Supporting Information

Hu and Yang 10.1073/pnas.1315215111

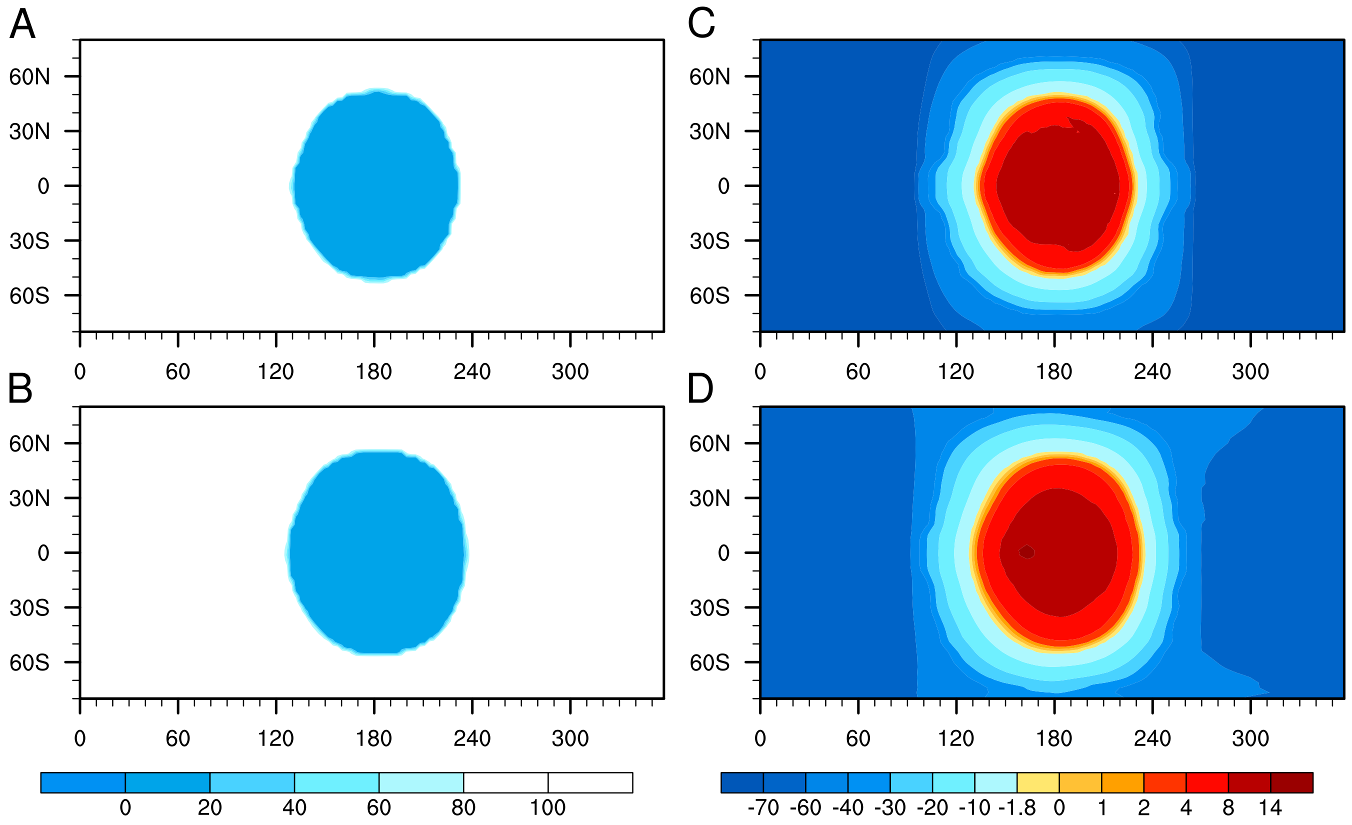

Fig. S1. Sea-ice coverage and surface air temperature in AGCM simulations with a slab ocean. (*Left*) Sea-ice fraction (unit, %); (*Right*) surface air temperature (unit, °C); (*Upper*) 355 ppmv of CO_2; and (*Lower*) 200,000 ppmv of CO_2. For *A* and *B*, blue indicates open ocean, and white indicates sea ice. Note that the color scale is not linear in *C* and *D*.

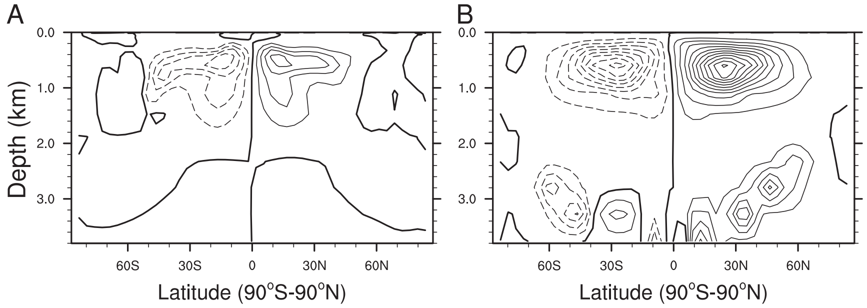

Fig. S2. Mean meridional mass streamfunction of eddy-induced MOCs. Contour interval is 10 Sv. Shown are (*A*) 355 ppmv and (*B*) 200,000 ppmv of CO_2. Solid contours indicate clockwise streamlines, and dashed contours indicate anticlockwise streamlines. The exoplanet studied here has a much slower rotating rate, 36.7 times slower than Earth's. Its gravity is 1.35 times greater than Earth's. Thus, the Rossby radius of deformation of its ocean is about 43 times larger than for Earth's oceans, according to the formula $L_R = (gD)^{1/2}/f_o$ for a barotropic ocean as an example. Here, L_R is the Rossby radius of deformation, g is the gravity, D is the ocean depth, and f_o is the Coriolis parameter at the reference latitude. L_R is about 200 km for Earth's tropical ocean. Thus, L_R is about 8,500 km for the exoplanet studied here, which is much greater than the numerical resolution of the ocean model. Therefore, persistent ocean eddies are model-resolved, and eddies parameterized by the Gent–McWilliams parameterization are weak.

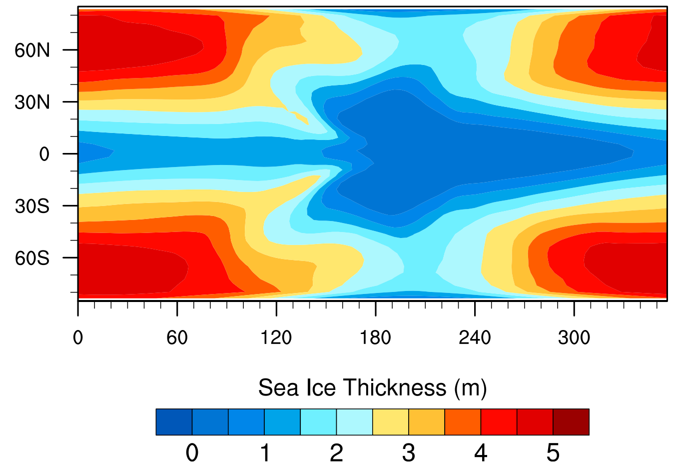

Fig. S3. Sea-ice thickness for 355 ppmv of CO_2. Color interval is 0.5 m.