Bulletin of the Earthquake
Research Institute
Vol. 44 (1966), pp. 551-559

33. *Geotectonic Maps of the Japanese Islands, (I)—Map of Faults.*

By Isamu Murai,

Earthquake Research Institute.

(Read Oct. 26, 1965.—Received March 31, 1966.)

1. Introduction

During recent decades geological research on the Japanese Islands has made outstanding progress. Many regional compiled geological maps have been published by the Geological Survey of Japan and other organizations. The writer continues the work of compilation of these maps to obtain fundamental data concerning the geotectonics of the Japanese Islands. This kind of work is quite laborious and requires a lot of time. The writer's work is not so complete and, of course, its accuracy entirely depends on that of the base maps. It must be refined progressively in accordance with the advance of geological research in the future.

The writer tried to make a compiled map of faults, which is presented in this paper. Besides this, he proceeds to the making of compiled maps of folding, igneous bodies, both intrusive and effusive, and of sedimentary formations, which will be presented in the next paper. The geotectonic framework of the Japanese Islands may be deciphered with the aid of these fundamental maps of every unit of geological constituent.

2. Base Maps used in Compilation

As the applicable maps for the writer's work of compilation, he used the regional geological maps with scales of 1:100,000 to 1:500,000 issued by the Geological Survey of Japan, prefecture offices, agricultural experiment stations of prefectures, and other public corporations. Each area of such maps is shown in the index maps (figs. 1~3). The maps are listed as follows:

1:500,000 geological sheet map, Geological Survey of Japan.

"Aomori", compiled by O. Hirokawa, *et al.*, (1960). Sheet no. 5.

"Akita", compiled by J. Hirayama, *et al.*, (1959). Sheet no. 6.

"Niigata", compiled by M. Fukuda, *et al.*, (1958). Sheet no. 7.

"Tôkyô", compiled by M. Fukuda, *et al.*, (1956). Sheet no. 8.

"Kanazawa", compiled by H. Isomi, *et al.*, (1958). Sheet no. 10.
"Kyôto", compiled by R. Endô, *et al.*, (1951). Sheet no. 11.
"Kôchi", compiled by R. Endô, *et al.*, (1951). Sheet no. 13.
"Fukuoka", compiled by S. Iwao, *et al.*, (1952). Sheet no. 14.
"Kagoshima", compiled by S. Iwao, *et al.*, (1954). Sheet no. 15.
1 : 200,000 geological sheet map, Geological Survey of Japan.
"Aomori", compiled by K. Tsushima, *et al.*, (1961). Sheet no. 23.

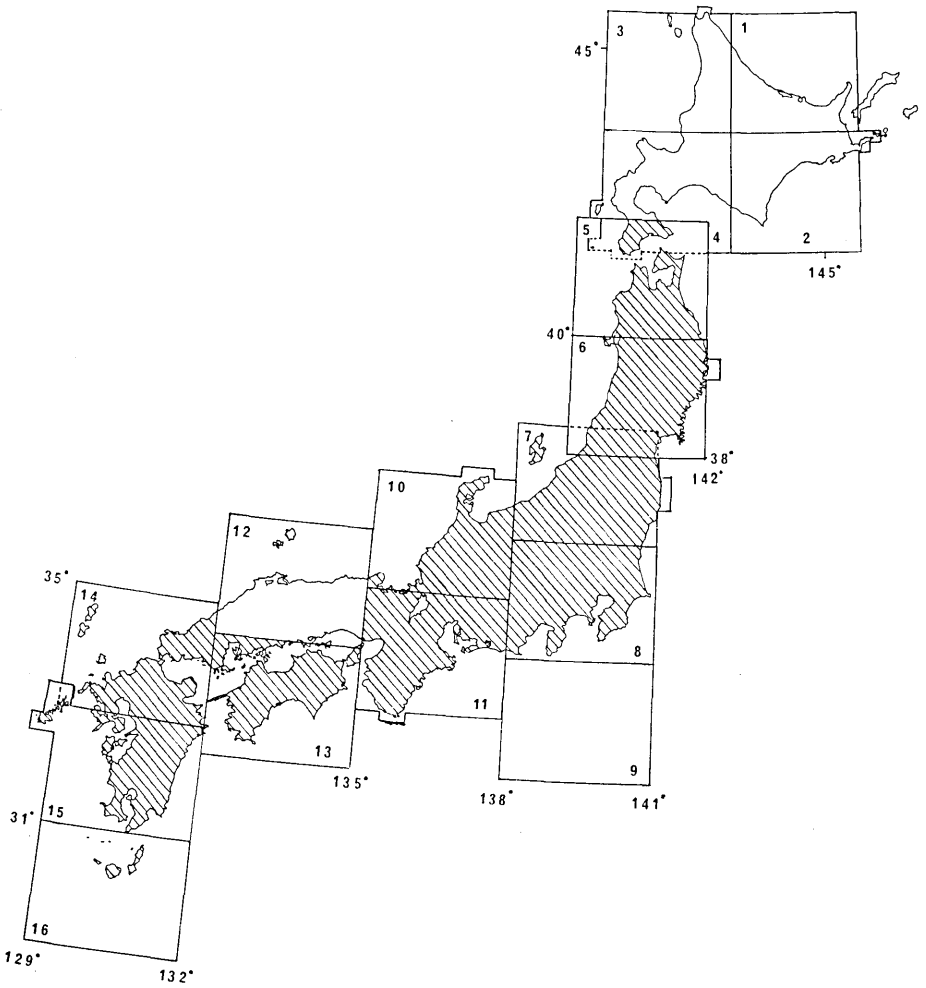

Fig. 1. Index map of the geological sheet-maps on scale 1:500,000, which were adopted for the compilation. Figures represent the sheet nos. from the Geological Survey of Japan.

"Ogashima", compiled by A. Ôzawa, (1960). Sheet no. 25.
"Akita", compiled by A. Ôzawa, (1960). Sheet no. 19.
"Shinjô", compiled by A. Ôzawa, (1960). Sheet no. 20.
"Ishinomaki", compiled by N. Kambe, (1959). Sheet no. 15.
"Mito", compiled by T. Suzuki, *et al.*, (1960). Sheet no. 24.
"Wajima", compiled by T. Sakamoto and K. Matsui, (1961). Sheet no. 4·10,
"Iida", compiled by K. Kawada, *et al.*, (1961). Sheet no. 1.
"Toyohashi", compiled by Compilation Section, Geological Dep., (1955). Sheet no. 2.

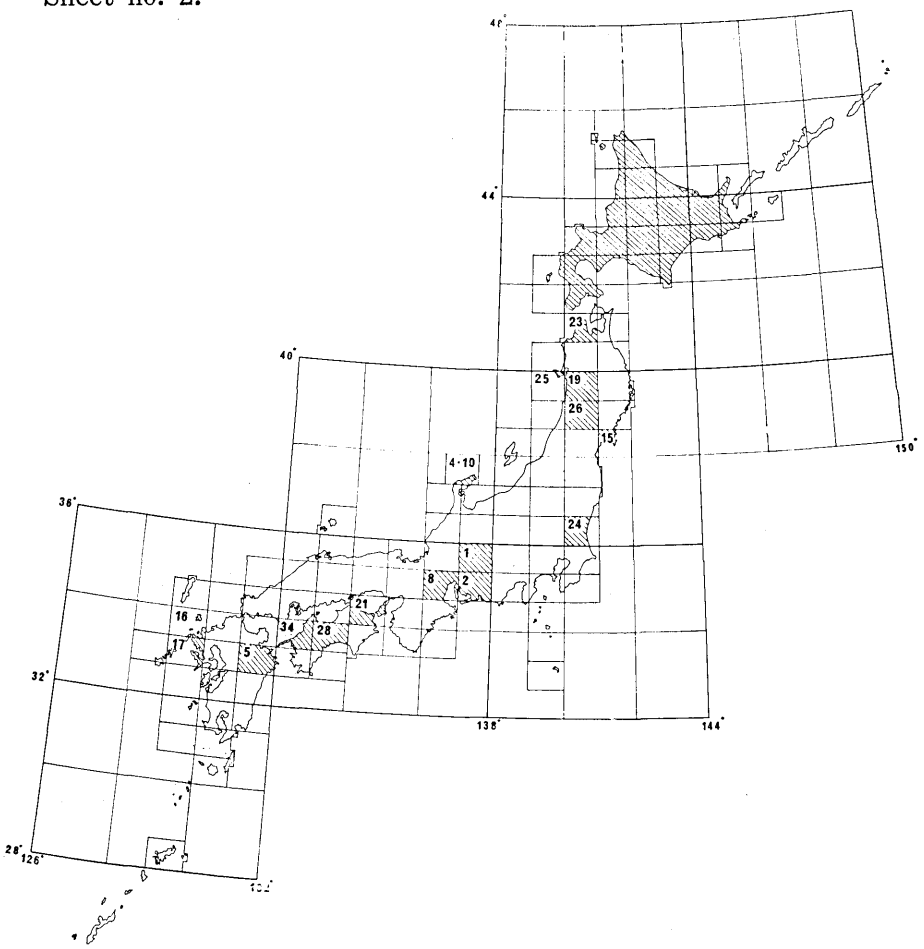

Fig. 2. Index map of the geological sheet-maps on scale 1:200,000, which were adopted for the compilation. Figures represent the sheet nos. from the Geological Survey of Japan.

"Nagoya", compiled by Compilation Section, Geological Dep., (1955). Sheet no. 3.
"Tokushima", compiled by K. Tsushima and M. Katada, (1961). Sheet no. 27.

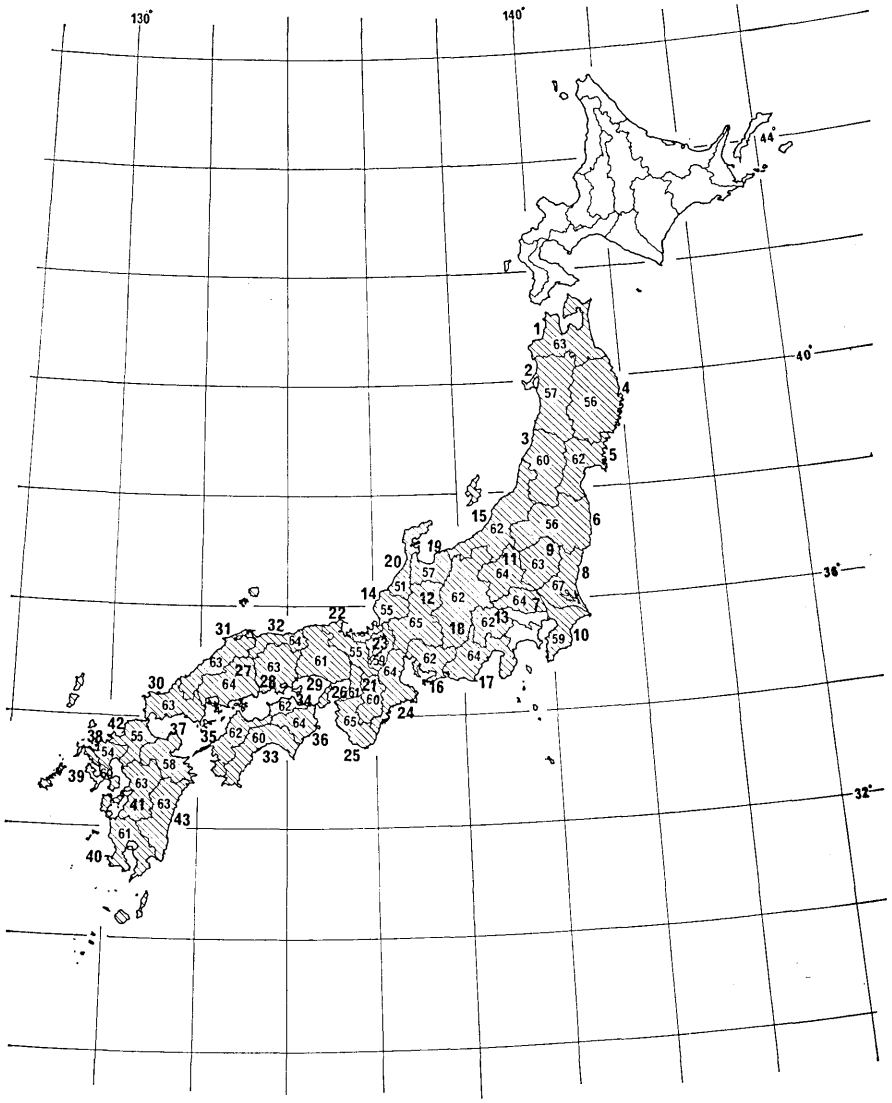

Fig. 3. Index map of the geological maps published by prefecture offices and other organizations. Large figures correspond to the nos. of each map in the text, and small figures represent the year of publication of each map.

"Kôchi", compiled by H. Isomi, (1958). Sheet no. 28.
"Matsuyama", compiled by Compilation Section, Geological Dep., (1957). Sheet no. 34.
"Ôita", compiled by K. Tsushima and K. Ono, (1958). Sheet no. 5.
"Karatsu", compiled by T. Suzuki, *et al.* (1959). Sheet no. 16.
"Nagasaki", compiled by I. Imai, *et al.*, (1965). Sheet no. 17.

1 : 200,000 geological map of Hokkaidô, compiled by Y. Sassa, *et al.*, Hokkaidô Geological Survey, (1953～58).

Geological map of each prefecture

1. "Aomori", 1 : 200,000, compiled by S. Kitamura, *et al.*, Naigai-chizu, (1963).
2. "Akita", 1 : 200,000, compiled by M. Saito, *et al.*, Mineral Resource Sec., Akita Prefecture Office, (1957).
3. "Yamagata", 1 : 200,000, compiled by S. Jinbo, Yamagata Prefecture Office, (1960).
4. "Iwate", 1 : 200,000, compiled by Geological Institute, Faculty of Sci., Univ. Tôhoku, Iwate Prefecture Office, (1956).
5. "Miyagi", 1 : 200,000, compiled by Y. Onuki and S. Kitamura, Naigai-chizu, (1962).
6. "Fukushima", 1 : 200,000, compiled by M. Watanabe, *et al.*, Fukushima Prefecture Office, (1956).
7. "Saitama", 1 : 200,000, compiled by H. Fujimoto, *et al.*, Saitama Prefecture Office, (1964).
8. "Ibaragi", 1 : 200,000, compiled by M. Omori and S. Nomura, Agricultural Experiment Station, Ibaragi Prefecture, (1962).
9. "Tochigi", 1 : 200,000, Tochigi Prefecture Office, (1963).
10. "Chiba", 1 : 200,000, compiled by K. Suyama and H. Naruse, Naigai-chizu, (1959).
11. "Gunma", 1 : 200,000, compiled by H. Arai, *et al.*, Gunma Prefecture Office, (1964).
12. "Gifu", 1 : 200,000, compiled by S. Ushimaru, Gifu Prefectnre Office, (1965).
13. "Yamanashi", 1 : 150,000, Erosion Control Society, Yamanashi Prefecture, (1962).
14. "Fukui", 1 : 200,000, compiled by Geological Survey of Japan, Fukui Prefecture Office, (1955).
15. "Niigata", 1 : 200,000, compiled by S. Saito, *et al.*, Niigata Prefecture Office, (1962).

16. "Aichi", 1 : 200,000, compiled by Fukada Geological Survey, Naigai-chizu, (1962).
17. "Shizuoka", 1 : 200,000, compiled by Geological Institute, Univ. Shizuoka, Shizuoka Prefecture Office, (1964).
18. "Nagano", 1 : 200,000, compiled by Nagano Geological Society, Naigai-chizu, (1962).
19. "Toyama", 1 : 200,000, Economic Dep., Toyama Prefecture Office, (1957).
20. "Ishikawa", 1 : 200,000, Local Development Office, Ishikawa Prefecture, (1951).
21. "Nara", 1 : 200,000, Nara Prefecture Office, (1960).
22. "Kyôto", 1 : 200,000, Agricultural Experiment Station, Kyôto Prefecture, (1955).
23. "Shiga", 1 : 200,000, Agricultural Experiment Station, Shiga Prefecture, (1959).
24. "Mie", 1 : 200,000, compiled by M. Kaneko, *et al.*, Mie Prefecture Office, (1964).
25. "Wakayama", 1 : 200,000, Naigai-chizu, (1965).
26. "Ôsaka", 1 : 150,000, Agricultural Experiment Station, Ôsaka Prefecture, (1961).
27. "Hiroshima", 1 : 200,000, compiled by Y. Umegaki, Hiroshima Prefecture Office, (1964).
28. "Okayama", 1 : 150,000, Okayama Prefecture Office, (1963).
29. "Hyôgo", 1 : 170,000, compiled by N. Ikebe, *et al.*, Hyôgo Prefecture Office, (1961).
30. "Yamaguchi", 1 : 200,000, compiled S. Imamura, *et al.*, Yamaguchi Prefecture Office, (1963).
31. "Shimane", 1 : 200,000, compiled by S. Nishiyama and K. Miura, Commerce, Industry and Fishery Dept., Simane Prefecture Office, (1963).
32. "Tottori", 1 : 200,000, Tottori Prefecture Office, (1964).
33. "Kôchi", 1 : 200,000, compiled by J. Katto, *et al.*, Kôchi Prefecture Office, (1960).
34. "Kagawa", 1 : 100,000, compiled by M. Saito, *et al.*, Kagawa Prefecture Office, (1962).
35. "Ehime", 1 : 100,000, compiled by Geological Survey of Japan, Ehime Prefecture Office, (1962).
36. "Tokushima", 1 : 200,000, Tokushima Prefecture Office, (1964).
37. "Ôita", 1 : 200,000, Ôita Prefecture Office, (1958).

38. "Saga", 1:100,000, compiled by K. Kinoshita, Saga Prefecture Office, (1954).
39. "Nagasaki", 1:200,000, Agricultural Experiment Station, Nagasaki Prefecture, (1960).
40. "Kagoshima", 1:200,000 compiled by N. Hatae, *et al.*, Kagoshima Prefecture Office, (1961).
41. "Kumamoto", 1:200,000, compiled K. Suyama, *et al.*, Naigai-chizu, (1963).
42. "Fukuoka", 1:200,000, Agricultural Experiment Station, Fukuoka Prefecture, (1955).
43. "Miyazaki", 1:200,000, Miyazaki Prefecture Office, (1963).

Besides the maps listed above, several geological maps annexed in the papers on the regional geology are adopted in the work of compilation. The references to the main sources are as follows:

Akaishi Mountainland Geological Research Group (1961): On the Itoigawa-Shizuoka tectonic line of eastern Akaishi massif, preliminary report (Japanese with English abstract), *Earth Science*, no. 54, pp. 40-44.

Hashimoto, I. (1962): The sedimentary complex of uncertain ages in South Kyushu, (Japanese with English abstract) *Repts. Earth Sci., Dept. General Education, Kyushu Univ.*, vol. 9, pp. 13-69.

Huzita, K. (1962): Tectonic development of the Median Zone (Setouti) of Southwest Japan since the Miocene, *Jour. Geosci., Osaka City Univ.*, vol. 6, part 4, pp. 103-144.

Matsuda, T. (1961): The Miocene stratigraphy of the Fuji river valley, Central Japan (Japanese with English abstract), *Jour. Geol. Soc. Japan*, vol. 67, no. 785, pp. 79-96.

Mukae, M. (1958): Volcanostratigraphical study on the Miocene volcanism in the Shimane prefecture, Japan, *Jour. Sci., Hiroshima Univ.*, ser. C, vol. 2, no. 2, pp. 129-172.

Murai, I. (1961): Some notes on the geologic structure of the Kita Mino District (Japanese with English abstract), *Bull. Earthq. Res. Inst.*, vol. 39, part 4, pp. 909-934.

Omori, M. (1958): On the geological history of the Tertiary System in the southwestern part of the Abukuma Mountainland, with special reference to the geological meaning of the Tanakura Sheared Zone, *Sci. Rept., Tokyo Univ. Education*, Sec. C, vol. 3, no. 24, pp. 199-280.

Shiida, I. (1962): Stratigraphical and geotectonic studies of the

Paleozoic Chichibu and the Mesozoic Hitaka (Shimanto) terrains in the central part of the Kii Mountainland Southern Kinki, Japan, *Research Bull., Dept. General Education, Nagoya Univ.*, vol. 4, separate volume (1), pp. 1–58.

Watanabe, K. (1954): Tertiary structure of the western Kwanto District Japan with special reference to the crustal movement in the Yorii phase, *Sci. Rept., Tokyo Univ. Education*, Sec. C, vol. 3, no. 24, pp. 199–280.

3. The Result and Some Remarks

The result of compilation on the distribution of faults is shown in Fig. 4. The accuracy of mapping varies from area to area in company with the accuracy of the responsible base maps. The writer made efforts to diminish such heterogenity of accuracy by adopting as many available maps as possible to obtain in the process of compilation. However, the results are in sufficient despite the writer's efforts. The accuracy of mapping fault systems generally depends upon the nature of the geological units in which the fault systems are developed. Fault systems developed in igneous bodies, both intrusive and effusive, tend to show lowered accuracy of mapping than those developed in sedimentary formations. In gently deformed Tertiary formations the development of fault systems has mostly been well researched and clarified in detail. While in metamorphose terrains and intensively deformed older formations, the development of fault systems is generally so complicated as to increase the difficulty of rapid progress of detailed research. In the areas covered by the sediments and volcanic materials of the Quaternary time, faults developed in the besement of pre-Pleistocene geologic units are almost entirely hidden. The white spaces left on the map correspond to such areas. Fig. 5 shows the outline of distribution of the Quaternary Sediments and Tertiary and Quaternary igneous rocks, which was drawn from two maps published by the Geological Survey.[1)]

In spite of such defects as mentioned above, it is considered that the geotectonic framework of the Japanese Island is clearly reflected in the pattern of the distribution of faults. The major tectonic lines or zones, for instance the Median line, Mikabu line, Butsuzo line, Itoigawa-

1) Y. SEKINE, *et al.*, *Mineral province of Japan*, 1. *Mineralization of Quaternrry period., the 75th commemoration of the founding of the Geolorical Survey of Japan* (1957).

K. ONO, *Distribution of Cenozoic volcanic rocks in Japan, in Chemical Composition of Volcanic Rocks in Japan* (Geological Survey of Japan, 1962).

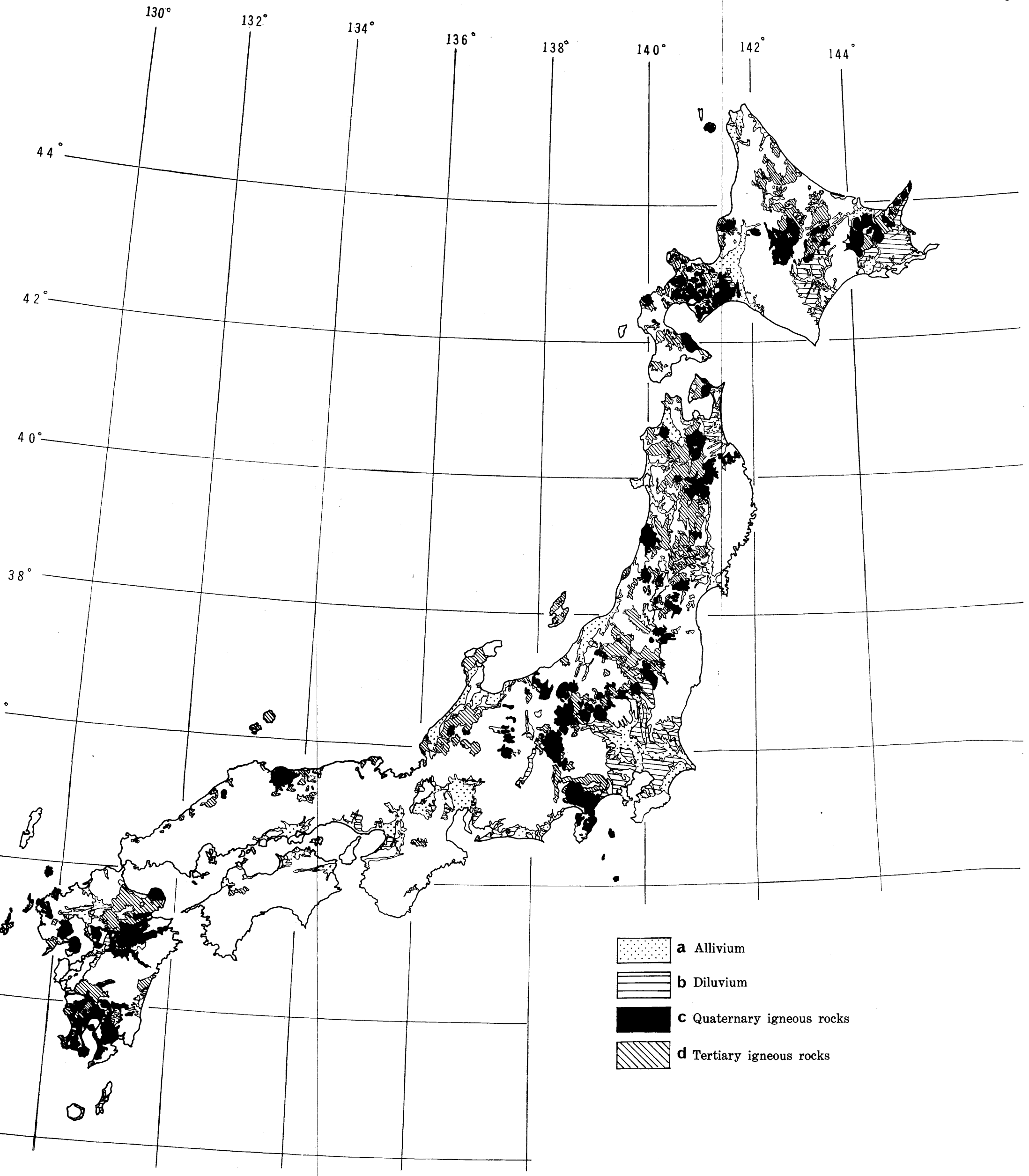

Fig. 5. Map showing the outline of distribution of the Quaternary sediments and the Cenozoic igneous rocks.

Shizuoka line, Hida peripheral zone, Kurosegawa zone, Kesennuma zone, Tanakura sheared zone, Maizuru zone, etc., are easily traced on the map. As to the characteristics of development patterns of faults, it is possible to divide the Japanese Islands into several tectonic units which coincide with the former results of the classification of tectotic provinces by many persons since Nauman and Harada. The systematical development of fault systems shows the characteristic feature of each tectonic unit. The detailed discussions concerning this problem will be presented in the next paper.

4. Acknowledgments

The writer is greatly indebted to Prof. R. Morimoto for his encouragement. He is also indebted to Mr. Y. Hosoya and Miss K. Ota for their great help in carrying out the laborious work of compilation of maps.

---

33. 日本列島の地質構造図 (I)—断層図

地震研究所　村　井　　勇

最近，10 万分 1 ないし 50 万分 1 程度の縮尺のかなり精度の高い編纂地質図が，各調査機関や県庁などからつぎつぎに公刊されている．これらは日本列島の地質構造を解明するための基礎的な資料として十分に役立つものと考えられ，これを整理統括して地質構造図を作る作業を続けている．ここに示したものはその一部で，断層の分布図である．基準にした地質図の精度がまちまちであるため，得られた結果は必らずしも完全なものではなく，将来資料の増加とともに修正を加えていかなければならない．このほかに褶曲図，各地質系統の分布図などを作製中である．
