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Sedimentary process of the Holocene Kiso river delta based on accumulation rate and particle size

Takashi Ogami[1*], Toshihiko Sugai[1]

[1]Frontier Science, University of Tokyo

Accumulation of quantitative analysis on deltaic sediment is important to clarify fluvial process at coastal area and to utilize the understandings for disaster prevention, developing coastal zone or application in other scientific fields. Case studies of the Holocene succession are important because investigation of changes in accumulation rate is possible based on ^{14}C dating method. We investigated characteristic and sedimentary process of deltaic sediment based on particle size distribution and accumulation rate of the latest Pleistocene-Holocene succession at the Nobi plain, central Japan.
Described and densely dated sedimentary cores (Yamaguchi et al, 2003; Ogami et al, 2009) drilled at deltaic lowland to fluvial plain were investigated in this presentation. The sediments are classified into sedimentary facies (B: meandering river ? tidal flat sediment, C: bay sediment, D: delta front sediment, E: delta plain sediment) and facies B, C and D are subdivided into subfacies (Ogami et al, 2009). We investigated relationship between particle size and accumulation rate for each facies.
Particle size analysis was operated for sediment consists of sand and mud (finer than 2 mm in diameter). We used a laser diffraction particle size analyzer (SALD-3000S, Shimadzu corps; detectable range is 0.08 - 3,000 um). Calibrated AMS ^{14}C dates measured for fossils of plants or shells from sedimentary cores (Yamaguchi et al, 2003; Ogami et al, 2009) were used as age control points.
The sedimentary cores were sectioned into segments bounded by two age control points. The length and duration of each segment are about 1 - 8 m and 200 - 1000 yr, accordingly. Averaged particle size distributions and mean accumulation rates are calculated for each segment. We operated regression analysis for each averaged particle size distribution and several normal distributed populations were extracted. Normal distributed populations mainly consist of sand sized grains were set as SP (Sand Population). A GUI program of regression analysis for particle size (Sasaki and Kiyono, 2003) was used in this operation.
SP consists of medium sand to fine sand sized particles (median diameter: 0.9 - 2.5 phi). SP is uniquely identifiable at facies B, D, E and base of facies C. Coarsening of sediment is concordant with increase of SP. SP is supposed to be traction load delivered by river, therefore changes in particle size should be indicating changes of river traction force.
There are poor correlations between particle size and accumulation rate. In the other hand, plots of accumulation rate against values of particle size are placed at specific area according to their sedimentary facies although there is some overlap among them. It suggests that sediments are roughly classifiable into sedimentary facies based on accumulation rate and particle size.
Sediments with high accumulation rate are characterized by moderately poor sorted particle size distribution (sorting index: > 1.5 phi). These sediments belong to facies B (fluvial sediment in transgressional stage) and facies D (delta front slope). These facts indicate that both of traction and suspended load should have rapidly accumulated at these settings as a result of combination of several sedimentary process.

Keywords: Holocene, accumulation rate, particle size, sedimentary facies, delta, traction load