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Structure and local heat transport in the geostrophic regime of rotating Rayleigh-Benard convection SERGIY GERASHCHENKO, SCOTT BACKHAUS, ROBERT ECKE, Los Alamos National Laboratory — We report experimental measurements of velocity fields and local temperature for rotating thermal convection in the geostrophic range with Rayleigh number $10^7 < Ra < 2 \times 10^8$ and Taylor number $10^9 < Ta < 10^{10}$ (Ekman number $10^{-5} < Ek < 3 \times 10^{-5}$). The fluid is water with Prandtl number $Pr \approx 6$. The velocity was obtained in a 2 cm $\times$ 2 cm area using particle tracking velocimetry, and the temperature in the middle of that area was measured using a thermistor. The simultaneous velocity and temperature data allow the local heat transport to be obtained. We also compute the vertical and lateral spatial correlation lengths, the probability distribution functions of temperature and velocity, and the spatial structure of the velocity field of localized convective structures - thermal plumes for the non-rotating system and Taylor columns for convection with rotation. We present the dependence of these quantities for differing balances of buoyancy and rotation with Rossby number $Ro = \sqrt{Ra/PrTa}$ in the range $0.01 < Ro < 0.2$ and provide a characterization of the state of geostrophic rotating thermal convection for the regime with $Ra/Ra_c < 10$ where $Ra_c = 8.7Ta^{4/3}$.

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