Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

MIS23-17 Room:415 Time:May 2 14:45-15:00

Recognition of washover deposits in the Shizuoka Plain, based on analysis of shape of sand grains

KITAMURA, Akihisa[1*] ; OGURA, Kazuki[1] ; UBUKATA, Takao[1]

[1]Shizuoka Univ

Three-dimensional morphometric analyses were performed to compare the shape of the sand grains as mentioned below. The surface of the upper part of the sand grain was first scanned to collect the x-, y- and z-coordinates of each point on the grain surface using a Shimadzu OLS4000 confocal laser scanning microscope. The obtained upper surface was connected with its vertically reflected shape to obtain a symmetric closed surface model. The surface model was then converted into a solid model by filling the inside of the surface model with equally spaced points. The axes of sand grains were defined as the principal component axes for the 3D coordinate data of the points consisting of the solid model. The aspect ratios of the sand grain was computed as the square roots of the ratios between eigenvalues of the covariance matrix between the coordinates. The collected coordinate data for the upper surface were normalized for location, orientation, and size so that the centroid of the solid model is placed at the origin, the major axis is placed along the x-axis, and the volume of the solid model is fixed at a constant value. A series of the normalized z-coordinates of individual points was defined as the shape function of the corresponding x- and y-coordinate data and was then decomposed into a 2D domain using a two dimensional Fourier transform. The shape of the sand grain was represented by a set of Fourier amplitudes of each frequency. The angularity was assessed for each grain by the sum of the Fourier amplitudes of the first and higher harmonics divided by the magnitude of the 0th harmonic.

The results of the morphometric analyses clearly indicated that the ratio of the minor axis length to the major axis length well defines the difference in grain shape between beach sands and inferred flood sediments. Most of the flood sediments have smaller aspect ratio (i.e., elongate form) than do most of the beach sands. Scatter plots of the angularity against the aspect ratio for the two sedimentary environments were fairly separated with only slight overlap along the axis of the aspect ratio. Variation in angularity was greater among flood sediments than among beach sands and there was no beach-sand grain with the angularity larger than 7.89. The composition of inferred tsunami deposits seems a mixture of the flood and beach sediments in terms of their grain shape.

Keywords: washover deposits, sedimentary grains, analysis of shape