Measurement of k_{deg} in mitotic cycle 14

If we let $Q_{df}(t_0)$ represent the amount of Dronpa-Bcd converted to the dark state and $Q_{df}(t_0+T)$ represent the amount recovered from the dark state after a time T, it follows that the degradation rate, k_{deg}, can be determined according to the equation

$$Q_{df}(t_0+T) = e^{-k_{deg}T} Q_{df}(t_0). \tag{16}$$

We verify that this relation holds in Fig. 4 *c*, showing that $\log(Q_{df}(t_0+T)/Q_{df}(t_0))$ is well fit by a linear function of T in early cycle 14, consistent with first-order degradation. The degradation rate, k_{deg}, at this developmental time point, indicated by the slope, is 0.028 min^{-1}, which corresponds to a Bcd lifetime, τ_{Bcd}, of 36 min. However, performing this measurement at different time points after fertilization demonstrates that the degradation rate is developmentally regulated (Fig. 4 *a*). At the onset of cycle 14, k_{deg} is 0.020 min^{-1}, corresponding to a lifetime of 50 min. By the time the embryo begins gastrulation, k_{deg} has increased and the lifetime of the protein has fallen to 15 min.