Feeding and circulatory flows of a spiriferide brachiopod: an approach of computational fluid dynamics

Yuta Shiino[1]; Osamu Kuwazuru[2]; Nobuhiro Yoshikawa[2]

[1] Earth and Planetary Sci., Univ. of Tokyo; [2] Institute of Industrial Sci., Univ. of Tokyo

Moving fluids around the valves of Devonian spiriferide brachiopod *Paraspirifer bownockeri* were analyzed to demonstrate the generation of feeding and circulatory flows when the ventral or dorsal valve faces upstream. This analysis is based on the computational fluid simulation by means of Finite Volume Method. To examine the function of sulcus, two types of model were constructed. One of the model accurately mimics the shape of *Paraspirifer bownockeri*, and the other lacks the sulcus as a major depression in the midline of valves. A three-dimensional models were constructed from the sequential image data of cross sections, which were taken by a X-ray micro CT scanner. In the simulation, three patterns of velocity, 0.01, 0.1 and 1.0 m/s, were adopted. The simulated results in the mimic model showed that fluid pressures along the gape of the model fairly increased around the center of gape, which resulted in the generation of inflow through the gape around the sulcus. This relationship never changed in the other conditions of model directions and three patterns of velocity. Meanwhile, the modified model with no sulcus generated a vague pressure gradient along the gape. All of the results indicate that the sulcus functions to generate a distinct pressure gradient along the gape. Thus the spiriferide brachiopod could be interpreted to intake the effective feeding and circulatory flows through the gape around the sulcus passively.