

Formation environment and sensitivity of the Holocene marine clay in the Osaka Plain, Japan

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Sensitive clays are recognized in some Holocene alluvial plain in Japan. In the east part (the Kawachi area) of the Osaka Plain, sensitive clay is mainly distributed. It is recognized that the sensitive clay is formed by the leaching of soluble elements from pore of marine clay. Some area where sensitive clay distributes, in common, locates the closed-off section of bay. So, the depositional environment of clay might be the primary factor of the formation of sensitive clay. We compared the formation environment and physical properties of Holocene clay between the west part and east part of the Osaka Plain. The sedimentation rate of the clay bed (most fine part) at east part is 2.1-2.7 m/ky. This rate is about 2 times higher than the west part (0.9-1.2 m/ky). The assemblage of fossil foraminifer suggests the salinity at sedimentation of the eastern clay is lower than western clay. The upper part of the eastern clay deposited in fresh water has also high sensitivity. Water content of clay indicates the eastern clay has higher pore space than the western clay. The western clay includes many pellets (its diameter of 0.5-2 mm) formed by benthos. These amounts of pellets suggest the higher activity and disturbance of benthos in the west part than the east part. The liquid limit of the western clay is little bit higher than the eastern clay.

As the mentioned difference on the clay, the eastern clay was deposited rapidly through flocculation under the brackish water, and formed large pore space. These large pore spaces have been kept under the low activity of benthos. So, the eastern clays have high water contents which exceed the liquid limits of clay. When the eastern clay is disturbed, strength of the clay severely decreases. On the other hand, the western clay was deposited at lower sedimentation rate than the eastern clay. After the deposition, the clay has decreased the pore space by benthos disturbance. The activity of benthos increases the viscosity of clay, and decreases the pore space. It follows that the western clay has low water content to its liquid limit, and is under low sensitivity.

To conclude, the sensitive clay in the east part of the Osaka Plain is occurred under the primary factor of the depositional environment, such as high sedimentation rate with flocculation under the brackish water and low benthos activity.