Cumulative distributions AdamOptimizer **QNGOptimizer**  $\beta_1 = 0.9$ ,  $\beta_2 = 0.99$ ,  $\varepsilon = 10^{-8}$ approx='block-diag',  $\lambda$ =0 1.0 stepsize=0.01 stepsize=0.01 stepsize=0.025 stepsize=0.025 Probability of occurrence 0.8 stepsize=0.05 stepsize=0.05 stepsize=0.075 stepsize=0.075 stepsize=0.1 stepsize=0.1 0.6 stepsize=0.125 stepsize=0.125 stepsize=0.15 stepsize=0.15 stepsize=0.175 stepsize=0.175 0.4 stepsize=0.2 stepsize=0.2 stepsize=0.225 stepsize=0.225 stepsize=0.25 stepsize=0.25 0.2 (b) (a) 0.0 MomentumQNGOptimizer MomentumOptimizer  $\rho$ =0.9, approx='block-diag',  $\lambda$ =0  $\rho = 0.9$ 1.0 stepsize=0.01 stepsize=0.01 stepsize=0.025 stepsize=0.025 Probability of occurrence 0.8 stepsize=0.05 stepsize=0.05 stepsize=0.075 stepsize=0.075 stepsize=0.1 stepsize=0.1 0.6 stepsize=0.105 stepsize=0.125 stepsize=0.109 stepsize=0.15 stepsize=0.113 stepsize=0.175 0.4 stepsize=0.116 stepsize=0.2 stepsize=0.225 stepsize=0.25 0.2 (c) (d) 0.0 0.2 0.2 0.0 0.4 0.6 0.8 0.0 0.4 0.6 0.8 1.0 1.0 delta energy delta energy