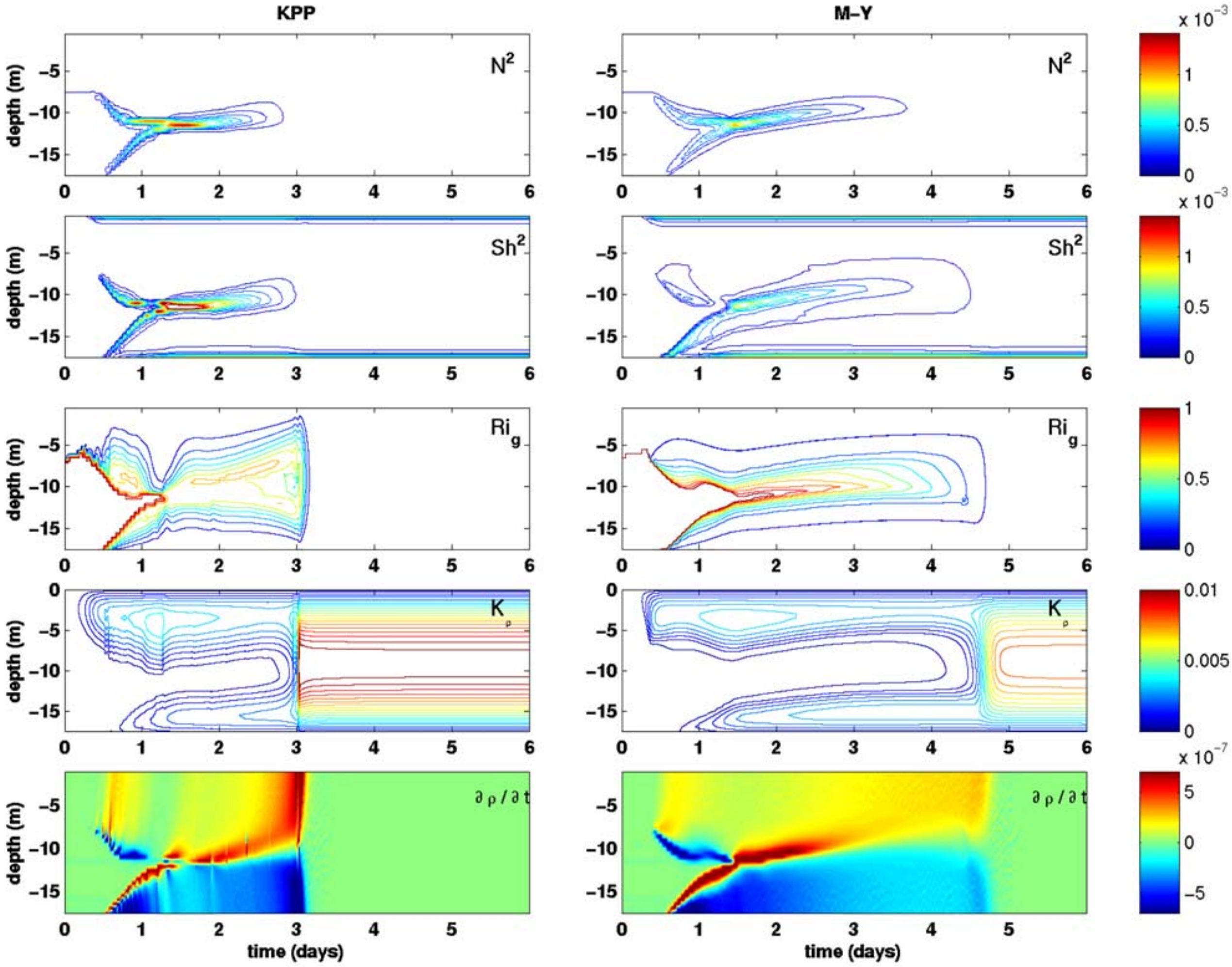

Figure 16. Time-depth contour plots of various fields associated with vertical mixing N^2, Sh^2, Ri_g, K_ρ, and $\partial_t\rho$ for the $N_o/10$ interacting boundary layers experiment.

the circulation by shutting down the onshore/offshore transport.

[69] Figure 16 offers the graphical explanation for this. With surface and bottom boundary layers in close proximity at day 1.5, adequate shear exists in the pycnocline to compensate for the enhanced stratification there and reduce the Richardson number below Ri_o. This promotes a moderately enhanced level of mixing within the pycnocline and a strong vertical flux of density through the beginning of day 3. Both the shear and stratification intensify more with KPP during the first 2 days than with M-Y, but with KPP the increase in shear is proportionately large enough relative to the increase in stratification to cause the onset of turbulent mixing throughout the water column by day 1.2 when Ri_g everywhere in the water column drops below 0.7. The presence of even moderate mixing across the interface between the boundary layers with KPP leads to the "fanning out" of the contours of Ri_g between days 1.2 and 3. With M-Y the shear across the pycnocline never becomes as intense and mixing proceeds as a boundary layer entrainment process for significantly longer. Diffusion of turbulent kinetic energy into this region does not appear to play a significant role in increasing the mixing either.

[70] The contours of vertical mixing coefficient (Figure 16) show that the transition from there existing two distinct boundary layers to a single well mixed water column is more abrupt with KPP than with M-Y. The maximum Ri_g in the water column drops from 0.5 to close to 0 within several hours with KPP while this same process takes over a day with M-Y. The matching of surface and bottom boundary layer vertical mixing profiles in KPP likely plays a role in this as it provides a means by which the diffusion coefficient at any location feels the effect of mixing elsewhere in the water column.

6. Two-Dimensional Upwelling: Case 3

[71] A two-dimensional coastal upwelling setting provides the opportunity to examine how these two mixing schemes respond when advection also plays an important role in redistributing density. Sensitivity tests were performed in which the stratification and the forcing were varied. The general pattern of response with the two parameterizations can be characterized by examining a small number of cases.

[72] Figure 17 shows density sections at day five for upwelling simulations with three different initial stratifica-