Field Pattern indicating a Key Surface in the Alluvial Plain Geomorphology

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Alluvial plains in Japan have suffered much vicissitude through the historical age. To clarify the change of plain morphology, dated plain surface is necessary. Concept of key surface[1] introduced by the present writer (Nishimura, 1957) is useful for the study like this, but it is not yet established how to determine the key surface. Tentatively proposed key surface is the one indicated by the field pattern.

Plain surface with the Jori field pattern[2], is qualified as the key surface because of the time definiteness. As studied by many students the establishment of the Jori field pattern was in 7th or 8th Century, and therefore the plain surface with the Jori field pattern at present proves not to have been modified after that time.

The problem of geomorphology now expands to include the morphology modified by human activities. The discussion developed here is not like that, but it uses the human activities as an evidence. The usefulness of this method is limited into particular time and particular area, but the principle can be applied to other lands, and other ages.

Some examples of the Jori key surfaces and the geomorphological changes recognized by them will be developed in this paper.

Shoreline Change

Along the east coast of Lake Biwa in Central Japan, there have been many sub-lakes called Naiko, most of which were recently reclaimed. At the bottom of these

1) Key bed or Key horizon indicates the contemporarity of the geological formation and the key surface indicates the contemporarity of the geomorphological surface, but the time scale of the former is very great compared with the latter. That is, the contemporarity of the geomorphological surface is much sensible or acute. The correlative formation such as paleosol used to determine the geomorphological surface is rather geological and has somewhat large time scale, which could not have the sensibility to identify the changeable plain morphology.

2) The Jori field pattern is a rectangular pattern and consists of larger units with about 600m by 600m area and smaller units with about 100 m by 100 m area. It covers most of the main plains in the central part of Japan and its distribution has been proved to reach to southern Kyushu and to northern Tohoku.

sub-lakes the Jori key surface was found. It means the submergence of the coast area and the making of sub-lakes due to this submergence.

Sonenuma to the west of Hikone City is one of the sub-lakes and not yet reclaimed. The location of Sonenuma is the site of ancient Heru village and the key surface with the Jori pattern of Heru village is now submerged under the sub-lake. This fact was proved by the study of Takeo Tanioka and Teizo Iyanaga (1956), and was interpreted geomorphologically by the present writer (Nishimura, 1957).

The beach-ridge between Lake Biwa and the sub-lakes was the coastal beach-ridge before the submergence. With the submergence the lower area inside the beach-ridge was drowned and became the sub-lakes. Therefore the present height of the beach-ridge indicates indirectly the depth of submergence.

At the northeastern coast of Lake Biwa the beach-ridge is almost drowned and the sub-lake continues to the mother lake and becomes a part of it. Thus the northern coast of Lake Biwa suffered deeper submergence.

In the circum-Inland Sea area, some examples of similar submergence were found.

To the north and east of Takamatsu City, northeastern Shikoku, the submergence of the Jori key surface was proved. To the east of Takamatsu City there is a vacant area of the Jori pattern encircled by the Jori pattern area, which is attributed to the submergence after the Jori age. On the submerged area the river deposition made a new alluvial land. Below the present sea level to the northwest of Takamatsu City was recorded the existence of the Jori pattern, where the land was lost and not revived (Nishimura, 1957).

Near Hiroshima City, two submerged areas were proved by the Jori key surface. In Fuchu to the east of Hiroshima the Jori key surface remained only at the valley head, Nukushina, and the extension of the key surface is buried under the alluvial plain. It is explained by the old submergence and the following alluvial deposition. Particularly in this area the human reclamation is an important factor of the alluvial deposition, because of the lacking of powerful depositing river. In Miyauchi to the west of Hiroshima the situations are quite equal to Fuchu. The sequence of the Jori key surface, the submergence and the alluvial over-deposition mainly by the human reclamation is observable (Nishimura, 1959).

There are many examples of the elongation of the Jori key surface after the Jori age along the coast of alluvial plains in Japan. It is obvious in these cases that the elongated part is younger than the key surface. The width of the elongated part is important for the measurement of velocity of the coastal alluviation in the case without any other factor.

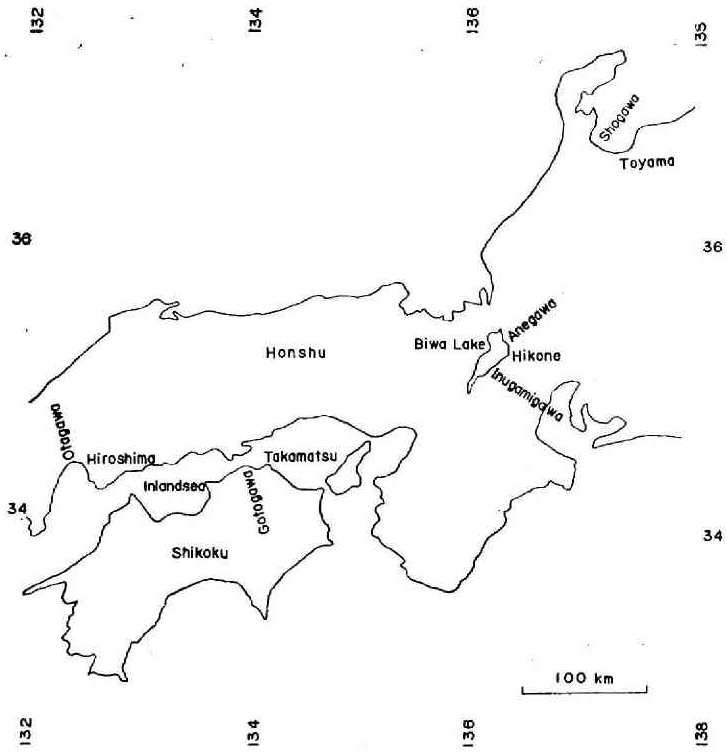

Fig. 1.

The distinction between the simple elongation and the over-deposition after the submergence is a problem to solve. The discontinuity of the plain surface and of the Jori pattern or the records of buried Jori key surface will be effective to this problem.

River Course Change

On the river course change of the Otagawa river near Hiroshima City the writer studied the sequence of change. About one thousand years ago it was in the central part of the valley, for the Jori field patterns on both sides of the probable river course have different directions, named Aki system and Saeki system. With the aerophoto interpretation at the west side of the valley an abandoned river course was found, which seems to be the following to the above. On the natural levee of this course, many settlements and road nets developed which continued until now. The third river course is the Furukawa course, now a tributary of the main course. And at last the present main river course cut the Jori key

surface at Hesaka-Nishihara area, where the Jori pattern on both sides perfectly continues (Nishimura, 1959).

Thus the Jori pattern is used to find out the imperceptible old river course as other field patterns, and especially the Jori pattern can give the date enough accurate for the time scale of the river course.

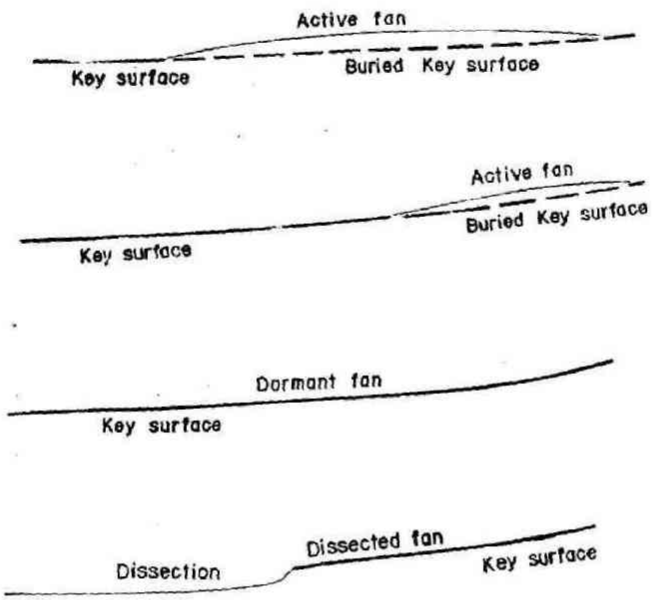

Fig. 2.

The Gotogawa river flows down on the Kagawa-fan and runs northwards at the west foot of Mt. Shikinzan to the west of Takamatsu City. The old course of this river flowing east of Mt. Shikinzan into the present Takamatsu City, which was probably named Kagawa, is also proved by the Jori pattern. The Ritsurin Park is located in the old Kagawa river course abundant in groundwater and riverine gravels (Nishimura, 1957).

The activity of alluvial fan-making is generally the result of the river course change on the fan, on which some examples in connection with the Jori key surface will be shown.

Growth of Alluvial Fan

Almost all over the Shogawa-fan in the western Toyama Prefecture was distributed once a wide Jori field pattern system, which was proved by the presentation of some old maps preserved at Shosoin archive in Nara City. Nowadays around the area residual patterns are perceptible. The present writer explained these facts in connection with the growth of the Shogawa-fan (Nishimura, 1959). He estimated the growth-rate by waste-deposition for about a thousand years and concluded that the Jori key surface is buried on the average five meters under the present fan surface. The estimation was based on the record of deposition in the artificial reservoirs just upstream the Shogawa-fan.

In the case of the Inugamigawa-fan east of Lake Biwa, the situations are similar and the burying of the Jori key surface was concluded. But it is partial one. The upper part of the Inugamigawa-fan is missing the Jori pattern, where the fan-making was active through and after the Jori age, and at the lower part of the fan the Jori pattern key surface is maintained.

It is contrastive that the Anegawa-fan next to the north of the Inugamigawa-fan maintained the Jori key surface undisturbed.

The Anegawa river has two steps of outlet to basin, one to the basin south of Mt. Ibuki and the other to Lake Biwa basin. Principal deposition is done at the former, and the depositional agency at the latter, which made the Anegawa-fan, is not so strong compared with that of the Inugamigawa-fan. Therefore the Anegawa-fan is wider in area and gentler in slope, and the materials consisting the fan are finer than the Inugamigawa-fan.

Two categories of fan according to the fan-making activity were introduced by the writer (Nishimura, 1958a), the active fan and the dormant fan. The

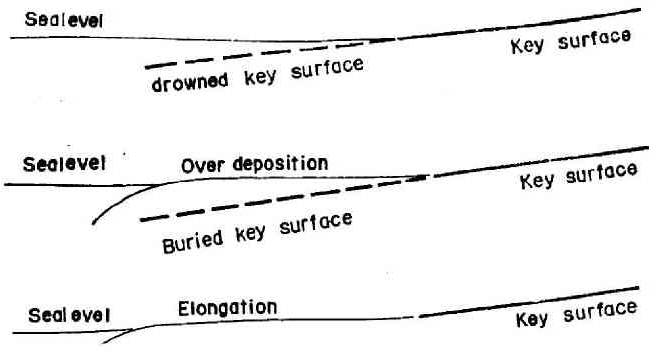

Fig. 3.

active fan is the fan whose fan-making is active and the dormant fan[3] is the fan whose fan-making is ceased. In the geological time scale all fans were active, but in the historical time scale some are active and some are dormant.

The Shogawa-fan and the Inugamigawa-fan were apparently the active fans even in the historical time scale and the Anegawa-fan has not been active at least for one thousand years. Human occupance made the activity of fan-making ceased by the fixing of river course. The fixing of river course on the Shogawa-fan began about four hundred years ago, and thereafter the fan became dormant on the whole.

Conclusion

From the above mentioned, the importance of the key surface is established.

References cited

Iyanaga, Teizo

1956 Nobles and Peasants in 8th Century

Nishimura, Kasuke

1957 Landform Development on some Plains with Jori Field System. Hiroshima Studies Literature Department. 11: 132–145

1958a Surface Development and Human Occupance of Shogawa Fan, Toyama Prefecture. Hiroshima Studies Literature Department 13: 177–187.

1958b Jori Pattern Distribution and Landforms. Hiroshima Historical Studies 70: 1–7

1959 Distribution of Jori Cadastral and Plain Morphology around Hiroshima City. Hiroshima Studies Literature Department 15: 112–127

3) The dormant fan is strictly distinguished with the dissected fan.