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**Controlling heat transport and flow structures in thermal turbulence using ratchet surfaces**[1] CHAO SUN, HECHUAN JIANG, Tsinghua University, XIAOJUE ZHU, VARGHESE MATHAI, University of Twente, ROBERTO VERZICCO, University of Rome "Tor Vergata", DETLEF LOHSE, University of Twente — In this combined experimental and numerical study on thermally driven turbulence in a rectangular cell, the global heat transport and the coherent flow structures are controlled with an asymmetric ratchet-like roughness on the top and bottom plates. We show that, by means of symmetry breaking due to the presence of the ratchet structures on the conducting plates, the orientation of the Large Scale Circulation Roll (LSCR) can be locked to a preferred direction even when the cell is perfectly leveled out. By introducing a small tilt to the system, we show that the LSCR orientation can be tuned and controlled. The two different orientations of LSCR give two quite different heat transport efficiencies, indicating that heat transport is sensitive to the LSCR direction over the asymmetric roughness structure. Through analysis of the dynamics of thermal plume emissions and the orientation of the LSCR over the asymmetric structure, we provide a physical explanation for these findings.

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