Synoptic Water Circulation Pattern Summary

Water circulation patterns during thermally stratified conditions were developed using both measured and simulated results. The ADCP and temperature logger data show the existence of internal wave motions whenever the Sea is stratified, and evidence of internal waves was observed in the ADCP records for both the southern and northern basins.

The northern basin remained stratified throughout the entire May simulation period, with peak velocities reaching magnitudes greater than 20 cm/s with a shear layer situated approximately 6 m off the bottom (see Figure 5.2). This period was not unique; temperature logger data shows that this basin remained stratified from March through early August 1997, when loggers were removed. This basin generally experiences lower surface wind magnitudes and is slightly deeper than the southern basin, conditions that encourage maintenance and development of stratification. Water circulates in a chaotic pattern in the northern basin, with no noticeable gyre, and only occasional cycles attributed to internal waves.

The southern basin is polymictic with vertical mixing extending to the bottom of Sites 1, 2 and 3 at least once every two weeks. This area is characterized by a large counter-clockwise gyre, which seems to exist year round (see Chapter 4). The motions of this gyre are advantageous for distribution of nutrients from the New and Alamo Rivers, which enter along the southern periphery of the basin.

Figures 5.22 through 5.25 summarize the stratified circulation patterns calculated by the hydrodynamic model. Large longitudinal temperature

gradients existed in the Sea during this period, with temperature differences of 6ºC or more between the northern and southern basins. Strong velocity gradients also existed, which may serve as mechanisms to drive internal wave motions along the thermocline interface. As described in Section 5.4.b, the hydrodynamic model did not capture observed internal wave motions. Peak velocities associated with internal waves are short lived (see Figure 5.2) however, so their ability to distribute nutrients is accordingly limited. Therefore, although the mechanics of internal waves is a challenging topic for future research, practical application of the model in its present state is not hampered by a limited capability to fully simulate wave phenomena.

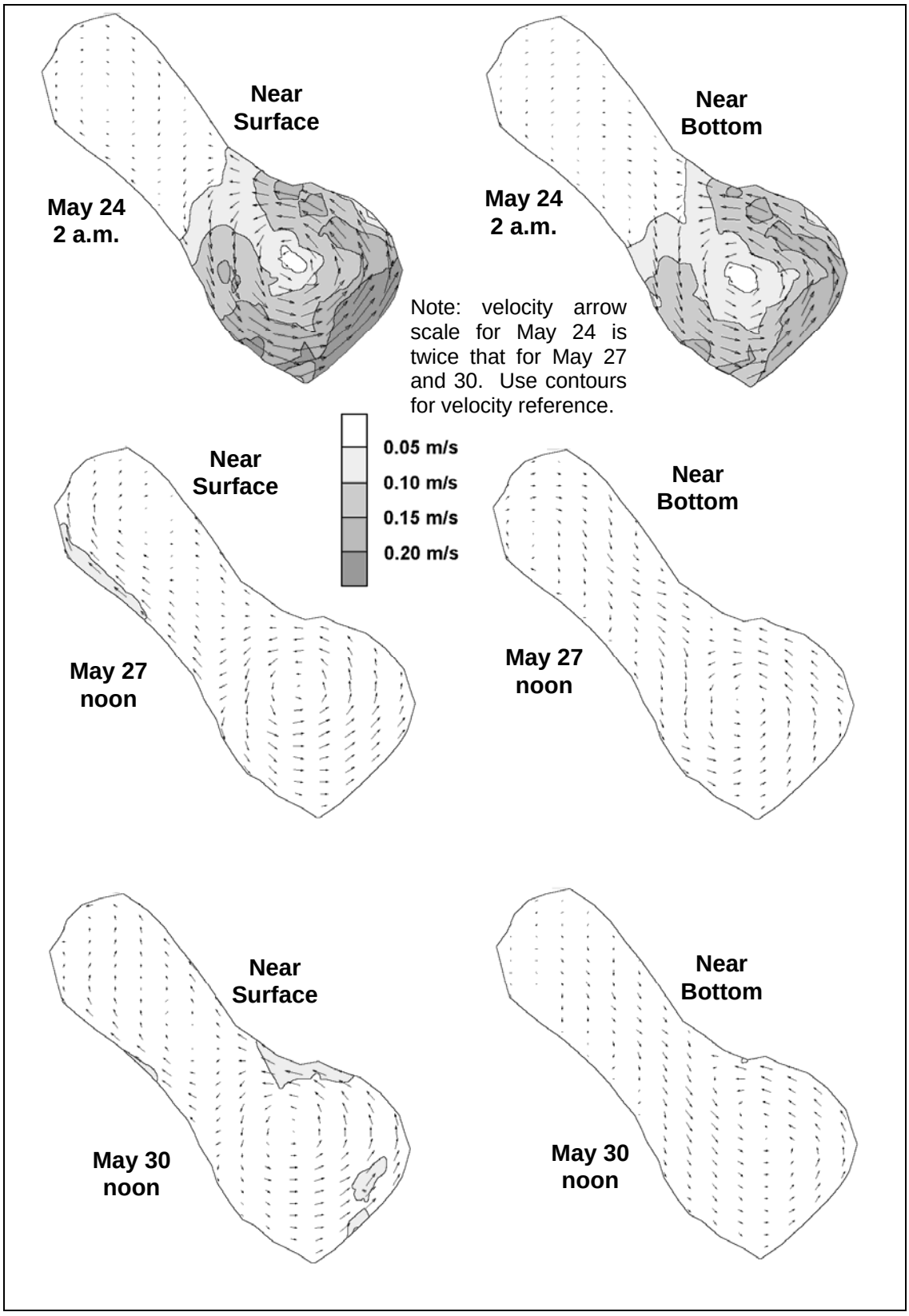
Near
Surface
May 24
2 a.m.
Near
Bottom
May 24
2 a.m.
Note: velocity arrow scale for May 24 is twice that for May 27 and 30. Use contours for velocity reference.
0.05 m/s
0.10 m/s
0.15 m/s
0.20 m/s
Near
Surface
May 27
noon
Near
Bottom
May 27
noon
Near
Surface
May 30
noon
Near
Bottom
May 30
noon

Figure Error! No text of specified style in document.**.1 Simulated Water Velocities: May 24-30, 1997**

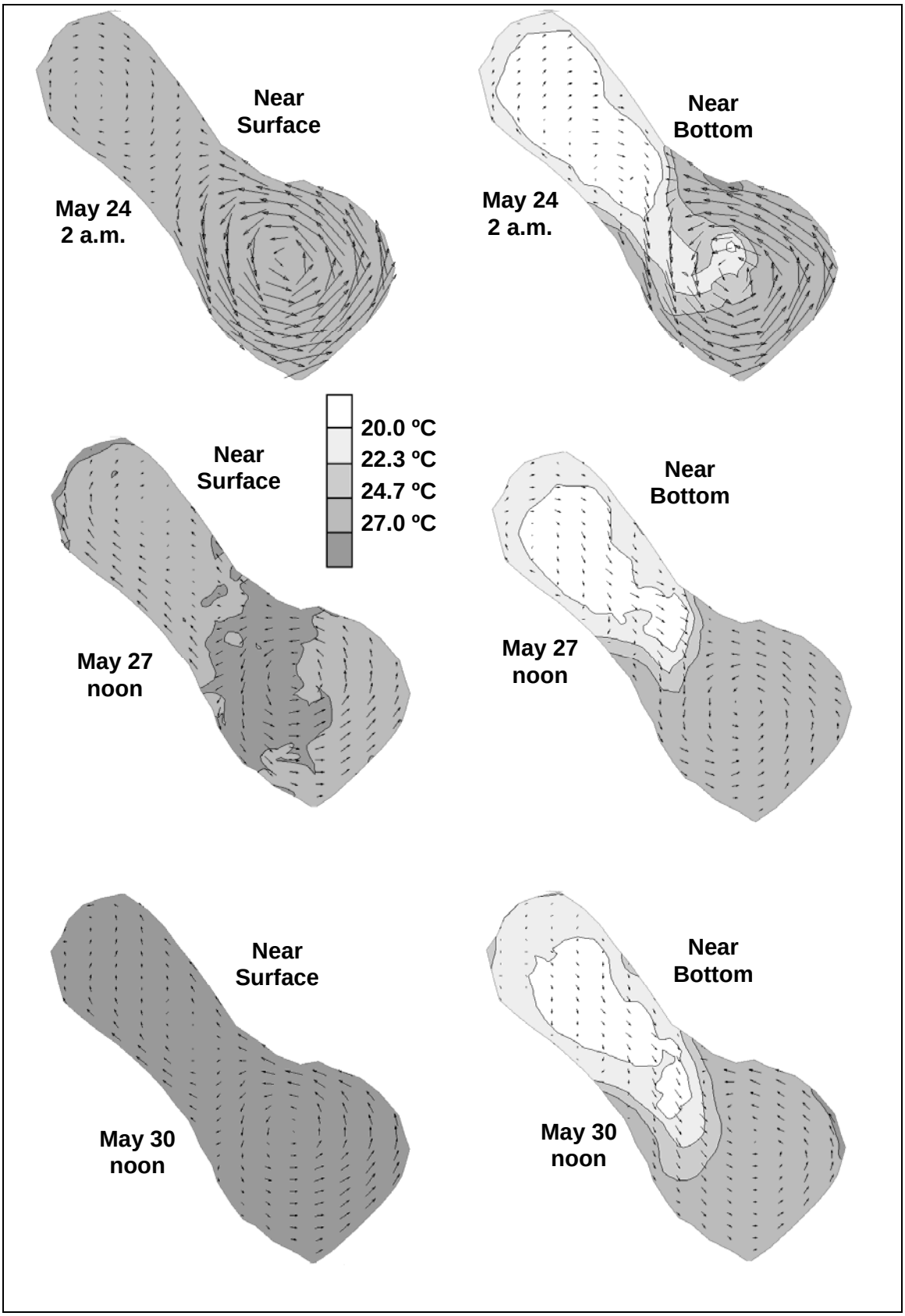

Figure Error! No text of specified style in document.**.2 Simulated Water Temperatures**

and Velocity Fields

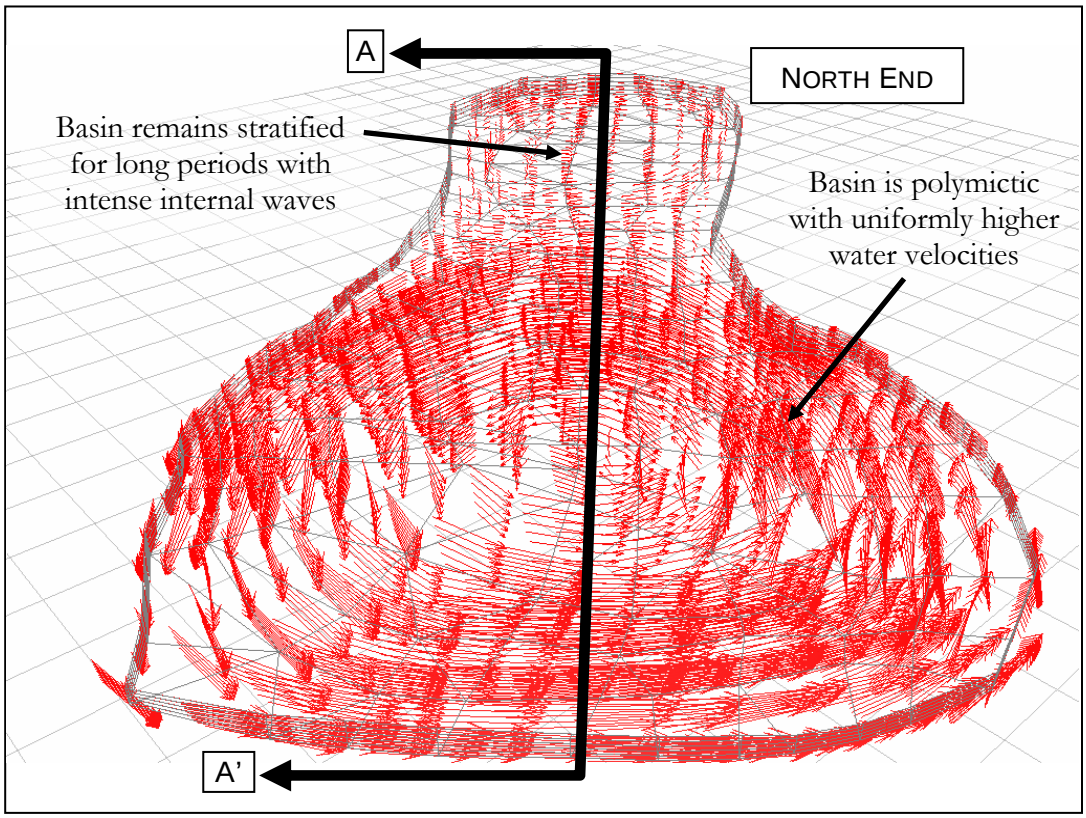

Figure Error! No text of specified style in document.**.3 Three-Dimensional Perspective of Water Circulation on May 24 at 2 a.m.**

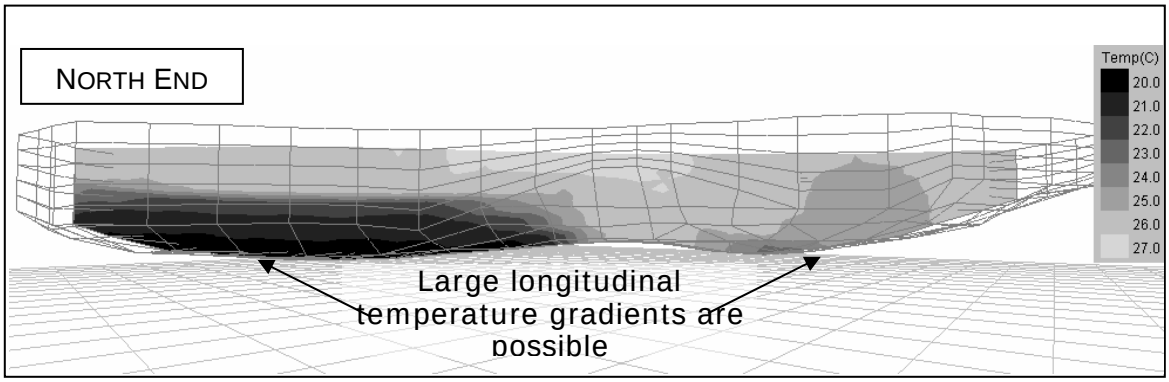

Figure Error! No text of specified style in document.**.4 Temperature Profile along Cut A-A' (2 a.m. on May 24)**