Estimation of the maximum erosion in one cycle of sea-level change at coastal region.

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1.Introduction

To estimate the maximum erosion in one cycle of sea-level change at coastal region, we research trace of the maximum erosion formed by river deepening based on the maximum depth of the buried valley formed on the base of alluvium. There are two erosion effects, surface erosion and liner erosion by river deepening. The latter is larger in general, and the former is thought to be a sum of the latter.

The catchment area that reflects the size of river system, the discharge, the altitude of the head of river, the vertical slope, and the distance from river mouth are elements with a large influence on the liner erosion of river. In addition, we think of the difference of elevation from the standard level for erosion (ex. surface of lake water), we call this difference of height the 'potential of erosion'. We think the potential of erosion fluctuates corresponding with uplift / subsidence and sea-level change.

Concerning the upper and middle reaches of river, according to Takagi et al. (2000), each river deepened by almost equal values of uplift during the period of one glacial and interglacial cycle. On the other hand, although the lower reach of river is the area of deposition because of positioning on alluvium plain, we must consider the influence of sea-level change at coastal region. We can estimate the depth of river deepening erosion at the maximum regression era by surveying the depth of buried valley formed on the base of alluvium at river mouth.

2.Method

We used the depth data of buried valley formed on the base of alluvium near 56 rivers' mouths in Japan. In addition, we correct depth data by removing the influence of uplift / subsidence after MIS2. Uplift after MIS2 is estimated using the MIS5e former shoreline altitude data from 'ATLAS OF QUATERNARY MARINE TERRACE IN THE JAPANESE ISLANDS' (ed. Koike and Machida, 2001) near survey points.

We investigate the relationship between the above maximum depth of buried valley formed by river deepening erosion and the next three elements: (1) The catchment area that indicates river system size or energy. (2) The distance from old river mouth. We use the distance from -100m point that may be near the old river mouth at MIS2. (3) The uplift after MIS5e.

3.Results and discussion

At first, the depth of buried valley formed on the base of alluvium generally increases with increasing of catchment area. Although dispersion is large, the maximum depth data of buried valley formed by erosion is under -90m, with correcting the influence of uplift / subsidence after MIS2.

Secondly, the depth of buried valley generally increases with increasing of distance from -100m point. Although dispersion is large in this case too, the linear correlative relationship on semi-log plot becomes better with adjusting data depending on the catchment area.

At last, the depth of buried valley increases with increasing of uplift after MIS5e. The relationship between these elements is almost linear, and dispersion is relatively small. According to the regression line, the amount of river deepening erosion after MIS5e is estimated by considering -50m (y-intercept; it indicates the case that uplift is zero) adding (or reducing) uplift (or subsidence). In addition, when the maximum depth data is considered, y-intercept value is -83m, and estimated -90m at the maximum.

4.Conclusion

The present sea-level is almost highest; therefore during the next cycle of sea-level change (for almost 100,000 years), the maximum regression will come again. The depth of river deepening erosion at the recent coastal region in maximum regression era is estimated with investigation of the depth of buried valley, and it is less than -90m at the maximum. In addition, total amount of erosion during the one cycle of sea-level change is estimated by adding (or reducing) the depth of buried valley (-90m at the maximum) to uplift (or subsidence) during 100,000 years.