Geological and Petrological Studies of the "Shirasu" in South Kyushu, Japan Part VIII : The "Shirasu" in the Nojiri District, Miyazaki Prefecture, and the Significance of the "Older Pumice Flow"

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Geological and Petrological Studies of the "Shirasu" in South Kyushu, Japan

Part VIII

(The "Shirasu" in the Nojiri District, Miyazaki Prefecture, and the Significance of the "Older Pumice Flow")

Sadakatu TANEDA

Abstract

The geology and lithological and petrographical properties of the "Shirasu" in the northeastern part of the Aira volcanic region are described briefly in this paper. The refractive indices of the glass are 1.497–1.501, the chemical compositions of the pumice fragments are SiO_2 73, and the "median diameters" (Md) obtained by mechanical analysis (excluding large fragments >4 mm) are 0.16–0.28 mm.

It is noticed that the "older pumice flow" differs from the "Shirasu" in distribution, contour lines for Md and petrographic properties, and its eruptive center seems to be found in the northern part of the Kirishima volcano.

I. Outline of geology and petrography

The geological succession in the Nojiri district, Miyazaki Prefecture is shown in Fig. 1, to which the brief description is added below:

(1) The basement is the "Shimanto group" regarded as the Mesozoic age consisting of sandstone and shale.

(2) The "older pumice flow" (Nojiri) is exposed in the Nojiri district, under the "younger pumice flow" (the "Shirasu") and the Kirishima volcanics composed of volcanic ash, and pumice, scoria and lithic lapilli.

(3) The "younger pumice flow" is the so called "Shirasu", character of which is the same as described in the previous papers (Parts I–VII (TANEDA 1954~ TANEDA et al., 1970); TANEDA, 1968, 71, 75). The "older pumice flow" (Nojiri) is riched in comparatively large pumice fragments, sometimes with obsidian ones.

The distribution of the "Shirasu" in the northeastern part of the Aira volcano is shown in Fig. 2, in which contour lines (200 m, 130 m and 100 m) for the basal plane of the "Shirasu" bed are shown, along with contour lines (400 m, 300 m, 200 m and 100 m) for the surface of the same bed. The Nojiri district is located at the northeastern part of the area shown in Fig. 2.

The refractive indices of glass of the "Shirasu" and the "older pumice flow" are listed into Table 1, and the chemical compositions of the pumice fragments in the both pumice flows are shown in Table 2, along with that of the host around

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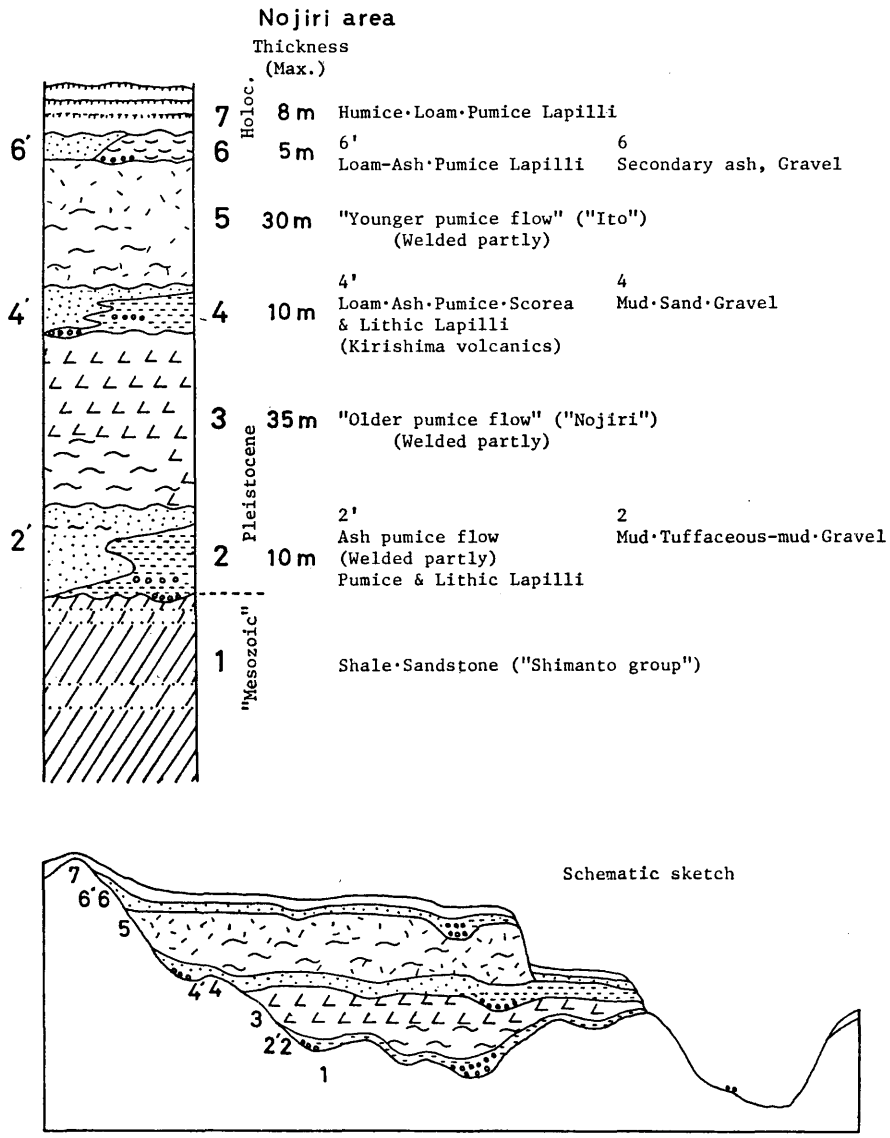

Fig. 1. Geological succession and schematic sketch of geologic section.

the pumice fragments analysed. It should be noticed that the "older pumice flow" differs from the "Shirasu" in petrographic properties as well as in distribution and grain size, of which description is given below.

II. Size distribution

The younger and older pumice flow deposits were mechanically analysed excluding large fragments exceeding 4 mm in diameter. Some of the data obtained are given in Table 3 and Fig. 3, showing the characteristic of pumice flow.

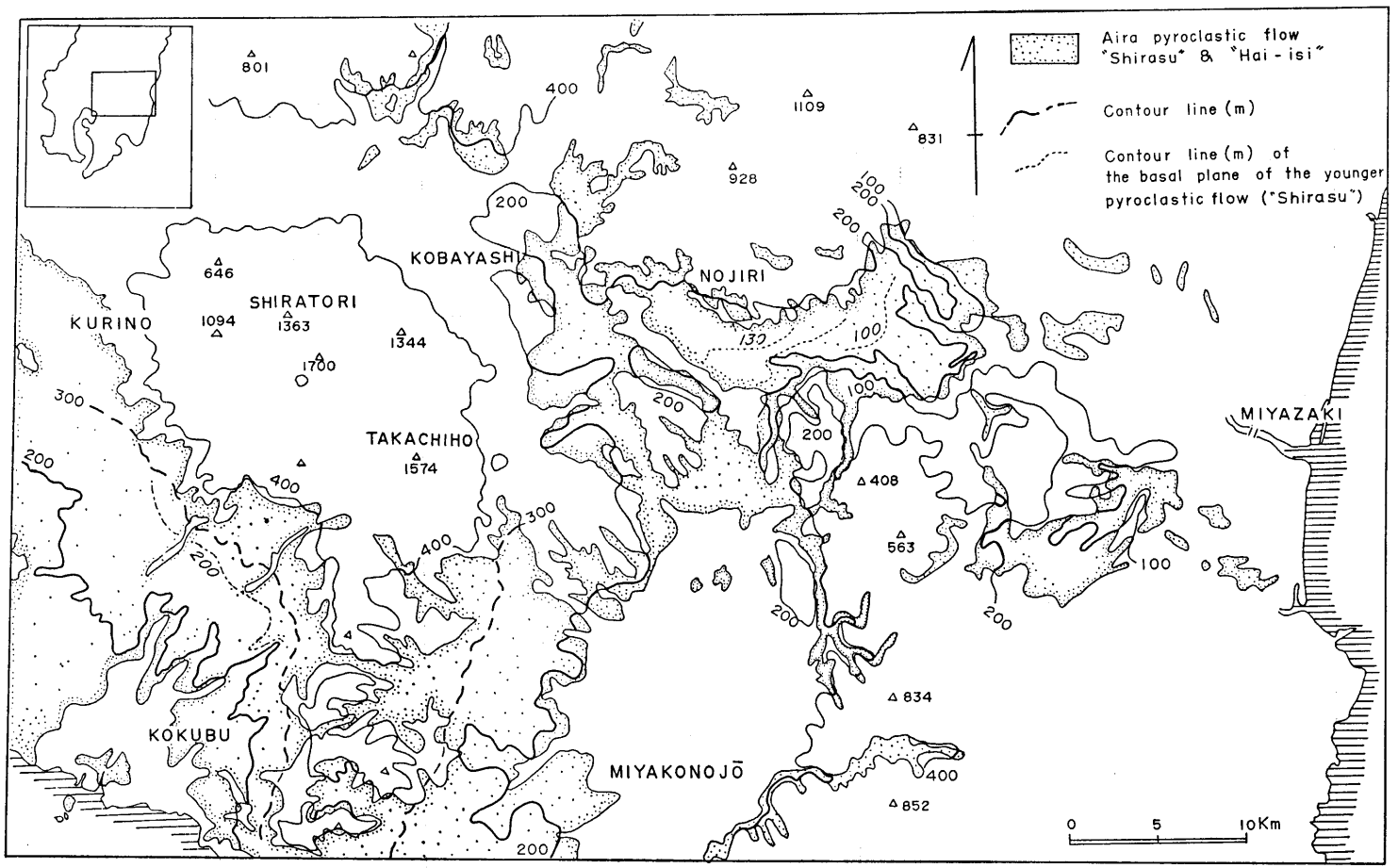

Fig. 2. Distribution of the "Shirasu" in the northeastern part of the Aira volcano. Contour lines for the surface (400, 300, 200, 100) and the basal plane (200, 1300, 100).

Table 1. Petrographic properties of the "younger pumice flow" ("Shirasu") and the "older pumice flow".

	SiO_2 Wt%	Glass n	Hypersthene n_1, n_2	Md (mm)
Younger pumice flow of South Kyushu	70–74	(1.491)1.497–1.501(1.502)	n_1 1.707–1.710 n_2 1.724–1.728	0.64–0.13
Nojiri district				
Non-welded	73	1.497–1.501		0.28–0.16
Welded	73	1.496–1.497		
Older pumice flow of Nojiri district	70	1.502–1.503		0.80–0.38

Table 2. Chemical compositions of the pyroclastic flow materials.

		1	2	3	4	5	6
SiO_2		73.24	73.23	73.13	70.07	69.98	73.01–73.76
TiO_2		0.10	0.20	0.26	0.31	0.38	0.15– 0.17
Al_2O_3		12.91	13.03	13.32	13.91	14.63	12.47–13.16
Fe_2O_3		0.58	0.36	0.70	0.81	1.32	0.03– 1.11
FeO		1.49	1.45	1.66	1.81	2.22	1.56– 1.76
MnO		0.03	0.04	0.03	0.04	0.02	0.03– 0.08
MgO		0.31	0.30	0.32	0.65	0.80	0.30– 0.44
CaO		2.03	1.92	2.26	2.20	2.62	1.92– 2.38
Na_2O		3.50	3.60	3.60	3.50	3.90	3.01– 3.93
K_2O		2.70	2.70	2.70	3.70	3.00	2.49– 3.17
H_2O+		2.40	2.41	2.03	2.61	1.36	2.09– 2.41
H_2O-		0.26	0.40	0.15	0.23	0.03	0.31– 0.56
P_2O_5		0.01	tr	0.01	0.01	0.01	0.10– 0.24
Total		99.56	99.64	100.17	99.85	100.27	99.89–100.65
Norm	Or	28. 7	28. 5	27. 8	35. 1	27. 7	30–32
	ab	53. 3	54. 4	52. 9	47. 5	51. 9	49–57
	an	18. 0	17. 0	19. 3	17. 4	20. 4	13–21
	wo	0.	0.	0.	0.	0. 2	0–15
	en	26. 5	26. 4	27. 7	37. 7	45. 6	26–29
	fs	73. 4	73. 6	72. 3	62. 3	54. 2	59–72

1–5. Collected by S. TANEDA from the Nojiri district, Miyazaki Prefecture; Analysed by N. ŌBA, 6. After K. YAMAGUCHI

1. Pumice fragment in the "Shirasu" (younger pumice flow).
2. Pumice fragment in "Hai-ishi" (the welded part of the younger pumice flow).
3. "Hai-ishi" (the host of pumice fragment (2)).
4. Pumice fragment in the "older pumice flow".
5. Glassy lava block in the "older pumice flow".
6. Pumice fragments in the "Shirasu" from the Kagoshima vicinity.

Table 3. Size distribution of the "Shirasu", excluding large fragments exceeding 4mm in diameter; 1-34 "Shirasu", 2'-34' the "older pumice flow", the Nojiri district.

Size / No.	mm 4-2	mm 2-1	mm 1-1/2	mm 1/2-1/4	mm 1/4-1/8	mm 1/8-1/16	mm 1/16>	Md
1	1	6	13	22	26	31	1	0.20
2	1	4	10	25	25	34	1	0.19
3	1	4	9	22	32	32		0.18
3L	1	5	11	31	27	25		0.24
4	0	5	12	29	32	22		0.23
5	2	4	13	25	27	27	2	0.21
5U	2	5	11	26	27	29		0.19
6	1	6	12	27	26	28		0.23
7	3	6	13	23	25	30		0.22
8	5	10	14	24	21	24	2	0.27
9	3	7	13	25	28	24		0.24
10U	4	10	12	17	19	32	4	0.20
10L	5	10	17	20	20	25	3	0.27
11	2	7	11	21	25	30	4	0.19
12	6	11	15	23	24	20	2	0.28
13	5	10	15	17	22	26	5	0.24
14	3	7	10	28	30	22		0.24
15	2	7	13	28	27	23		0.25
16	2	10	14	20	25	23	6	0.22
17	5	13	15	22	22	20	3	0.28
18	2	7	12	29	34	16		0.25
19	5	10	13	26	29	17		0.27
20	4	7	11	25	29	24		0.24
21	4	4	7	20	26	36	3	0.16
22	3	7	11	20	22	34		0.18
23L	3	8	16	32	19	21		0.28
23U	1	5	9	29	27	29		0.22
24	2	6	11	31	25	24	1	0.25
25	5	10	12	28	27	18		0.28
26	2	6	12	18	29	30	3	0.18
27	1	5	11	22	27	32	2	0.18
31	1	3	8	31	35	22	'	0.27
32	2	3	11	24	28	31	1	0.19
33	2	9	13	24	29	22	1	0.24
34	2	6	15	35	23	19		0.27
2'	8	18	22	19	16	15	2	0.49
3'	11	22	23	18	14	11	1	0.62
19'(1)	8	28	20	18	13	12	1	
19'(2)	12	23	20	17	13	14		0.60
23'	11	18	23	20	15	13		0.50
29'	13	19	20	17	14	13	4	0.54
30'	10	19	19	17	16	16	3	0.44
34'	3	18	30	25	14	10		0.52

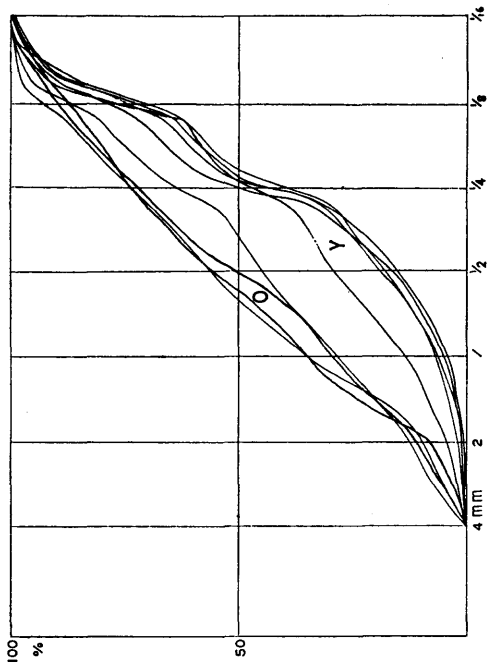

Fig. 3. Cumulative curve for the "younger pumice flow" (the "Shirasu") and the "older pumice flow".
O: the "older pumice flow".
Y: the "younger pumice flow" (the "Shirasu")

It is remarked that the contour lines for mediam diameter (Md) of the "older pumice flow" deposits differ distinctly from those of the younger pumice flow deposits (the "Shirasu") (Fig. 4). The eruptive center of the "older pumice flow" deposits seems to be found at the northern part of the Kirishima volcano, while that of the "Shirasu" seems to be the central part of the Aira volcano.

III. Remarks

In the Nojiri district, where is the northeastern end of the "Shirasu Region" are developed the pyroclastic flow deposits erupted from the different eruptive sources. One of them is the "Shirasu" (the "younger pyroclastic flow") and the other distinct one is the "older pyroclastic flow" (Nojiri).

The "Shirasu" is light gray pumice flow deposits, and composed of pumice and lithic fragments, glass flakes and a small amount of crystal grains of plagioclase, quartz, hypersthene and augite with or without hornblende.

In the illustoration showing the distribution of the "Shirasu" (Fig. 2), the contour lines for the surface and basal planes are shown respectively. The contour lines for Md are also given for the "Shirasu" and the "older pumice flow" (Fig. 4).

The older pumice flow deposit is coarse-grained, and the pumice is sometimes slightly yellowish in colour and basic (poor in SiO_2 content). It is very remarkable that the eruptive center of the "older pumice flow" (Nojiri) seems to be found in the northern part of the Kirishima volcano.

Acknowledgement

I wish to express my sincere thanks to Prof. Noboru ŌBA of Kagoshima University for his kind cooperation in chemical analysis of the pyroclastic flow materials, and to Dr. M. MIYACHI of Kyushu University for her cordial help in mechanical analysis.

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References

TANEDA, S. (1954): Geological and petrological studies on the "Shirasu" in South

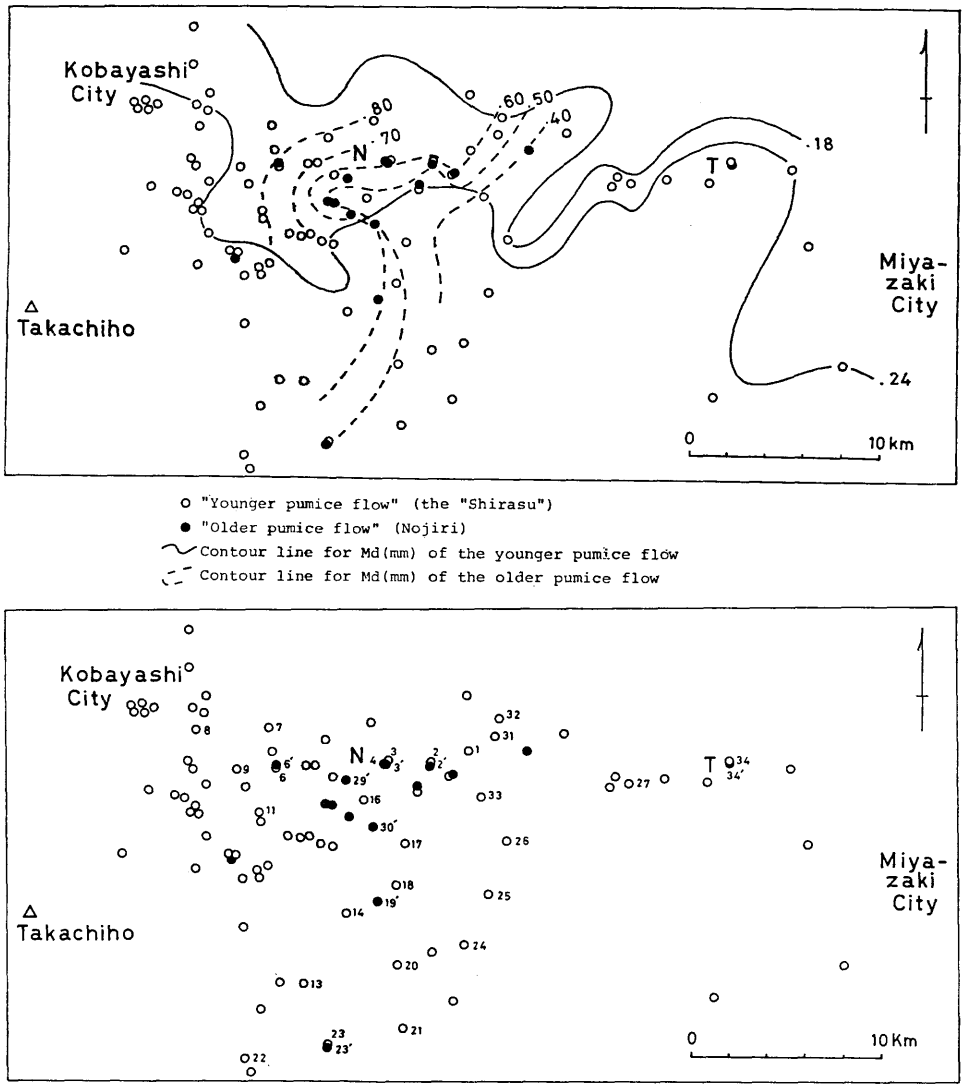

Fig. 4. Localities of samples mechanically analysed and the contour lines for Md. Locality Nos. refer to Table 3. Open circles: the "Shirasu", solid circles: the "older pumice flow". Abbrev.: N Nojiri, T Takaoka.

Kyushu, Japan. Part I. *Mem. Fac. Sci., Kyushu Univ., Geol.*, **4**, (2), 167–177.

TANEDA, S. (1957): Do., Part II. *Ibid.*, **6**, (2), 91–105.

———, et al. (1957): Do., Part III. *Ibid.*, **6**, (2), 107–127.

———, et al. (1970): Do., Parts IV–VII. *Ibid.*, **20**, (1), 147–175.

——— (1968): Geological studies on the damage of the Ebino Erthquake in 1968. *Bull. Volc. Soc. Japan*, **20**, (1), 61–73.

——— (1971): Studies on the size and shape of the fragments of the pyroclastic flow deposits. *Sci. Rep. Shimabara Volc. Observ., Fac. Sci., Kyushu Univ.*, No. 7, 9–18.

——— (1975): The shape and size of the fragments of the "Shirasu" with special reference to the collapses of the "Shirasu" cliff. *Ibid.*, No. 10, 9–20.