where $\hbar = \frac{h}{2\pi}$, h is Planck's constant, and k_B is the Boltzmann constant. The barrier heights, V_0 and V_1, are taken to be the maximum energy of the long-range adiabatic potential $V(R)$ evaluated in a basis set of partial waves $|LM_L\rangle$ [14]. The potential $V(R)$ includes a repulsive centrifugal term, $\hbar^2 L(L+1)/(2\mu R^2)$ where μ is the reduced mass of the colliding molecules, an attractive isotropic van der Waals interaction $-bC_6/R^6$, and the dipolar interaction. We use only two fit parameters, b and γ, when fitting this model to the measured β/T vs. d.

The solid lines in Fig. 4 are a fit of the measured time evolution of n, T_z, and T_x to the numerical solution of three differential equations (see Supplementary Information):

$$\frac{dn}{dt} = -(K_0 T_z + 2K_1 T_x)n^2 - \frac{n}{2T_z}\frac{dT_z}{dt} - \frac{n}{T_x}\frac{dT_x}{dt} \tag{3}$$

$$\frac{dT_z}{dt} = \frac{n}{4}(-K_0 T_z + 2K_1 T_x)T_z - \frac{2\Gamma_{el}}{3}(T_z - T_x) + c_{bg} \tag{4}$$

$$\frac{dT_x}{dt} = \frac{n}{4}(K_0 T_z)T_x + \frac{\Gamma_{el}}{3}(T_z - T_x) + c_{bg} \tag{5}$$

Here, we have allowed for a difference in the average energy per particle in the two trap directions, "T_z" and "T_x", so that $\beta = K_0 T_z + 2K_1 T_x$. For the fits, we fix the d-dependent coefficients K_0 and K_1 using the previous fit to the inelastic loss rate data in Fig. 1. In addition to heating due to inelastic loss, we include a measured background heating rate of $c_{bg} = 0.01$ μK/s. The elastic collision rate in Eqns. 4 and 5 is given by $\Gamma_{el} = \frac{n\sigma_{el}v}{N_{coll}}$, where the elastic collision cross section σ_{el} is a fit parameter, $v = \sqrt{\frac{8k_B(T_z+2T_x)}{3\pi\mu}}$, and the constant N_{coll} can be thought of as the mean number of collisions per particle required for rethermalization. We use $N_{coll} = 4.1$, which was computed for p-wave collisions [30], however, we note that N_{coll} depends on the angular dependence of the scattering and may be somewhat different for dipolar elastic collisions.

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