INVESTIGATION ON HYDRODYNAMIC INTERACTION BETWEEN TREE AND LAVA FLOW AND RESULTING STRUCTURE OF TREE MOLD

Tsutomu Honda

Mt.Fuji Volcano-Speleological Society, 3-6-1 Otsuka, Bunkyo-ku,Tokyo,112-0012 Japan

Abstract

On the northern flank of Mt.Fuji, a lot of groups of lava tree molds have been found and investigated by Ogawa and Tachihara (1997,1998). Tree molds are results and registered traces of interaction between tree and lava flow.

Tree molds are resulting from hydrodynamic interaction between living standing tree and lava flow (Honda,1999) as shown in Fig. l. This phenomena are strongly depending on lava viscosity, lava flow speed, diameter of living tree and its resistive strength against lava flow.

Broken tree inside of lava flow is also suffering the hydrodynamic force of lava flow its self. As lava flow has vertical velocity gradient to main flow direction, lifting force will be acting on broken tree inside of lava flow. However it depends on its mean density including crust around the broken tree and its rotating speed as shown in Fig. 2 and Fig. 3.

The author has investigated: l) Internal and external feature of tree mold depending on Re Number of lava flow, 2) the maximum diameter of standing tree resistive against lava flow by using flow resistive coefficient around the flow of vertical column and maximum bending stress of living tree, 3) Resistivity (against lava flow) of crust around the tree which has been burned out later, and finally 4) Magnus effect of broken tree with crust located inside of lava flow, which lifts up the tree mold to the surface of lava flow.

These analysis and effects were compared with the results of observations performed by Ogawa and Tachihara (1997) and these observations were found to be well explained by this interpretation and analysis of hydrodynamic interaction between lava flow and tree.

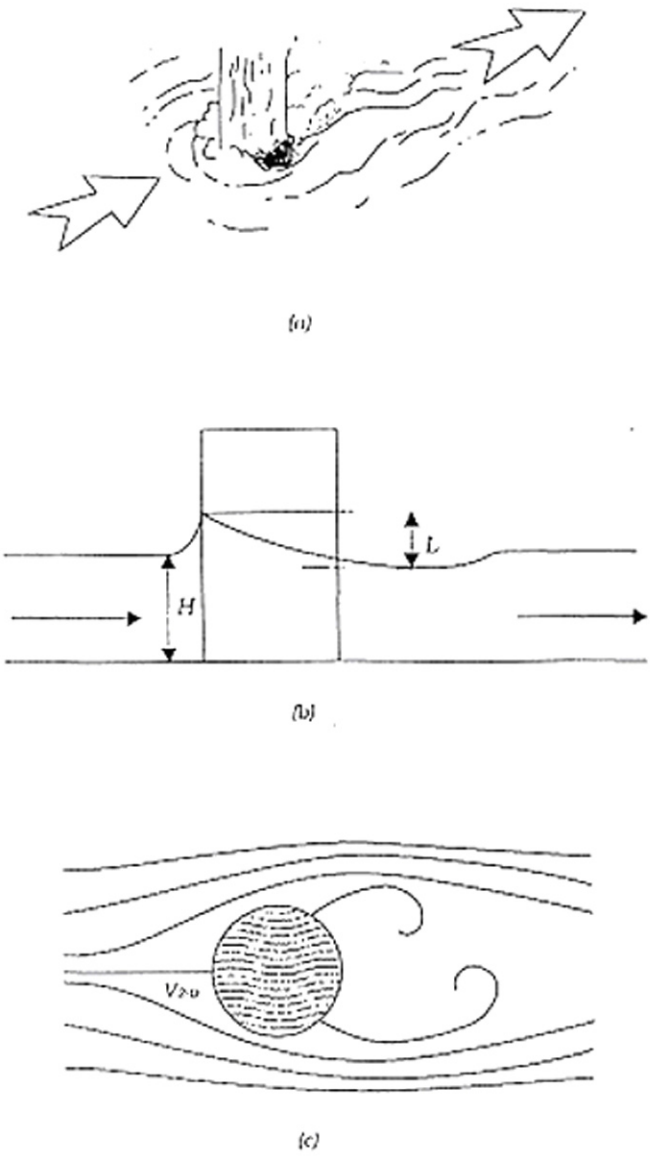

Fig. 1 – Flow around the standing living tree.

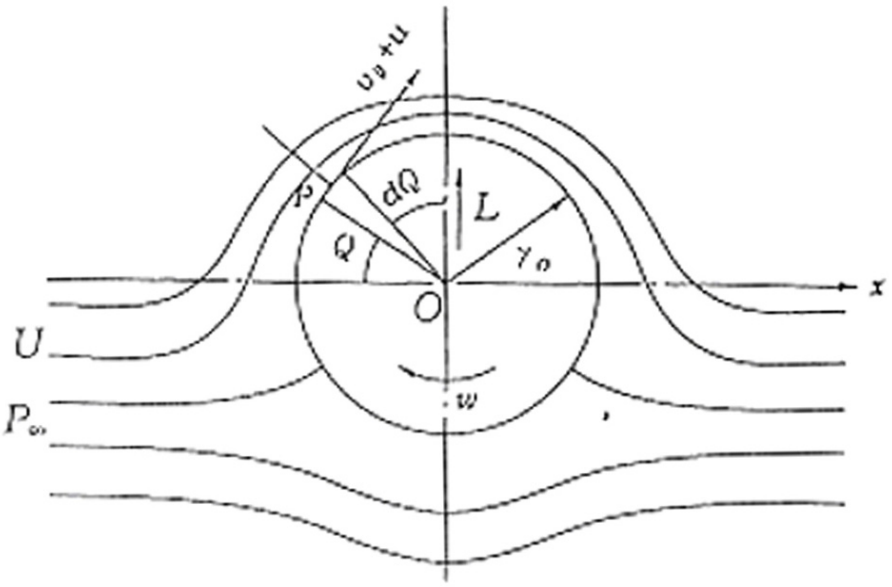

Fig. 2 – Lifting force acting on the rotating cylinder.

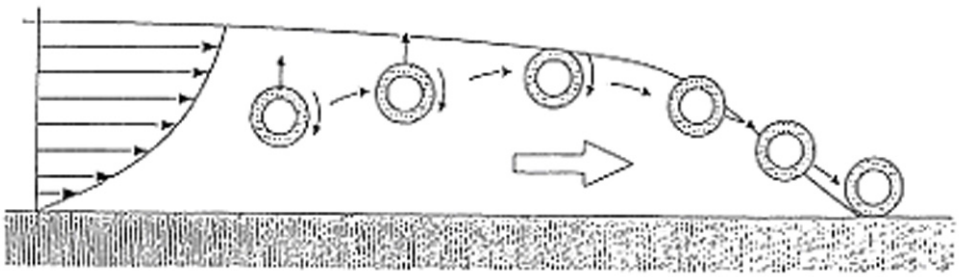

Fig. 3 – Lifting movement of tree mold located inside of the lava flow.