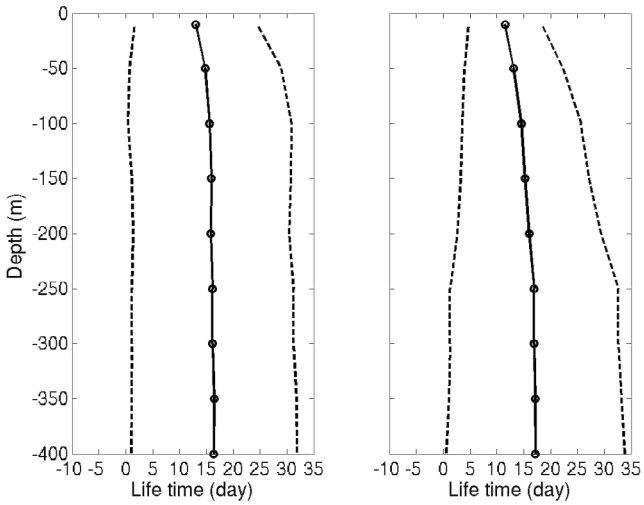

Figure 5. Vertical profile of eddy lifetime. The solid lines are mean lifetime, and dashed lines are from the subtraction/addition of standard deviation from/to the mean values, representing the variation ranges.

lifetimes. Some eddies can survive for a few months (which are not shown). Compared with results for open oceans [e.g., *Chelton et al.*, 2011; Liu et al., submitted manuscript, 2011], eddies in the SCB have relatively shorter lifetimes, which might be due to stronger advection in the coastal ocean and greater sinking source (friction) along the horizontal and in the bottom boundaries in the coastal ocean.

4.2. Eddy Sizes

[27] Histograms of eddy sizes at four levels are shown in Figure 7. The size of an eddy is defined as its radius. Cyclonic and anticyclonic eddies are more symmetric at lower levels than at the surface in terms of eddy size: at the surface there are more cyclonic eddies, which might be due to favorable positive wind curl at the surface as argued above. The peak number is located at about 5 km, which is considered as the scale of submesoscale eddies given that the mean deformation radius is about 20–30 km [*Dong and McWilliams*, 2007]. It is consistent with what *DiGiacomo and Holt* [2001] found using SAR imageries that they collected: most eddies' sizes are smaller than 10 km. Spatial distributions of eddy sizes at four levels are plotted in Figure 8. Eddies to the west of Santa Rosa Ridge (see Figure 1 for the map) and the western part of the SCB are much larger than those in the rest of the domain. Eddies between San Clemente Island and the coast, San Nicholas Island and San Clemente Island are also large. Eddy sizes decrease with the depth, which is further confirmed by the vertical profiles of both cyclonic and anticyclonic eddies as indicated in Figure 9. Mean eddy sizes are about 8–10 km at the nine levels with a variation range of 3 km $\sim$ 16 km.

4.3. Eddy Vorticity

[28] Theoretically, relative vorticity magnitude within an eddy decreases from its center to its boundary (reaches zero). The boundary of an eddy defined in the eddy detection scheme comprises turning points where the velocity magnitude starts to decrease from its increasing trend, i.e., the relative vorticity is equal to zero. The relative vorticity of an eddy is defined as the mean value within the eddy area confined by its boundary. Histograms of eddy relative vorticity normalized by the planetary rotation at four levels are shown in Figure 10, which normalized relative vorticity asymmetry in cyclonic and anticyclonic eddies near the sea surface, and the relative vorticity of cyclonic eddies has wider variation in their Gaussian distribution. The normalized relative vorticity with the peak number is about 0.3. The spatial distributions of normalized relative vorticity at four levels (10 m, 100 m, 200 m and 400 m) averaged over 1/16 degree $\times$ 1/16 degree bins, are plotted in Figure 11,

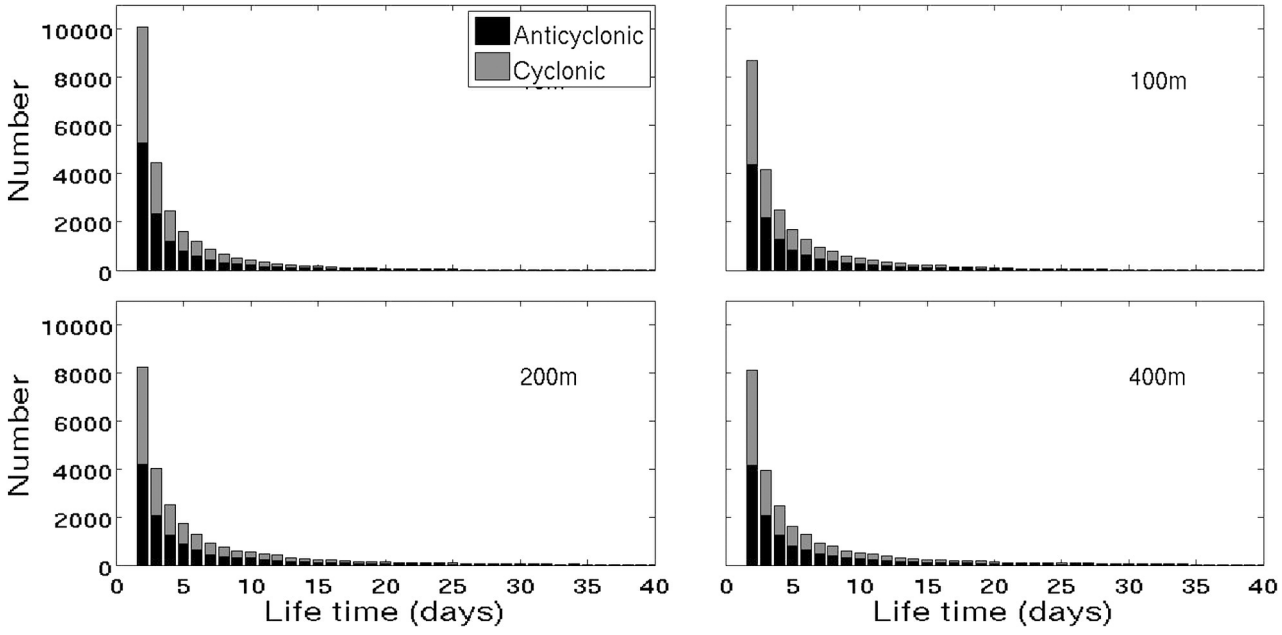

Figure 6. Histograms of eddy lifetime at four levels.