30		30	100	W		
	9	00		40	310	NW		
		03		40	160	NW		
		06		60	660	NW		
		09		80	510	NW		
1985								
JAN.	14	03	*	30	220	W		
BEZYMIANNY (Kamchatka, U.S.S.R.. 56.07°N, 160.72°E, 2,800m)								
1980								
APR.	18	06		30	230	ESE		
		09		50	260	E		
		10:30		60	410	E		
		21		60	210	E		
	19	00		40	280	E		
		03		(30)	(330)	E		
		10:30	*	30	180	E		
		16	*	20	120	E		
		18	*	30	190	E		
		22:30		30	390	E		
1984								
OCT.	14	06	*	110	1300	ENE		
		12	*	130	1300	NE		
GORELY-KHREBET (Kamchatka, U.S.S.R.. 52.45°N, 158.12°E, 1,829m)								
1984								
DEC.	21	09	*	50	150	ESE	-41	6.6
		10	*	40	90	ESE	-44	7.3
ALAID (Kurile Is., U.S.S.R.. 50.80°N, 155.50°E, 2,339m)								
1981								
APR.	27	11	*				-38	6.8
		12		20	80	NE	-35	6.8
		16		45	150	NE	-54	9.0
		18		70	350	NE	-54	9.0
		21		300	540	NE	-51	9.0
		22					-51	9.0
		22:30		460	810	NE	-50	8.9
		23					-49	8.9
	28	00		500	730	NE	-51	9.0
		03		500	960	NE	-48	8.6

TIME (GMT)		W	L	DIR.	T	H
		km	km		°C	km
	06	430	1150	NE	-49	8.3
	09	170	1020	NE-E	-47	7.9
	10				-48	8.0
	10:30	220	1000	NE-E	-47	8.0
	11				-48	7.8
	12	360	800	E	-49	7.8
	16	240	720	E	-51	8.2
	18	160	660	E-SE	-52	9.0
	21	180	600	SE	-49	8.6
	22				-44	8.1
	22:30	220	640	SE	-44	8.2
	23				-45	8.4
29	00	270	630	SE	-48	8.9
	03	660	810	SE	-50	9.1
	06	580	980	SE-S	-52	9.5
	10				-48	8.8
	10:30	260	1650	SE	-43	8.2
	11				-44	8.3
	12	330	1750	SE	-50	9.0
	16	470	1940	SE	-53	9.6
	18	440	2200	SE	-57	10.2
	21	360	2350	SE	-47	9.2
	22				-57	10.3
	20:30	260	2450	SE	-58	10.8
	23				-58	11.0
30	00	180	2470	SE	-61	11.4
	03	250	2750	E-SE	-59	10.8
	06	270	2300	E-SE	-62	11.7
	09	270	2650	E-SE	-52	10.1
	10				-33	7.5
	10:30	390	2980	E-SE	-41	8.6
	11				-42	8.7
	12	70	180	E	-45	9.1
	(Former cloud: 310km W & 2,510km L)					
	16 *	70	210	E	-48	9.3
	(Former cloud: 360km W & 1,440km L)					
	18 *	60	>120	NE	-53	9.7
	(Former cloud: 390km W & 1,380km L)					

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		21	*	80	>460	NE	-57	10.0
			(Former cloud: 400km W & 930km L)					
		22					-57	9.9
		22:30	*	120	>390	ENE	-55	9.8
			(Former cloud: 380km W & 800km L)					
		23					-55	9.7
May	1	00		90	440	ENE	-55	9.7
			(Former cloud: 300km W & 780km L)					
		03		70	350	ENE	-50	9.6
		06	*	60	190	NE	-47	9.5
			(Former cloud: 300km W & 700km L)					
		18	*	30	210	E	-23	6.1
	2	03	*	40	390	ESE		
		06	*	40	480	ESE		
		12	*	30	270	SE		
		18	*	30	230	ESE		
		21		40	360	ESE		
		22:30	*	(30)	(190)	ESE		
	3	00	*	(30)	(440)	ESE		
		12	*	(80)	(200)	SSE		
	7	12	*	60	220	NE		
	8	09	*	40	60	E		
		10:30	*	30	50	E	-32	7.9
		12	*	30	90	E		
		16		50	200	E		
		18		60	280	E		
		21		40	490	E		
		22					-46	9.7
		22:30		40	510	E	-49	10.3
		23					-4.8	10.2
	9	00		50	480	E	-46	9.9
		03		50	530	E	-40	9.1
		06	*	70	620	ESE	-33	8.1
		09	*	(60)	(140)	ESE	-20	5.7
		10:30	*	(30)	(90)	ESE		
		12	*	30	240	ESE		
	15	10:30	*	40	270	E-S		
		22:30	*	30	40	SE		

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
16	00		20	100	SE		
	03		30	190	SE		
	06		50	380	E-SE		
	09		50	310	S-E		
	10:30	*	100	250	SE		
	12		50	110	SE		
	16	*	30	100	S		
	18	*	60	80	SSW		
	21		40	120	SSW		
	22:30					-20	5.7
17	00		40	60	SSW		
	03		30	50	SSW		
	06		60	140	SSW		
	09		40	120	S		
	10:30					-19	5.3
	12		40	320	S-SE		
	16		40	320	S		
	18		40	320	S		
	21		30	440	SE-S		
	22:30		30	380	SE-SSW		
18	00		30	410	SE		
	03		70	710	SE		
	06		60	990	SE		
	09		20	370	SE		
	10:30		20	330	ESE		
	12		60	780	SE		
	16		40	700	SE-ESE		
	18		80	940	SE-ESE		
	21		40	640	SE		
	22:30		30	250	SE		
19	00		30	300	S-ESE		
	03		30	160	S		
	06		30	130	SSE		
	09		40	130	SE		
	10:30		40	180	SE		
	12	*	40	300	SE		
20	03		30	210	ESE		
	10:30		40	180	SE		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		21		40	390	SE		
	21	21		20	140	ESE		
	22	00		20	220	ESE		
		16		30	350	ESE		
	23	00		20	60	ESE		
		03		20	350	E		
		06		20	150	E		
		09		20	150	E		
		10:30		30	110	E		
		12		30	240	E		
		16		90	260	SE-E		
		18		90	190	S-SW	-45	9.8
		21		30	310	SSE		
		22:30		30	340	SE	-34	8.1
		23					-34	8.1
	24	00		40	370	SSE		
		03		40	300	SSE	-33	8.0
		06		50	260	S-SE		
		09		90	260	S		
		10:30		70	200	S		
		12		70	280	SE-SSE		
		16		90	490	SE		
		18		70	580	SE		
		21		90	760	SE	-22	6.2
		22:30		90	400	SE		
	25	00		50	410	ESE		
		03		90	770	ESE		
		06		40	540	ESE		
		09		30	270	E		
1982								
MAR.	29	00		30	160	ESE	-36	8.4
GARELOI (Aleutian Is., 51.80°N, 178.80°W, 1,573m)								
1980								
SEP.	16	16	*	(50)	(490)	ESE		
		18	*	(50)	(270)	E		
	17	10:30	*	40	130	ENE		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
ASAMA (Honshu, Japan. 36.40°N, 138.53°E, 2,550m)								
1982								
APR.	25	18		10	30	SE	-28	7.2
		21		(20)	(180)	SE-SSE	+1	3.0
		22		(20)	(100)		+5	2.2
		22:30		(20)	(70)	SE	+8	1.7
1983								
APR.	7	18	*	(30)	(90)	NE	-30	7.5
SUKURAJIMA (Kyushu, Japan. 31.583°N, 130.667°E, 1,118m)								
1984								
MAY	3	00		10	40	W		
	5	18		20	90	W		
	8	06		10	40	ENE		
	9	00		10	40	ESE		
	10	03		10	30	SE		
		06		20	50	SE		
	11	00		10	40	NE		
		03	*	(10)	(30)	NE		
		16	*	(20)	(30)	WNW		
JULY	25	00	*	(10)	(20)	SE	+13	0.9
AUG.	1	00		10	40	SW	+1	2.9
	5	00	*	10	20	NW	+11	1.8
		06		10	30	W	+2	2.8
	6	00		10	30	NNW	+17	0.7
	8	06		10	30	WNW	-6	3.9
	24	00		(10)	(20)	SW	+21	0.3
	29	06		10	20	NW	+19	0.4
DEC.	9	03	*	10	20	NW	+13	0.5
	12	09	*	30	40	NW	+5	1.9
	19	06		10	30	NE	+5	2.0
1985								
JAN.	2	00		(10)	(60)	E		
	5	06		(10)	(80)	SE		
	6	06		20	40	SE		
	30	06	*	10	30	SE		
FEB.	14	00	*	10	30	SE	+9	1.6
	24	03		20	70	ESE	-3	3.6
MAR.	1	03		10	30	E	+12	1.1

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		06	*	10	20	E	+10	1.4
	6	00	*	10	20	E	+10	1.4
		06		10	40	E	+12	1.2
	7	18		30	60	SE	-16	5.6
	23	23		20	40	ESE	+6	2.3
	24	00		(20)	(30)	E	+5	2.2
	29	06		(20)	(40)	SE		
	31	06		(10)	(20)	SE		
JULY	22	06	*	10	20	N	+10	1.4
		09	*	10	20	N	0	3.2
	29	00		20	90	W	+14	1.1
		02		20	60	W	+14	1.1
		03		30	50	W	+13	1.1
		06		10	60	W	+14	1.1
	31	00	*	10	10	NW	+6	2.2
		03	*	(30)	(40)	NNW	-10	4.4
		06	*	(20)	(30)	N	-9	4.3
		09	*	(20)	(30)	N	-1	3.3
PAGAN (Mariana Is., Central Pacific. 18.13°N, 145.80°E, 570m)								
1981								
MAY	14	23		10	10	NE	-14	6.9
	15	00		60	70	SE	-79	16.2
		03		220	250	SE	-79	16.5
		06		340	470	SE	-77	16.3
		09		470	710	SE	-68	14.1
		10					-58	12.4
		10:30					-56	12.6
		11					-53	12.4
		12		(730)	(670)	SE	-57	12.8
		16		(840)	(770)	SE		
		18	*	(930)	(990)	SE		
		21	*	(1030)	(1060)	SE		
		22:30	*	(960)	(890)	SE		
MAYON (Luzon, Philippines. 13.26°N, 120.68°E, 2,990m)								
1984								
SEP.	10	18	*	10	10	W	-1	4.9
	11	00		20	70	W	+10	3.1
		06		(60)	(90)	WSW	-17	7.6

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		12		50	>70	W	-17	7.7
		18		(40)	(120)	W	+10	3.1
	12	00		10	40	W	+15	2.0
		06		30	70	WSW	0	4.7
		12		30	100	SW	-2	5.0
		18		(30)	(100)	SW	0	4.8
	13	00		(30)	(80)	SW	-10	6.6
		06		30	90	SW	-30	9.3
		12	*	10	20	W		
	14	00	*	30	70	NW&SW		
		18	*	(20)	(60)	NW		
	15	00		20	70	NW	+7	3.4
		18		40	50	W&SW		
	16	00		20	70	W	+10	3.2
		06		20	>30	W	-19	7.9
	23	00		50	110	W	-67	14.0
		06		90	320	W	-77	15.1
		12		50	170	W	-70	14.3
		18		60	230	W	-74	14.9
	24	00		70	200	W	-81	16.0
		06		60	130	WSW	-77	15.4
		12		80	100	WSW	-50	12.1
		18		20	40	W	-23	8.7
	25	00		30	80	WSW	-37	10.6
		06	*	20	30	NW	-33	10.1
	26	06	*	20	50	WSW	-26	9.2
	28	03		30	90	SW		
		12		(30)	(70)	W		
	29	12	*	20	70	WSW		
OCT.	1	03	*	(20)	(30)	SW		
		18		20	40	W	-2	5.6
	2	06		30	70	SW		
		12		(20)	(80)	W	-18	8.1
BULUSAN (Luzon, Philippines. 12.77°N, 124.05°E, 1,559m)								
1980								
FEB.	9	21	*	30	60	S		
		22:30	*	(20)	(60)	S		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
DUKONO (Halmahera, Indonesia. 1.70°N, 127.87°E, 1,087m)								
1978								
JUL.	24	09	*	40	270	W-SW		
		10:30	*	(90)	(130)	SW		
GAMALAMA (Halmahera, Indonesia. 0.80°N, 127.33°E, 1,715m)								
1983								
AUG.	8	21	*	40	80	SW	-75	15.8
		22:30	*	(50)	(220)	SW		
	9	00	*	(120)	(350)	SW		
	10	21	*	40	80	SW		
SOPUTAN (Sulawesi, Indonesia. 1.11°N, 124.73°E, 1,784m)								
1982								
AUG.	26	06		93	120	W	-70	14.6
		09		290	390	W	-72	15.0
		10					-69	14.5
		10:30		370	490	NW&W	-69	14.5
		11					-69	14.4
		12		410	610	NW&WSW	-67	14.2
		16		270	590	NW&WSW	-69	14.5
		18		(210)	(540)	WSW	-43	11.1
		21	*	(210)	(420)	WSW	-59	13.2
		22					-45	11.4
		22:30	*	(170)	(320)	WSW		
		23					-46	11.5
	27	00		30	50	W	-66	14.1
		(Former cloud: 120km W & 250km L)						
		03		120	230	W	-66	14.1
		06		(240)	(370)	W	-51	12.2
		09		(260)	(520)	WNW		
		10:30		(270)	(370)	W		
		12	*	(280)	(440)	W		
SEP.	17	06		50	150	WSW	-70	14.8
		09		200	390	WSW	-69	14.7
		10					-58	13.2
		10:30		260	460	WSW	-53	12.4
		11					-56	12.9
		12		310	510	WSW	-52	12.2

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		16		290	660	W&NW	-59	13.6
		18		(260)	(490)	W&NW	-46	11.5
		21		(300)	(410)	W&NW		
		22:30		(300)	(520)	W&NW		
	18	00		(280)	(520)	W&NW		
		03		30	90	WSW	-62	14.0
		(New. Former cloud: 360km W & 400km L)						
		06		140	320	WSW	-54	12.9
		(Former cloud: 240 km W & 360km L)						
		09		(210)	(530)	WSW	-39	10.6
		10					-34	10.0
		10:30		(240)	(520)	WSW	-33	9.9
		11					-22	8.4
		12		(220)	(620)	W		
NOV.	9	10	*				-74	14.9
		10:30		70	170	W	-76	15.2
		11					-77	15.2
		12		120	220	W	-77	15.1
		16		220	420	W&N	-76	15.0
		18		230	490	W&N	-76	14.9
		21		290	510	WSW&N	-76	14.9
		22					-76	14.9
		22:30		310	550	WSW&N	-77	15.1
		23					-76	14.9
	10	00		290	490	WSW&N	-76	14.9
		03		230	580	WSW	-74	14.8
		06		320	680	WSW	-67	14.1
		09		(400)	(770)	WSW		
		10:30		(430)	(870)	WSW		
		12		(510)	(980)	WSW		
		16	*	(540)	(1060)	WSW		
		18	*	(640)	(1140)	WSW		
1984								
MAY	25	15		60	60	UP	-79	15.7
		21		170	260	W	-82	15.9
	26	03		(240)	(390)	NW	-70	14.7
		09	*	(450)	(470)	W	-54	12.6

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
AUG.	31	00		40	50	UP	-74	14.4
		06		310	410	W	-75	14.9
		12	*	(380)	(630)	W	-61	12.4
		18	*	(410)	(320)	W	-67	13.3
1985								
MAY	19	06	?	50	90	SSW		
		09	?	140	150	S	-83	16.0
		10	?				-77	16.3
		10:30	?	120	150	S	-75/T	16.8
		11	*				-75/T	16.8
		12	*	160	170	S	-75/T	16.8
		16	*	170	210	S	-79/T	16.1
		18	*	180	260	S	-81	15.9
		21	?	(210)	(290)	S	-66	13.7
		22:30	?	(190)	(300)	S		

(T: Over tropopause)

UNA UNA (Sulawesi, Indonesia. 0.17°S, 121.61°E, 508m)

1983								
JULY	23	09		90	100	UP	-74	15.1
		10					-76	15.3
		10:30		200	320	W		
		11					-76	15.3
		12		250	560	WSW		
	25	16		30	30	UP	-70	14.5
		18		160	210	SW		
		21	*	(240)	(380)	SW		
	27	12		30	70	WSW		
		18		40	140	SW		
		21		60	180	SW		
		22		80	250	WSW		
		22:30		90	290	WSW		
		23		90	280	WSW		
	28	00		80	270	SW		
		03		90	560	WSW		
		06		120	650	WSW		
		09		160	710	WSW		
		10		200	740	WSW		
		10:30		250	790	WSW		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		11		190	630	WSW		
		12		180	570	WSW		
		16	*	(80)	(160)	WSW		
	30	09		60	80	w	-73	16.4/14.5
		(Altitude of tropopause: 16.1km)						
		10					-80	16.0
		10:30		120	280	W		
		11		160	340	W		
		12		180	390	WSW		
		16		90	200	SW		
		(New. Former cloud: 310km W & 380km L)						
		18		130	260	SW		
		(Former cloud: 280km W & 520km L)						
		21		(140)	(310)	SW		
		22		(120)	(300)	SW		
AUG.	1	21		70	90	SW	-72	15.0
		22					-65	14.0
		22:30		90	190	SW	-63	13.7
		23					-72	15.0
	2	00		110	280	SW	-75	16.6/15.3
		(Altitude of tropopause: 16.0km)						
		03		180	440	SW	-79	15.9
		06		20	50	SW	-60	13.3
		(New. Former cloud: 260km W & 540km L)						
		09		30	80	SW	-56	12.8
		(Former cloud: 380km W & 560km L)						
		10		(20)	(100)	SW		
		10:30		(120)	(180)	SW		
		(Former cloud: 280km W & 470km L)						
		11		(180)	(220)	SW		
		12	*	(210)	(360)	SW		
		(Former cloud)						
		16		50	100	SW	-71	14.8
		(New. Former cloud: 140km W & 320km L)						
		18		(90)	(120)	SW		
		21	*	(40)	(100)	SW		
		22:30		20	90	SW		
		(New.)						

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
4	03		70	90	NWN	-73	15.6
	06		(120)	(150)	NWN	-73	16.6/15.6
	(Altitude of tropopause: 16.3km)						
	09		(170)	(190)	NWN	-63	13.8
	10:30		(160)	(190)			
	12	*	(120)	(140)			
6	09		90	110	S	-73	16.5/14.7
	(Altitude of tropopause: 15.8km)						
	10					-69	14.2
	10:30		120	130	S		
	12		(140)	(190)	S		
7	06		110	200	W	-75	16.1/15.4
	(Altitude of tropopause: 15.9km)						
	09		240	360	W	-79	15.8
	10					-77	15.8/15.7
	(Altitude of tropopause: 15.8km)						
	10:30		280	340	W	-75	16.1/15.4
	(Altitude of tropopause: 15.8km)						
	12		320	410	W		
	16		90	160	NW		
	(New. Former cloud: 350km W & 400km L)						
	18		(80)	(210)	NW		
	21	*	20	40	SW		
	(New. Former cloud: 120km W & 160km L to NW)						
11	06		110	290	SW	-69	14.3
	09		(120)	(490)	SW		
	10:30		(170)	(650)	W		
	18		90	130	SW	-73	14.8
	21		(120)	(480)	SW		
22	06	*	20	20	UP	-41	11.2
	09		120	160	W	-77	16.7/16.1
	(Altitude of tropopause: 16.4km)						
	10.30		(130)	(240)	WSW	-60	13.7
	12		(140)	(180)	NSW		
26	03		40	50	WSW	-70	14.2
	06		120	340	WSW	-66	13.9
	09	*	(210)	(360)	WSW	-54/-28	12.6/9.2
	10:30	*	(240)	(290)	WSW		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
GALUNGGUNG (Java, Indonesia. 7.25°S, 108.05°E, 2,168m)								
1982								
APR.	5	00		50	70	UP	-72	15.0
		03		80	160	ENE	-67	14.0
		06		(140)	(240)	NE	-63	13.7
	24	22					-77	16.2
		22:30		60	60	UP	-81	17.8
		23					-81	17.8
	25	00		90	150	SW	-81	17.8
MAY	5	21		140	160	S	-77	16.2
		22					-69	14.2
		22:30		200	240	S	-60	13.0
	6	00		200	260	S	-48	11.5
		03		(330)	(380)	SW	-27	9.1
		06	*	(320)	(590)	SW	-14/-50	7.1/11.9
		09		(330)	(380)	W	-33	9.9
		10	*				-47/-72	11.7/15.1
	17	16		80	90	S	-77	16.2
		18		(130)	(190)	SSE		
		21		(130)	(260)	SE		
		22		(140)	(310)	SE		
		22:30		(160)	(350)	SE		
	18	00		90	130	SE	-75	15.5
		(New. Former cloud: 150km W & 440km L)						
		03		170	270	SE	-74	15.4
		(Former cloud: 160km W & 400km L)						
		06		(240)	(350)	SE		
		(Former cloud: 110km W & 340km L)						
		09		130	210	SSE	-77	16.2
		(New. Cloud at 00 GMT: 360km W & 390km L. Cloud at 16 GMT on 17: 90km W & 260km L)						
		10					-74	15.4
		10:30		(180)	(280)	SSE		
		(Cloud at 00 GMT: 430km W & 440km L)						
		11		(180)	(320)	SSE		
		12		(140)	(400)	SE		
		(Former cloud at 00 GMT: 400km W & 560km L)						

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
		16	70	90	UP	-74	15.4
		(New. Former cloud at 09 GMT: 200km W & 600km L. Cloud at 00 GMT: 360km W & 790km L)					
		18	(120)	(220)	SE	-77	16.2
		(Cloud at 09 GMT: 280km W & 550km L. Cloud at 00 GMT: 420km & 790km L)					
		21	(140)	(440)	SE		
		(Cloud at 09 GMT: 280km W & 580km L. Cloud at 00 GMT: 520km & 880km L)					
		22:30	(220)	(460)	SE		
		(Cloud at 09 GMT: 260km W & 300km L. Cloud at 00 GMT: 390km & 790km L)					
	19	00	(230)	(480)	SE		
		(Cloud at 09 GMT on 18: 230km W & 240km L. Cloud at 00 GMT on 18: 310km W & 510km L)					
		03	(260)	(640)	SE		
		(Cloud at 09 GMT on 18: 160km W & 320km L)					
		06	(430)	(870)	SE		
		09	(30)	(40)	E	-11	6.7
		(New. Cloud at 16 GMT on 18: 470km W & 880km L)					
		10 *	(30)	(50)	ESE		
		10:30 *	(30)	(50)	ESE	-23	8.8
		(Cloud at 16 GMT on 18: 390km W & 790km L)					
		11 *	(30)	(50)	ESE		
		12 *	(30)	(50)	SE		
		(Cloud at 16 GMT on 18: 370km W & 790km L)					
JUNE	24	16	240	250	SW		
		18	350	340	SW	-67	13.8
		21	330	450	SSW		
		22	360	500	SSW		
		22:30	390	560	SSW		
		23	390	560	SW		
	25	00	380	570	SW		
		03	120	180	S		
		(New. Cloud at 16 GMT on 24: 440km W & 660km L)					
		06	(180)	(250)	SW	-69	14.2
		(Cloud at 16 GMT on 24: 650km W & 750km L)					
		09	(280)	(350)	SW		

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
		(Cloud at 16 GMT on 24: 490km W & 850km L)					
		10:30	(280)	(380)	SW		
		(Cloud at 16 GMT on 24: 490km W & 930km L)					
		12	400	930	SSW		
		(Cloud at 16 GMT on 24 and at 03 GMT on 25 joined)					
		16	(390)	(930)	SW		
		(Joined cloud)					
		18	(370)	(740)	SW		
		(Joined cloud)					
		21	(370)	(710)	SW		
		(Joined cloud)					
		22:30	(390)	(760)	SW		
		(Joined cloud)					
	26	00	(440)	(630)	SW		
		(Joined cloud)					
		03 *	(520)	(440)	WSW		
		(Joined cloud)					
JULY	13	16	180	230	SSW	-77	16.2
		18	220	390	S	-75	15.5
		21	230	440	S		
		22	250	440	S		
		22:30	(290)	(440)	S		
		23	(280)	(420)	SSE		
	14	00	40	50	UP	-70	14.4
		(New. Former cloud at 16 GMT on 13: 210km W & 390km L to SSE)					
		03	(140)	(220)	SW		
		(Cloud at 16 GMT on 13: 190km W & 410km L to SE)					
		06	40	60	UP	-72	15.0
		(New. Cloud at 16 GMT on 13: 180km W & 400km L to ESE. Cloud at 00 GMT: 180km W & 260km L to S)					
		09	250	350	SW		
		(Cloud at 16 GMT on 13: 170km W & 300km L to ESE. Cloud at 00 GMT joined to the one at 00 GMT)					
		10	(250)	(380)	SE		
		10:30	(230)	(400)	SE		
		(Joined cloud. Cloud at 16 GMT on 13: 220km W & 270km L to ESE)					
		11	(200)	(350)	SE		
		(Joined cloud)					

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
	12		(190)	(300)	SE		
	(Joined cloud. Cloud at 16 GMT on 13: 230km W & 390km L to ESE)						
	16	*	(230)	(380)	SE		
	(Cloud at 16 GMT on 13 also joined)						
	18	*	(240)	(460)	E		
	(Joined cloud)						
	21		(330)	(720)	SE		
	(Joined cloud)						
	22:30		(240)	(630)	SE		
	(Joined cloud)						
15	00		(180)	(510)	SE		
	(Joined cloud)						
	03	*	(200)	(920)	SE		
	(Joined cloud)						
	06	*	(200)	(990)	SE		
	(Joined cloud)						
	12		60	140	S	-72	15.0
	16		40	60	S		
	(New. Former cloud: 170km W & 480km L to SE)						
	18		(50)	(60)	E		
	(Cloud at 12 GMT: 180km W & 520km L)						
	21		(220)	(490)	SE		
	(Cloud at 12 GMT)						
	22:30		(230)	(530)	SE		
	(Cloud at 12 GMT)						
16	00		(270)	(480)	SE		
	(Cloud at 12 GMT on 15)						
	03		(220)	(460)	SE		
	(Cloud at 12 GMT on 15)						
	06		(140)	(290)	SE		
	(Cloud at 12 GMT on 15)						
	09	*	(140)	(260)	SE		
	(Cloud at 12 GMT on 15)						
28	16		80	230	SWS	-73	15.4
	18		130	480	SWS	-58	13.0
	21		(190)	(670)	W		
	22:30		(200)	(750)	W		
29	00		(290)	(580)	W		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		03		(360)	(620)	W		
		06		(260)	(540)	W		
		09	*	(270)	(530)	W		
		10:30	*	(260)	(530)	W		
		12		(270)	(530)	W		
		16		(90)	(230)	SW		
		(New)						
		18	*	(190)	(220)	SW		
		21		(220)	(240)	SW		
		22:30		(200)	(230)	SW		
	30	00		(210)	(250)	SW		
		18		20	30	SW	-41	11.1
		21		(210)	(290)	SW		
		22		(200)	(360)	SW		
		22:30		(200)	(430)	SW		
		23		(200)	(400)	SW		
	31	00		(200)	(350)	SW		
		(Separated cloud to WNW; 100km W & 130km L)						
		03		(160)	(260)	S		
		(Separated cloud to W; 170km W & 260km L)						
		06		(170)	(220)	S		
		09	*	(210)	(260)	S		
		10:30	*	(260)	(300)	S		
		16		190	250	SW	-57	12.9
		(New activity)						
		18		(220)	(320)	SW		
		(Separated cloud to WNW; 80km W & 90km L)						
		21		(160)	(390)	S		
		(Separated cloud to W; 130km W & 150km L)						
		22:30		(190)	(280)	S		
		(Separated cloud to W; 120km W & 150km L)						
AUG.	1	12		50	60	W	-72	15.3
		16		(180)	(280)	W		
		18		(390)	(420)	W		
		21		(400)	(440)	W		
		22:30	*	(420)	(610)	W		
	7	16		70	120	SW		
		18		(90)	(140)	SW		

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
	21		(120)	(210)	SW		
	22:30		(140)	(220)	W		
8	00		(170)	(240)	W		
	03		(180)	(270)	W		
	06	*	(190)	(380)	W		
9	06		60	110	SW	-46	11.5
	09		100	210	SW		
	(Cloud to NW: 80km W & 260km L)						
	10		120	210	SW		
	10:30		160	210	SW		
	(Cloud to WNW: 90km W & 300km L)						
	11		(150)	(240)	SW		
	12		(150)	(280)	SW		
	(Cloud to WNW: 150km W & 310km L)						
	16		(140)	(320)	SW		
	(Cloud to WNW: 140km W & 420km L)						
	18	*	(140)	(260)	WSW		
	(Cloud to WNW: 110km W & 330km L)						
10	09		70	140	W		
	10		(80)	(140)	W		
	10:30		(100)	(130)	SW		
	11		(100)	(180)	SW		
	12	*	(120)	(210)	SW		
11	18		60	70	SW	-69	14.0
	21		90	260	SW	-45	11.4
	22		100	300	SW		
	22:30		120	330	SW		
	23		(140)	(330)	SW		
12	00		(210)	(320)	SSW		
	03		(220)	(380)	SW		
	06	*	(240)	(400)	SW		
	09	*	(360)	(460)	SW		
	10:30	*	(260)	(400)	SW		
	12	*	(180)	(370)	SW		
	16	*	(160)	(290)	W		
	18	*	(150)	(300)	W		
13	06		40	60	SW	-63	13.5
	09		130	290	SW		

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
	10		130	340	SW		
	10:30		(160)	(390)	SW-NW		
	12		(180)	(490)	SW-NW		
	16	*	(180)	(330)	SW		
	18	*	(190)	(360)	SW		
	21	*	(180)	(310)	SW		
	22:30		(150)	(290)	SW		
14	00	*	(120)	(310)	WSW		
	16		60	140	SES		
	18		120	210	SES		
	(Cloud to NW: 60km W & 80km L)						
	21		(150)	(230)	SES		
	(Cloud to NW: 130km W & 90km L)						
	22:30		(140)	(260)	S		
	(Cloud to NW: 140km W & 170km L)						
15	00		(210)	(290)	S		
	(Cloud to NW: 180km W & 210km L)						
	03		(200)	(340)	S		
	(Cloud to NW-W: 220km W & 350km L)						
	10:30		40	40	up		
16	00		20	30	S	-9	6.0
	03		110	340	S-W-N	-63	13.5
	06		(200)	(690)	S-NW	-54	12.5
	09		(310)	(760)	SSW		
	10:30		(310)	(790)	S		
	12		(350)	(710)	S		
	16	*	(450)	(700)	S		
24	03		20	110	S		
	06		(20)	(90)	SE		
	09	*	(20)	(100)	SE		
	10	*	(20)	(80)	SE		
25	22		30	60	W		
	22:30		40	90	W		
	23		60	110	W		
26	00	110		150	W		
	03		(150)	(290)	W		
	06		(210)	(270)	W		
	09		(180)	(280)	W		

TIME (GMT)			W	L	DIR.	T	H
			km	km		°C	km
	10		(180)	(280)	W		
	10:30		(190)	(270)	W		
	11	*	(220)	(270)	W		
	12	*	(270)	(280)	W		
	16	*	(220)	(330)	W		
27	16		20	30	W	-2	5.3
	18		80	90	W	-3.5	10.2
	21		(100)	(210)	W		
	22		(110)	(240)	W		
	22:30		(130)	(280)	W		
	23		(140)	(300)	W		
28	00		(150)	(340)	W		
	03		(190)	(520)	W		
	06		(270)	(690)	W		
	09		(340)	(810)	W		
	10:30		(310)	(520)	W		
29	06		80	100	N-S		
	09		110	280	N-S		
	10		150	320	N-S		
	10:30		(190)	(410)	NW-S		
	12		(200)	(350)	SW		
	16		(210)	(340)	SW		
	18		(230)	(380)	SW		
	21		(240)	(470)	SW		
	22:30		(240)	(540)	SW		
30	00		(270)	(540)	SW		
	03		(260)	(540)	SW		
	06		(240)	(600)	SW		
	09	*	(230)	(640)	SW		
	10:30	*	(120)	(650)	SW		
	12	*	(90)	(640)	SW		
	22:30		20	30	SW	-27	9.1
31	00		80	160	SW	-45	11.3
	03		(180)	(350)	SW		
	06		(200)	(300)	SW		
	09		(250)	(320)	SW		
	10:30		(310)	(380)	SW		
	12		(390)	(460)	SW		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		16		(270)	(700)	SW		
SEP.	2	00		30	70	NE		
		03		90	240	S	-64	13.6
		06		(190)	(400)	S		
		09		(240)	(540)	S		
		10		(250)	(540)	S		
		10:30		(290)	(530)	S		
		12		(290)	(540)	S		
		16	*	(230)	(780)	S		
	16	16		50	(110)	SSW		
		18		(100)	(170)	S		
		21		(110)	(190)	S		
		22	*	(140)	(190)	S		
		22:30	*	(160)	(190)	S		
	18	18		50	60	SW		
		21		(100)	(210)	SW		
		22		(110)	(220)	SW		
		22:30		(120)	(240)	SW		
	20	16		90	240	W-N		
		18		(140)	(310)	W-N		
		21		(220)	(360)	W		
	22	12		60	80	SW		
		16		(140)	(290)	SW		
		18	*	(180)	(410)	SW		
	23	00	*	(30)	(120)	E		
	24	10:30		20	30	W		
		11		40	120	W		
		12		60	170	W		
		16		(210)	(330)	SW		
		18		(290)	(380)	SW		
		21	*	(240)	(410)	S		
OCT.	8	09		110	190	W	-65	13.3
		10		120	220	W	-53	12.1
		10:30		(160)	(280)	SSW	-45	11.3
		11					-37	10.3
		12		(240)	(360)	SWS	-33	9.8
		16	*	(380)	(440)	SWS		
	11	09		30	60	SW	-55	12.3

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
		10					-53	12.2
		10:30		60	110	SWS	-49	11.8
		11					-43	11.2
		12		(80)	(160)	SWS	-36	10.3
	14	06		70	90	SE	-72	15.2
		09		(190)	(230)	SE		
		10:30		(190)	(370)	SES		
SANGEANG API (Sunda Is., Indonesia. 8.183°S, 119.067°E, 1,949m)								
1985								
JULY	30	06		100	130	SW	-71	14.1
		09		(110)	(360)	SW	-50	11.8
		10				SW	-37	10.2
		10:30		(150)	(380)	SW	-30	9.4
		11				SW	-24	8.5
		12		(160)	(470)	SW	-18	7.7
		16	*	(210)	(440)	SW		
		18	*	(140)	(380)	SW		
KARKAR (New Guinea. 4.65°S, 145.96°E, 1,840m)								
1979								
MAR.	11	00	?	90	210	W		
LANGILA (New Britain, SW Pacific. 5.53°S, 148.42°E, 1,189m)								
1982								
DEC.	23	18	?	20	20	UP		
1983								
FEB.	11	16	?	20	20	UP		
ULAWUN (New Britain, SW Pacific. 5.04°S, 151.34°E, 2,300m)								
1980								
OCT.	6	22:30	?	120	140	WNW		
	7	00	?	170	270	WNW		
LOPEVI (New Hebrides, SW Pacific. 16.51°S, 168.35°E, 1,447m)								
1982								
OCT.	24	21		80	190	SES	-57	13.2
		22		(110)	(260)	SES	-41	10.7
		22:30		(120)	(240)	SES		
	25	00		(130)	(310)	SES		
AMBRYM (New Hebrides, SW Pacific. 16.25°S, 168.08°E, 1,334m)								
1980								
JULY	23	00	*	(30)	(50)	SSE		

TIME (GMT)				W	L	DIR.	T	H
				km	km		°C	km
HOME REEF (Tonga, SW Pacific. 18.99°S, 174.78°W, Submarine)								
1984								
MAR.	2	09	?	90	100	W	-54	12.5
		10	?	60	180	W	-56	12.6
		10:30	?	(60)	(180)	W	-60	13.2
		11	?	(60)	(200)	W	-76	15.2
		12	?	(100)	(200)	W	-74	15.0

Table 2-3 Annual number of volcanoes that erupted during late-1977 - 1985 in the field of view of GMS and annual frequency and rate of eruptions that sent up eruption clouds detected by GMS images. Number in parentheses denotes eruptions that sent up eruption clouds higher than 4 km. GOOD means well detected eruption cloud data without being disturbed by surrounding atmospheric clouds.

Year	Eruption	Detected Eruption Cloud			
		ALL	GOOD	ALL	GOOD
1977*	18 (0)	0	0	0.0%	0.0%
1978	32 (3)	1	0	3.1	0.0
1979	29 (2)	1	0	3.4	0.0
1980	36 (8)	6	2	16.7	5.6
1981	23 (5)	3	2	13.0	8.7
1982	21 (8)	6	5	28.6	23.8
1983	20 (8)	4	1	20.0	5.0
1984	23 (12)	6	3	26.1	13.0
1985	25 (5)	4	2	16.0	8.0
Mean	25.2(5.7)	3.4	1.7	13.7	6.6
Total	227 (51)	31	15	-	-

*1977 November - December

Table 4-1 Horizontal moving velocity (Vec) and horizontal diffusivity estimated from eruption cloud data and surrounding wind velocity (Vw). Tec means surface temperature of eruption cloud used for this calculation.

Volcano	Date of Eruption	Tec	Vec	Vw	Horizontal Diffusivity
		°C	m/s	m/s	cm^2/s
Alaid	April 27 - 30, 1981	-30	19 - 32	10 - 30	2.1×10^9 - 1.3×10^{10}
		-40			
		-60	8 - 12	10 - 30	-
Pagan	May 15, 1981	-65	14 - 15	10	9.7×10^9 - 1.3×10^{10}
		-75	5 - 7	10	-
Soputan	August 26, 1982	0 - -30	16 - 24	10*	4×10^9 - 2×10^{10}
		-40	10		
		-50 - -70	3 - 7	10*	-
Galunggung	April 24 - 25, 1982	-40 - -78	12 - 14	10*	6.5×10^9
		-81	10	10*	-
	May 5, 1982	0 - -30	9 - 16	10*	1.4×10^{10}
		-40 - -60	5 - 7	10*	-
	July 28, 1982	0 - -50	24 - 30	20*	3.4×10^9
		-60 - -70	16 - 18	20*	-
Lopevi	Oct. 24, 1982	-30 - -42	13.5	10*	2.5×10^9
Una Una	Jul. 30, 1983	-50 - -70	9 - 24	8	7×10^9
	Jul. 31 - Aug. 1, 1983	-70	9	10*	1 - 3×10^9
		-50 - -60	10 - 23	10*	-
	Aug. 2, 1983	-50 - -75	5 - 11	8	1.1×10^9
	Aug. 4 - 6, 1983	-70	3 - 5	5*	2 - 3×10^9
		-40 - -60	7 - 12	5*	2 - 3×10^9

* : rough estimation

Table 5-1 Duration time (Time) and the maximum altitude of eruption cloud (Ht) of individual eruptions at Soputan and Una Una volcanoes by ground observations (OBS) and GMS image inspections and analyses (GMS).

Volcano	OBS		GMS	
	Time (GMT)	HT	Time (GMT)	Ht
		km		km
Soputan	1982		1982	
	Aug. 26 0330-ca. 1200	3	Aug. 26 06-21	15.0
	Aug. 26 2315-Aug. 27 ca. 0600	10	Aug. 27 00-06	14.2
	Sep. 17 0407- x	x	Sep. 17 06-18	14.8
	Sep. 18 0126-ca. 0500	14	Sep. 18 03-11	14.0
	Nov. 09 0920-1245	3	Nov. 09 1030-12-*	15.2
	Nov. 09 ca. 1600-Nov. 10 ca. 1000	5	Nov. 09 16-Nov. 10 06	15.1
	1984		1984	
	May 25 1443-1900	4	May. 25 15-21	16.2
	Aug. 30 2309-Aug. 31 0657	6	Aug. 31 00-06	15.4
Una Una	1983		1983	
	Jul. 23 0823- x	10	Jul. 23 09-12	15.3
	Jul. 25 1525-1621	7.5	Jul. 25 16-18	14.5
	Jul. 26 2000-2205	7.5	x	x
	Jul. 27 0700-1210	7.0	Jul. 27 12-*	-
	Jul. 27 1602-1645	8.0	Jul. 27 18-21	-
	Jul. 28 0830-0930	8.0	Jul. 28 03-12	-
	Jul. 30 0815- x	6.0	Jul. 30 09-18	15.9
	Aug. 1 1034-1200	7.0	x	x
	Aug. 1 1330-1830	6.0	x	x
	Aug. 1 1914-2200	8.0	Aug. 1 21-2230-*	15.0
	Aug. 2 0000-0100	8.0	Aug. 1 23-Aug. 2 09	15.9
	Aug. 2 1105-1800	5.0	Aug. 2 16	14.8
	Aug. 4 0115-0300	6.0	Aug. 4 03-09	15.6
	Aug. 6 0720- x	6.0	Aug. 6 09-1030	14.7
	Aug. 7 0300-1100	10.0	Aug. 7 06-16	15.8
	Aug. 11 0315-0335	8.0	Aug. 11 06	14.3
	Aug. 11 1647-1747	9.0	Aug. 11 18-21	14.8
	Aug. 18 0213-0440	12.0	x	x
	Aug. 22 0403- x	8.0	Aug. 22 06-09	16.1
	Aug. 24 1348-1420	4.0	x	x
	Aug. 25 1047-1200	5.5	x	x
	Aug. 26 0223-0339	10.0	Aug. 26 03-06	14.2

x : No observation.
- : Not analyzed.
* : Not separated on GMS images.

Table 5-2 Examples of estimation of thermal energy releases based on eruption cloud data at some volcanic eruptions. Grades of intensity of individual eruptions are divided into two classes of large (L) and small (S) ones. Thermal energy release rate (T. E. R.) and its mean value (Mean T. E. R.) in mega watts, total of duration time of individual eruption (Duration Time) in hours, total thermal energy release based on eruption cloud data (Total T. E. R.) in erg, total volume of ejected materials (Ejecta) in m^3, estimated kinetic energy by ejecta (K. E.) in ergs and thermal energy released by juvenile ejecta (T. E.) in ergs are compiled.

Volcano (Year)	Individual Eruption			Mean	Duration	Total	Ejecta	K.E.	T.E.
	Class	Date	T.E.R.	T.E.R.	Time	T.E.			
		GMT	MW	MW	hour	erg	m^3	erg	erg
Alaid (1981)	L	Apr. 28 06	1.7 $\times 10^4$						
		Apr. 29 00 - 06	1.3-1.5 $\times 10^4$	1.1 $\times 10^4$	102	7×10^{22}	3×10^{8}*	5×10^{22}	3×10^{24}
		Apr. 30 00	1.5 $\times 10^4$						
	S	May 9 00 -09	0.2-1.0 $\times 10^4$	0.4 $\times 10^4$	220				
Asama (1982)	S	Apr. 25 18	0.3 -0.5 $\times 10^4$	0.3 $\times 10^4$	0.4	4×10^{19}	6×10^{4}	1×10^{18}	6×10^{20}
Pagan (1981)	L	May 15 00 -06	3.1 -3.7 $\times 10^5$	1.2 $\times 10^5$	10	4×10^{22}	9×10^{7}	2×10^{22}	9×10^{23}
Galung-gung (1982)	L	Apr. 24 03 -25 00	0.8 -1.4 $\times 10^5$						
		May 5 21 -22	0.8 -1.1 $\times 10^5$	1.1 $\times 10^5$	188	7×10^{23}	2×10^{8}	3×10^{22}	2×10^{24}
		July 13 16	6.4 $\times 10^5$						
		July 28 16	2.1 -2.8 $\times 10^5$						
	S	Aug. 27 16	0.1 -1.0 $\times 10^4$	0.2 $\times 10^4$	43				
Lopevi (1982)	L	Oct. 24 21	4.0 $\times 10^4$	2 $\times 10^4$	1.6	1.2 $\times 10^{21}$	10^{6}*	5×10^{19}	2×10^{22}

* : rough estimation

Table 5-3 Estimated thermal energy release rate (Q) on the basis of eruption cloud of individual eruptions at Soputan and Una Una volcanoes by applying the method proposed by Briggs (1969). Δh, u and x mean cloud-altitude above the crater, surrounding wind velocity and horizontal distance used for the calculation, respectively.

Volcano	GMS Data	△h	u	x	Q
	GMT	km	m/sec	km	M watt
Soputan	1982				
(1,784 m a. s. l.)	Aug. 26 06-21	13.0	13	27	1.7×10^5
	Aug. 27 00-06	12.4	7	22	3.5×10^4
	Sep. 17 06-18	13.0	10	22	1.2×10^5
	Sep. 18 03-11	12.1	11	22	1.3×10^5
	Nov. 09 1030-12-*	13.4	8	39	2.1×10^4
	Nov. 09 16-10 06	13.3	8	33	2.9×10^4
	1984				
	May 25 15-21	14.1	5	5	3.7×10^5
	Aug. 31 00-06	13.1	8	33	2.8×10^4
Una Una	1983				
(508 m a. s. l.)	Jul. 23 09-12	14.8	23	44	5.4×10^5
	Jul. 25 16-18	14.0	7	22	5.1×10^4
	Jul. 30 09-18	15.4	12	17	5.8×10^5
	Aug. 01 21-2230-*	14.2	8	11	3.2×10^5
	Aug. 01 23-02 09	15.0	8	44	2.4×10^4
	Aug. 02 16	14.0	14	22	4.1×10^5
	Aug. 04 03-09	15.1	4	17	2.0×10^4
	Aug. 06 09-1030	14.2	8	22	8.0×10^4
	Aug. 07 06-16	15.3	9	11	5.7×10^5
	Aug. 11 06	9.6	9	50	6.8×10^3
	Aug. 11 18-21	14.3	26	44	7.0×10^5
	Aug. 22 06-09	10.7	19	44	1.1×10^5
	Aug. 26 03-06	13.7	20	17	1.9×10^6

* : Not separated from the volcano in GMS image.

Table 5-4 Summary of mean thermal energy release rate (Mean T. E. R.), total thermal energy (Total T. E.) based on eruption cloud data, total volume of ejecta (Ejecta) and thermal energy (T. E.) by ejected materials of the 1982 and 1984 Soputan Eruptions and the 1983 Una Una Eruption.

Volcano	Mean T.E.R.	Total T.E.	Ejecta	T.E.
	M watt	erg	m^3	erg
Soputan (1982 Aug., Sep. and Nov.)	8×10^4	2×10^{22}	3.5×10^6	4.2×10^{22}
Soputan (1984 May and Aug.)	2×10^5	1×10^{22}	1.0×10^{7}*	1.2×10^{23}
Una Una (1983 Jul. - Aug.)	4×10^5	1.9×10^{23}	9.4×10^7	1.1×10^{24}

* : approximate estimation

Table 5-5 Height of eruption cloud above the crater (Δh), the surrounding wind velocity (u) and horizontal distance from the crater (x) used for calculation of thermal energy release rate (Q) in the 1984 Mayon Eruption.

Date	△h	u	x	Q
GMT	km	m/sec	km	Mega Watts
1984				
Sep. 10 18	1.9	5	9	2.8×10^{2}
11 00	0.1	5	28	0.4×10^{-2}
06	3.3	5	31	1.2×10^{2}
12	4.7	4	33	1.6×10^{2}
18	0.1	5	27	0.5×10^{-2}
12 06	1.7	4	22	0.2×10^{2}
12	1.8	4	28	0.1×10^{2}
18	1.8	4	56	0.3×10^{1}
13 00	2.5	5	17	1.8×10^{2}
06	6.3	4	23	8.0×10^{2}
15 00	0.4	4	6	0.3×10^{1}
16 00	0.2	5	23	0.5×10^{-1}
06	4.9	4	5	8.0×10^{3}
23 00	10.8	13	25	1.2×10^{5}
06	12.1	16	17	6.6×10^{5}
12	10.9	10	34	2.9×10^{4}
18	11.9	13	23	1.8×10^{5}
24 00	12.4	12	10	8.7×10^{5}
06	12.4	14	25	2.2×10^{5}
12	9.1	9	23	2.7×10^{4}
18	3.7	5	6	4.6×10^{3}
25 00	6.3	4	12	2.9×10^{3}
06	7.1	6	23	3.8×10^{3}
26 06	6.2	6	30	1.5×10^{3}
Oct. 1 18	2.6	10	4	2.9×10^{4}
2 12	5.1	15	17	4.1×10^{4}