G212-P003 **Room: Poster Session Hall** **Time: May 19**

Bedforms affected by sediment load under upper-regime flow; an implication to spaced stratification in turbidite sandstones

Yuichiro Miyata[1]; Chikako Tanaka[2]

[1] Dept. Sci., Yamaguchi Univ.; [2] Earth Science, Yamaguchi Univ.

http://www.sci.yamaguchi-u.ac.jp/geo/index.html

Multiple inversely graded units (spaced stratification) show several characteristic features common in deposits formed by upstream migration of stable antidunes in an open channel, such as (1) subparallel erosion surfaces covered by very fine-grained and/or heavy sands, and (2) consistent a(p)a(i) fabric of sand grains. However, channel antidunes are usually unstable displaying occasional breaking wave resulting lenticular lamina sets. Stability of antidunes is likely be controlled mainly by the Froude number of the fluid flow, but problems remain uncertain due to interaction between fluid flow and bedform. Under the fixed flow condition with Froude number of about 1.4, it was observed that bedform was changed as well as wavelength, direction of migration. In the open flume of 5.44 x 0.074 m wide and water discharge of 67, 90, and 135 cm2/s/cm, 0 to 13 wt% of medium to fine grained sand were fed from the upstream end. With decreasing feeding rate, bedform changed from (#6) flat bed, (#5) antidunes steadily migrating upstream, (#4) antidunes with less wavelength showing occasional breaking wave, (#3) standing antidunes, (#2) antidunes migrating downstream, and (#1) fast-moving ripple-like bed with inharmonious water surface. Under higher feeding rate, antidunes were stable with longer wave-length and with less frequent breaking waves. Breaking wave, more frequent under less sediment supply than that of bedform #4. The thickness of sheet flow layer with high sediment concentration is thicker over upstream migrating antidunes as well as higher bulk concentration than that over downstream migrating antidunes, as shown by transparent lighting images. Therefore, the sediment concentration is likely the most effective factor to the bedforms under supercritical flow. The facts of larger wavelength and less wave breaking under higher sediment concentration suggest that the sediment load can stabilize the flow.

The supercritical flow with sand-sized sediment load over antidunes bed has a turbulent boundary layer, and the Reynolds number is the order of 104 for these experiments. The turbulent flow structure was examined in relation to the grain velocity. The flow was visualized using the aluminum powder, and the velocity was measured with an aid of PTV technique for the high-speed movie. The mean velocity and velocity deviation (turbulent component) were obtained for both the flow and the sediment grains. The velocity gradient near the bottom and the turbulent component of both vertical and horizontal velocities are large compared with the velocity of the sediment grains. Grain velocity structure did not change at least in the concentration range from 1 to 13 wt%.

One of the reason why the sediment load can suppress the flow turbulence is that the apparent viscosity was decreased to more laminar regime due to higher sediment concentration in the lower part of the flow. The Richardson number (Ri), which represents the stability of the boundary flow, indicates that the flow becomes more stable in case of lower velocity gradient and/or higher density gradient. The sediment grains concentrated in the lower boundary, therefore, contribute to the higher density gradient as well as lower velocity gradient, both of which results in higher Ri, i.e. more stable boundary flow. The more stable supercritical flow with more sediment load can suppress flow oscillation or breaking wave, resulting in upstream migrating stable antidunes or flat bed.

Under sediment gravity flow, depositing grains show the same motion as in an open channel (Parker et al., 1986). In massive turbidite sandstone layers, multiple inversely graded beds suggesting upstream migration of stable antidunes are well demonstrated rather than lenticular lamina sets indicative of breaking antidunes. It can be attributed to the supercritical flow with higher sediment concentration due to abundant sediment rain from much thicker suspension cloud.