RE-EXAMINATION OF TECTONIC MOVEMENT BETWEEN THE EASTERN AND WESTERN COASTS OF THE KOREAN PENINSULA DURING THE PLEISTOCENE

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Introduction

It had been interpreted that the figures of coastline of the eastern and western coasts of the Korean peninsula are monotonous and complicated, respectively, are caused by uplift of the eastern coastal region and submergence of the western coastal region of Korean peninsula by Kwon(1984), and Park(1969) et al. Recently, however, it was proposed that the western coastal region of the Korean peninsula had been also uplifted during the Quaternary by Choi(1996, 1997, 2001). Thus, reexamination of the pattern of tectonic movement between the eastern and western coasts of the Korean peninsula during the Quaternary is required.

In Korean peninsula, on the eastern coast where marine terraces are well developed many Pleistocene paleo-shorelines had been recognized. On the western coastal region where marine terraces are poorly developed, however, identifications of the Pleistocene paleo-shorelines using the marine terraces are scarcely possible. Thus, a proper method estimating the Pleistocene paleo-shorelines in the western coast of the Korean peninsula is necessary.

In this paper firstly, Pleistocene paleo-shorelines of the western coast of Korea were estimated using the thalassostatic terraces which had developed near the river mouth of the Ungcheoncheon River in the mid-western coast of Korea. Secondly, the pattern of tectonic uplift between the eastern and western coasts of the Korea peninsula during the Pleistocene was reexamined by the comparison of the estimated paleo-shorelines inferred from the thalassostatic terraces in the western coast and the paleo-shorelines of the marine terraces in the eastern coast of the Korean peninsula.

Thalassostatic terraces of the Ungcheoncheon River in the mid-western coast of Korea.

1. Fluvial terraces of the Ungcheoncheon River

Two groups of fluvial terraces, that is, terraces which are consisted by poorly sorted, angular and subangular gravels and terraces which consists of well sorted, rounded and subrounded gravels, are developed along the Ungcheoncheon River (Choi, 1996 a).

Deposits of the present river floor of the Ungcheoncheon River consist of well sorted, rounded and subrounded gravels. Judging from the characteristics of deposits of the above two groups of terraces, it is thus considered that the former and latter groups of terraces were

formed in the insufficient and similar discharge environments, respectively, compared with the discharge conditions of the present river (Choi, 1996a, 1998)

According to Choi(1997), it is regarded that the southward shift of the northern limit of polar front (Changma front in Korea) due to the air temperature cooling, the drying of a large part of the Yellow Sea due to the sea level lowering, and the decrease of amount of evaporation in the East Sea(Sea of Japan) due to the interception of warm(Kuroshio) current have been brought a decrease of precipitation and river discharge during the Last Glacial in the Korean peninsula. Therefore, among the above two groups of fluvial terraces of the Ungcheoncheon River, it have been inferred that terraces which were consisted from the poorly sorted, angular and subangular gravels were formed in the Glacial period, while terraces which were consisted from the well sorted, rounded and subrounded gravels were formed in the Interglacial period in the Korean peninsula by Choi(1996, 1998)

Choi(1996, 1998, 2000) interpreted the terraces which were consisted from the well sorted, rounded and subrounded gravels and developed in particular near the river mouth of the Ungcheoncheon River as so called 'thalassostatic terraces' of Zeuner(1959)

2. Thalassostatic terraces of the Ungcheoncheon River

Tahlassostatic terraces near the river mouth of the Uncheoncheon River could be classified into six surfaces, i. e., Ungcheon terrace 1,2,3,4,5 and 6 surfaces, in descending order, according to the relative heights from the river floor.

Ungcheon terrace 1

This surface is well developed in Daechang-ri, Ungcheon-eup, Boryong-shi of Chungcheongnam-do prefecture. Relative height from the river floor of this terrace is 83m. Terrace deposit consists of well sorted, rounded gravel of 30□40cm in diameter. Terrace gravel is completely,weathered and red soil had been formed on the upper member of the terrace deposits.

Ungcheon terrace 2

This surface is well developed in Jeobdong-gol and Daechang-ri, Boryong-shi. Relatvie height from the river floor is about 60m. Terrace deposits of 2m thick mass consists of rounded gravel of 30cm in diameter. Terrace gravel is weathered and red soil had formed on the terrace surface.

Uncheon terrace 3

This surface is well developed in Nocheon-ri, Boryong-shi. Relative height from the river floor is 42m. Terrace deposits consist of well sorted, rounded gravel of 30cm in diameter. Red soil has been formed on the terrace surface.

Ungcheon terrace 4

This terrace is the broadest one among the thalassostatic terraces of the Ungcheoncheon River. Relative height from the river floor is about 30m. Terrace deposit of 4.5m thickness consists of well sorted, rounded gravel of 20 to 30cm in diameter. Soil color is red (7.5 YR 4/8).

Ungcheon terrace 5

This surface is well developed between Nocheon-ri to Hwanggyo-ri, Boryong-shi. Relative height from the river floor is about 18m. Terrace gravel is well sorted and weathered so deeply as to have 5mm to 10mm thick weathering rind. The matrices of the deposits contain a lot of fine materials generated by weathering after deposition.

Soil color is red (10YR 4/8). This terrace is the lowest one which the red soil have been formed on the terrace deposits in the western coastal region of Korea.

Ungcheon terrace 6

This surface is the lowest thalassostatic terrace in the Ungcheoncheon River. Terrace deposit of 5m thickness was founded. Sedimentary facies of terrace deposits similar to that the above Ungcheon terrace □. Terrace gravels suffered from chemical weathering but were, however, less weathered(3mm to 5mm thick weathering rind) than those of the Ungcheon terrace □. Soil color of this terrace is reddish brown(2.5YR 4/6□4/8).

Estimated paleo-shoreline altitudes inferred from the thalassostatic terraces of Ungcheoncheon River

It was revealed that paleo-shorelines of the last Interglacial marine terraces were approximately coincide with the estimated paleo-shorelines inferred from the Last Interglacial thalassostatic terraces in the eastern coastal zone of Korea by Choi(1991, 1993a, b, 1996, 2001). Therefore, it is considered that paleo-shoreline altitudes of the periods when the above six thalassostatic terraces were formed can also be estimated from the relative heights from the river floor of these terraces, particularly near the river mouth of the Ungcheonchen River.

Judging from the features as described above, paleo-shorelines of the formation periods of the above Ungcheon terraces □ to □ are estimated 83m(□), 60m(□), 42m(□), 30m(□), 18m(□) and 10m(□), respectively. It is considered that these paleo-shorelines can be used in investigation of environmental changes and tectonic movement during the Pleistocene in the western coastal region of Korea where the marine terraces had been poorly developed.

Determination of key surface for the correlation of thalassostatic terraces of Ungcheoncheon River

Materials for absolute dating have not been founded from the thalassostatic deposits of the Ungcheoncheon River. Thus, Soil color of the paleosols which had been formed on the marine terraces and the thalassostatic terraces of the eastern coastal region of Korea was used in determining the key surface for the chronological study of the thalassostatic terraces of the

Ungcheoncheon River.

It was revealed that the lowest terrace which were formed paleo red soil on the terrace surface is the marine and thalassostic terraces of the Last Interglacial culmination period(oxygen isotope stage 5e) in the eastern coast of Korean peninsula by Choi(1997).

Among the above six thalassostatic terraces, Ungcheon terrace □ was decided as a key surface for the identification of the thalassostic terraces of the Last Interglacial culmination period, based on the facts that this terrace is the lowest thalassostatic terrace which have been formed red soil on the terrace deposit in the Ungcheoncheon River(Choi, 2001).

Correlation of the Pleistocene sea levels between the western and eastern coasts of the Korean peninsula

1. Marine terraces and paleo-shorelines in the eastern coast of Korea

Table 1 shows the marine terraces and paleo-shorelines of the eastern coast of Korea. Terraces which are marked by squares in table 1 demonstrates the marine terraces of the Last Interglacial culmination stage in each papers, respectively. Table 1 also shows that variable opinions on the chronology of the Pleistocene terraces of the eastern coast of Korea have been stated, because the ages of these terraces have been determined by relative dating methods.

Recently, Choi(1996, 1977) revealed that the lower marine terrace □ had been formed in Last Interglacial culmination stage by the amino-acid date of 125ka BP(Table1,3)

2. Correlation of estimated paleo-shorelines inferred from the thalassostatic terraces of the western coast and paleo-shorelines of the marine terraces of the eastern coast Korea

Choi(1997, 2001) clarified that the paleo-shorelines of the lower marine terrace I of the Last Interglacial culmination stage were distributed at the almost same altitude (18m above sea level) along the whole eastern coast of Korean peninsula. In this study, marine terraces of table 1 were rearranged based on this results of Choi(1997, 2001) as seen in table 2.

In table 2, the lower marine terrace I of the Last Interglacial culmination stage of Choi(1997, 2001) was used as a key surface in recomplicating marine terraces of each papers. The rest of marine terraces besides marine terraces which corresponded to the lower marine terrace I of Choi (1997, 2001) could be classified to be several groups, i. e. 80m to 90m, 50m-60m, 40m, 30m, and 10m groups of marine terraces, respectively, based on the paleo-shoreline altitudes of terraces as stated in table 2 and 3.

In this paper, representative names of each groups of marine terraces in table 2 were newly called as Jeondongjin terrace(Oh, 1997), Eupcheon terrace (Lee, 1985), Wolseong terrace (Lee, 1985), Hasidong terrace (Chang, 1987), lower marine terrace I (Choi, 1997), and lower marine terrace □ (Choi, 1997), respectively, in descending order (Table 3).

3. Reexamination of Tectonic Movement between the Eastern and Western Coasts of the Korean Peninsula during the Pleistocene.

Table 3 shows the renamed and recomplicated marine terraces and its paleo-shorelines of the eastern coast and the thalassostatic terraces and estimated paleo-shorelines of the western coast of Korea. In this table, Ungcheon terrace □ of the western coast was correlated with the lower marine terrace I of the eastern coast of Korea, based on the fact that both terraces were the lowest surfaces in which the red soil had been formed in each coasts.

Judging from the result of terrace correlation as seen in table 3, the estimated paleo-shorelines inferred from thalassostatic terraces of the western coast almost accord with the paleo-shorelines of marine terraces of the eastern coast of Korea.

On the basis of the above facts, therefore, it can be proposed that both the western and eastern coastal region of Korean peninsula have been uplifted at the almost same amount and rate, at least since the time of formation periods of the Ungcheon terrace □ in the western coast and Jeongdongjin terrace in the eastern coast of Korea.