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Experimental study of convection cell transition in internally heated layer JUNPEI TAKAHASHI, KANAKO YANO, YUJI TASAKA, YUICHI MURAI, YASUSHI TAKEDA, Hokkaido Univ., TAKATOSHI YANAGISAWA, YASUKO YAMAGISHI, JAMSTEC, JAMSTEC TEAM — Convection cell induced by internal heat sources in a shallow layer behaves characteristically with respect of internal Rayleigh number (R_I). For example, horizontal scale of the cell expands dramatically in proportion to R_I and at higher R_I, another cell structure is formed; an additional cell appears in the cell or descending flow at the center of a cell expands to the edge of cell. These transitions of cell structure haven't been investigated well experimentally although it doesn't appear in ideal condition. We attempt to determine the flow structure in a cell by Particle Image Velocimetry to investigate transition mechanisms. The fluid layer has 210 times 210 mm of the cross section and is 7 mm in the height. Simultaneous multi-layer measurement is performed by color-striped light sheet and transitional state of convection cell is observed. Vertical velocity component is also obtained and we investigate how cell behaves with respect of R_I. R_I/R_{Ic} was changed from 4 up to 25, where R_{Ic} corresponds to the critical Rayleigh number at the onset of the convection. We confirmed cell transition is strongly related with development of descending flow at the center of a cell. Cell dilatation process is described as a consequence descending flow develops and strongly expands at the bottom of fluid layer.

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