Symmetry-breaking transition in natural convection flow between parallel vertical walls maintained at different temperatures WOONGKI KANG, CHANGHOON LEE, Yonsei university — The purpose of this study is to observe transitions in natural convection flow of water in the vertical channel as the Rayleigh number increases. The Navier-Stokes equation and energy equation were solved under The Boussinesque approximation using direct numerical simulation. Aspect ratio of the domain is 12:2:6 (streamwise: wall-normal: spanwise). The range of Rayleigh number is from 50,000 to 2,000,000. Various different flow regimes such as laminar steady flow, time-periodic unsteady flow, chaotic unsteady flow and turbulent flow were observed. Most interestingly, the symmetry between up flow near the hot wall and down flow near the cold wall is broken intermittently as Rayleigh number increases so that the mean flow is upward for a while, then it quickly switches to the downward flow, and it repeats temporally alternating pattern randomly. As Rayleigh number further increases, transitions between the up and down flows becomes less frequent. Detailed statistics and flow patterns will be presented in the meeting.

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