Figures:

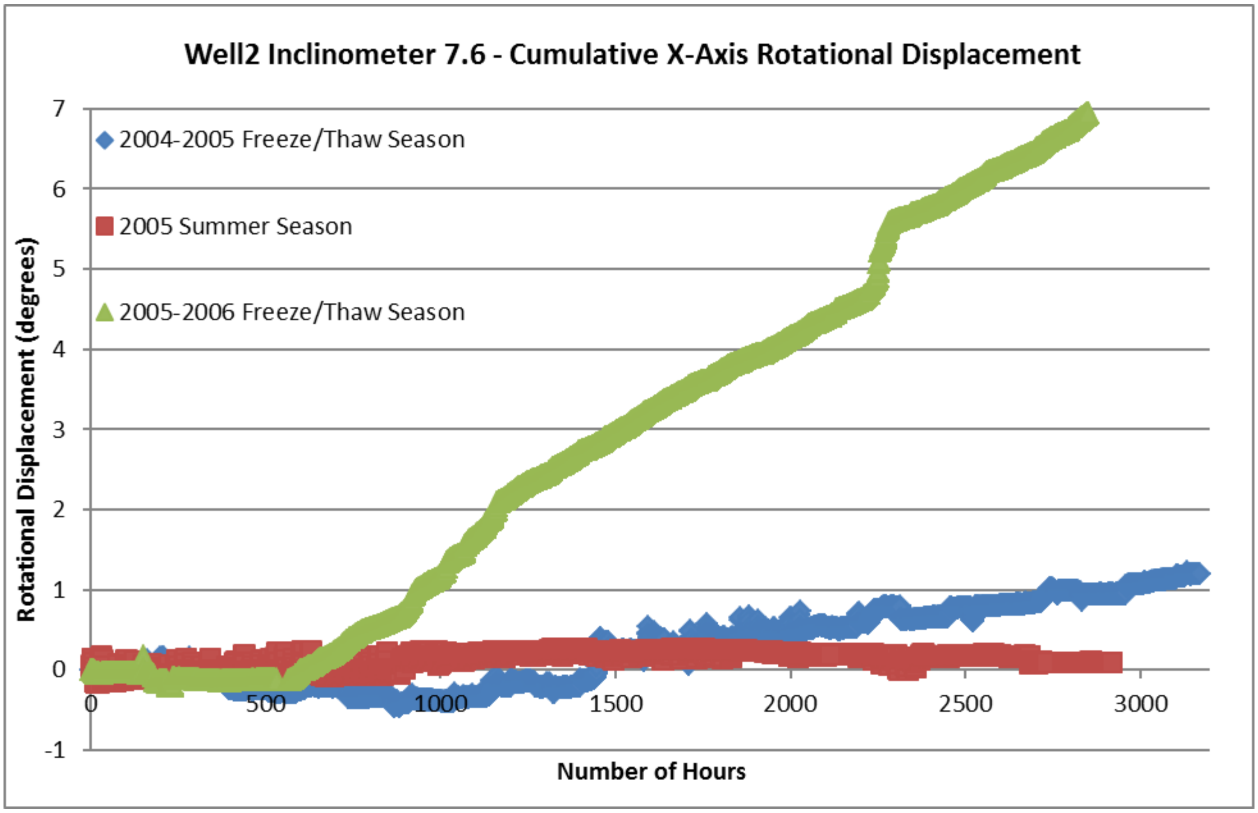

Figure 1: Displays seasonal data contrasting two freeze/thaw cycles (winters of 2004-2005 and 2005-2006) and one summer cycle (2005). The downslope (rotational) cumulative displacement of the inclinometer is greatest during the freeze/thaw seasons and relatively constant during the summer.

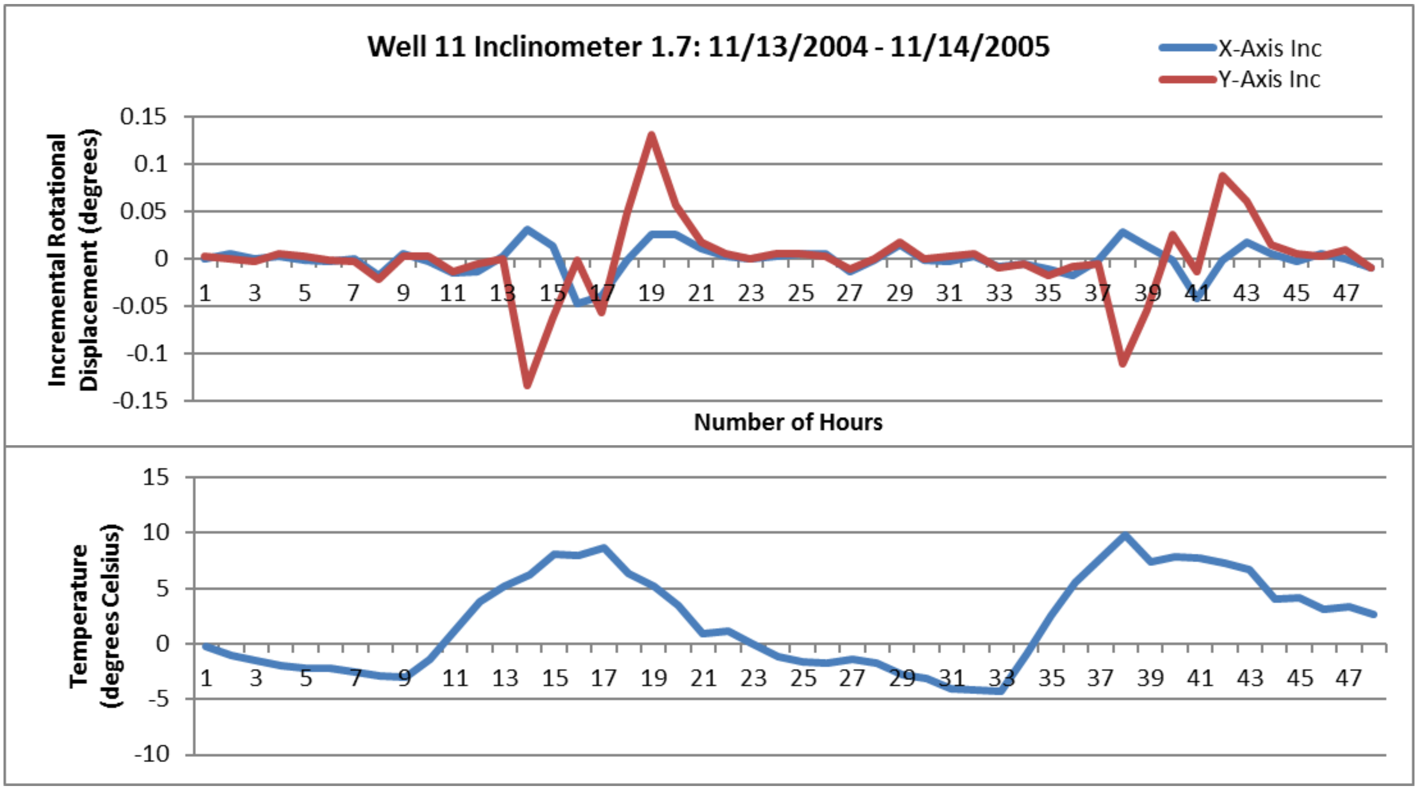

Figure 2: Both the x-axis displacement (downslope) and y-axis displacement (slope strike) show largest amounts of movement during periods of temperatures above freezing (0° Celsius) and show relatively no displacement during periods of freezing. Temperature plays an important role in shallow slope displacement. This inclinometer in Well 11 is 1.7 feet below the slope surface.

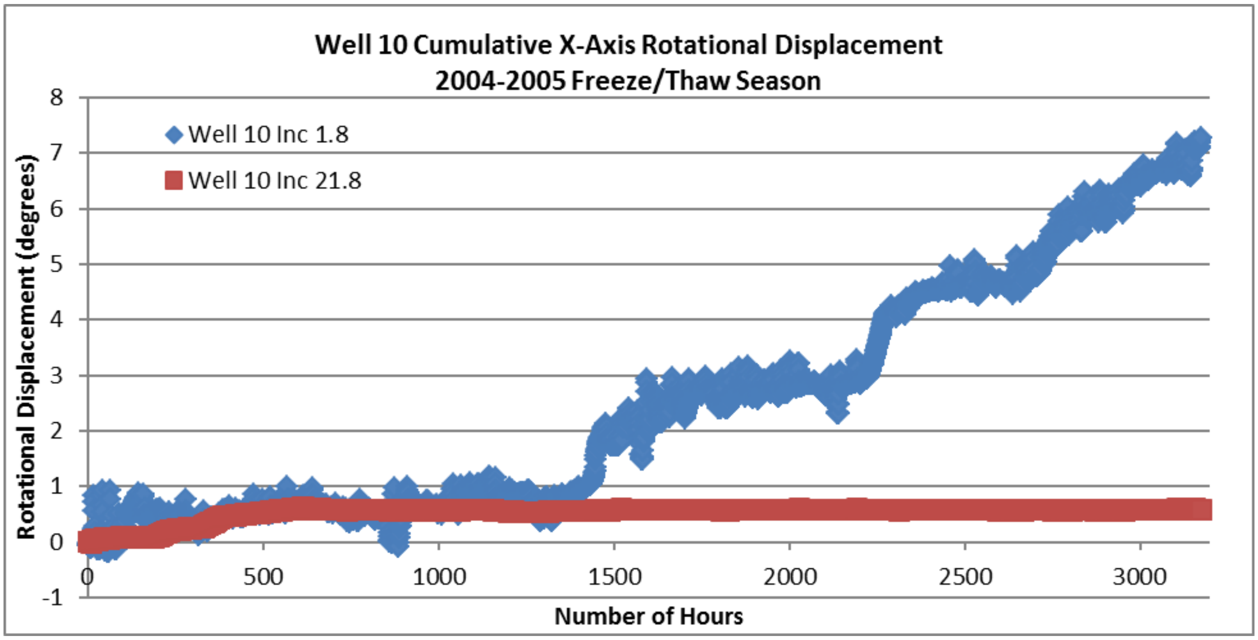

Figure 3: The difference in downslope displacement between a shallow inclinometer (1.8 feet below the slope surface) and a deep inclinometer (21.8 feet below the slope surface). The freeze/thaw cycles do not affect the deep inclinometer as much as the shallow inclinometer. Most slope displacements occur as shallow movement where the material undergoes regular freeze/thaw events. Shallow displacements are more intense than deep displacements, which tend to occur gradually. Deep displacements are thought to be indirect results of temperature: freezing temperatures causes the bluff to freeze, creating a barrier in which groundwater is unable to flow, and ultimately raises the groundwater in the bluff. The thawing of the bluff then releases the groundwater and causes small slope displacements.

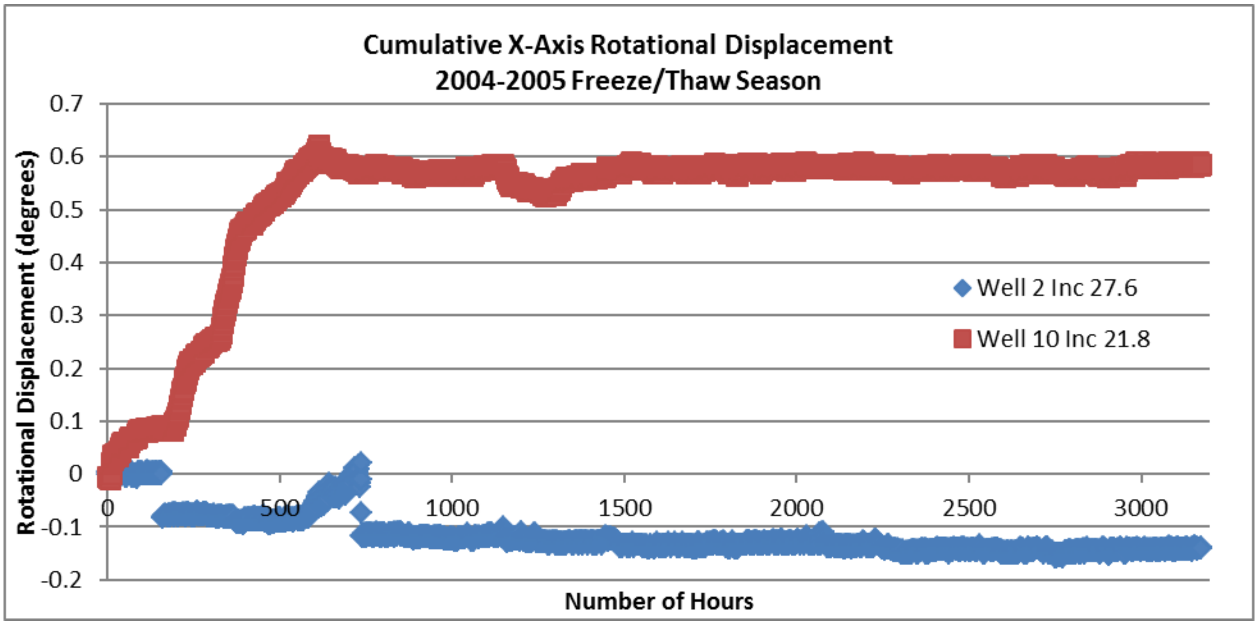

Figure 4: A comparison between the control zone and the dewatering zone. Much more displacement occurs in the natural bluff (the control zone) compared to the dewatered portion of the bluff. Dewatering a bluff is an effective way to minimize slope displacement. Notice that Well 10 Inclinometer 21.8 occurs in the previous figure where, compared to the shallow inclinometer in the control zone, there is relatively little displacement of the deep inclinometer in the dewatered zone.

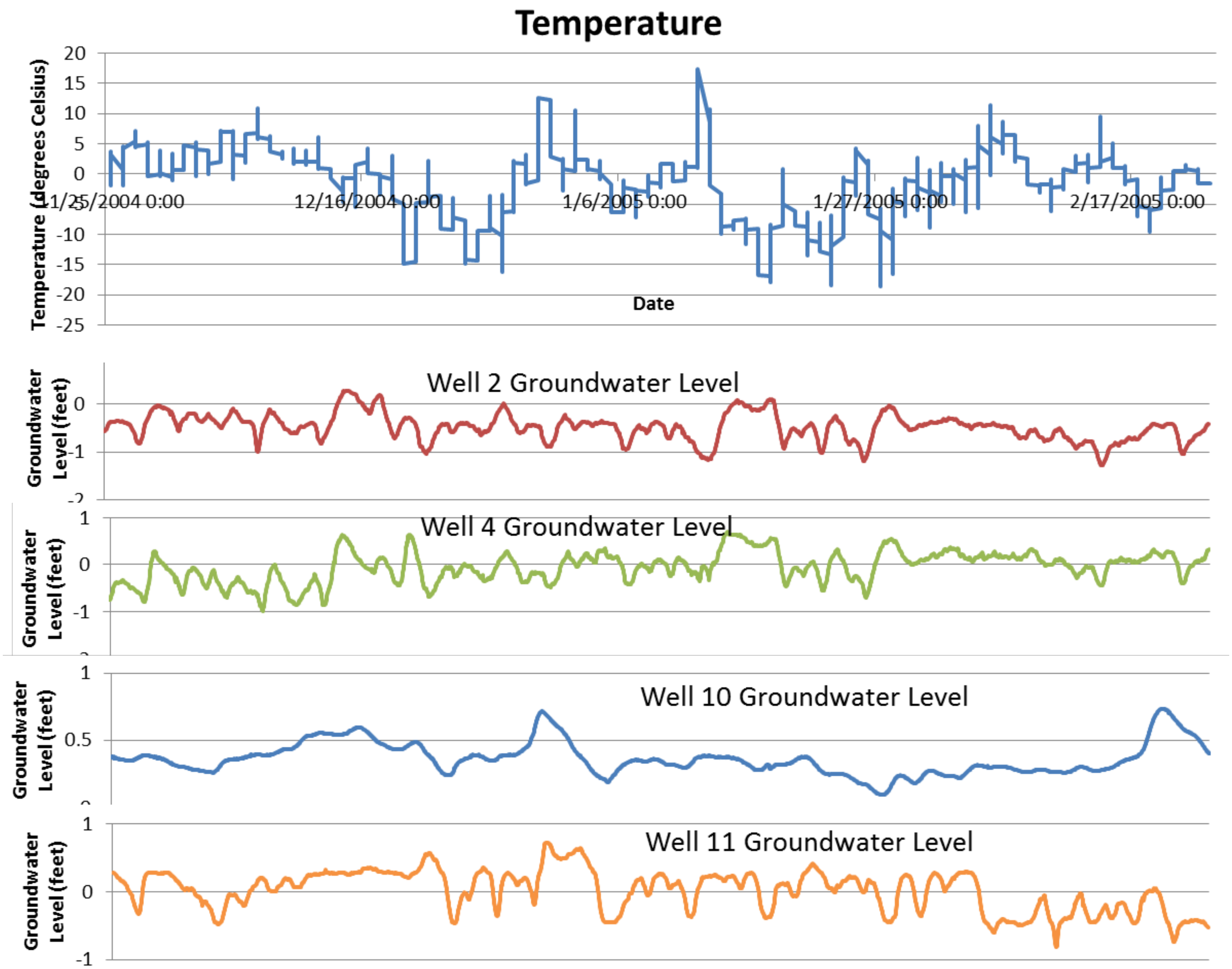

Figure 5: The effects of temperature on groundwater. As the temperature drops below freezing, groundwater levels tend to rise due to the obstruction of groundwater flow from within the bluff. As temperatures rise above 0° Celsius, groundwater levels tend to drop.

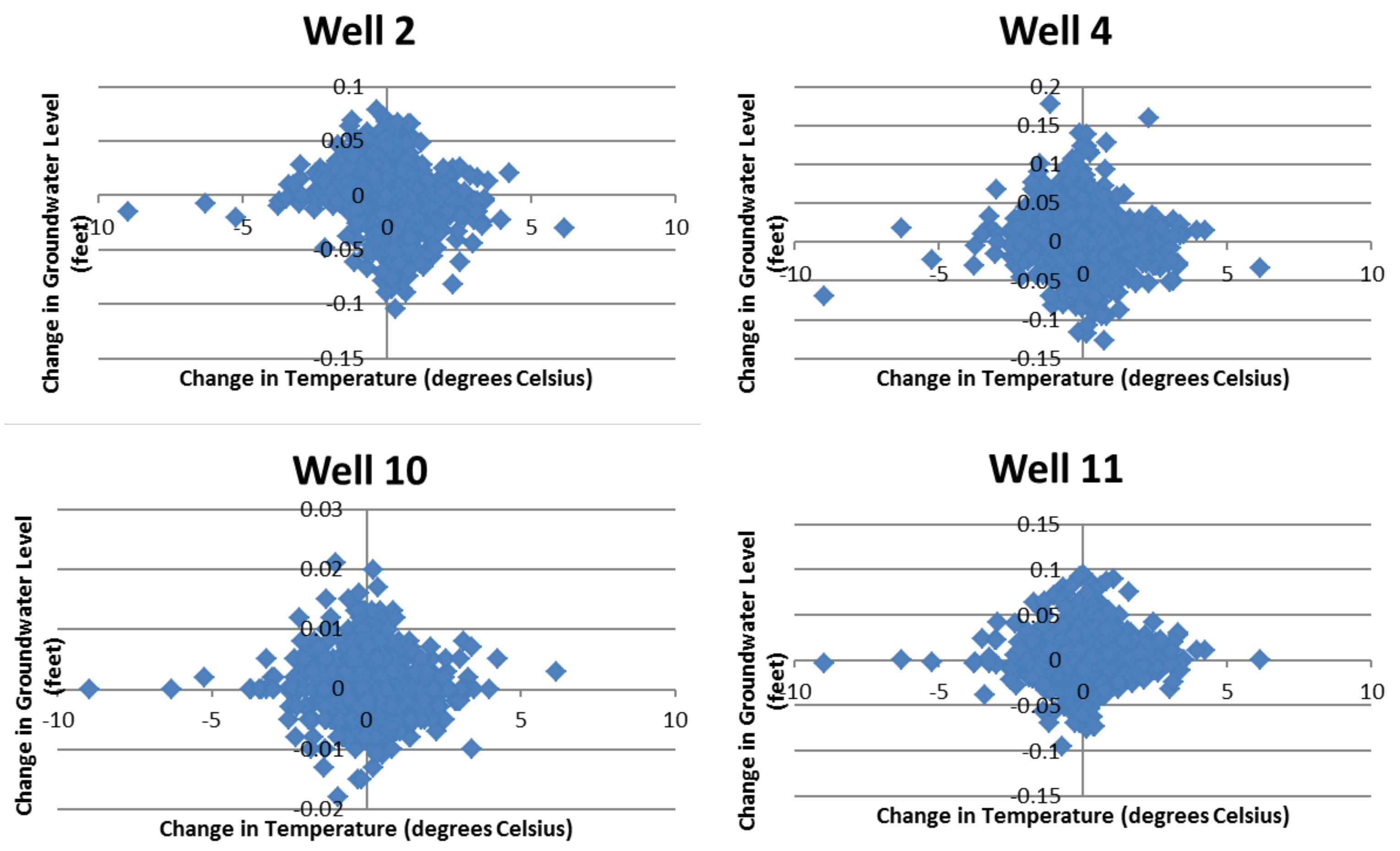

Figure 6: The hourly change in groundwater level with respect to the hourly change in temperature. There are roughly one thousand points in each plot. Further work will be done applying point-concentration contours lines further developing the correlation between temperature and groundwater levels.

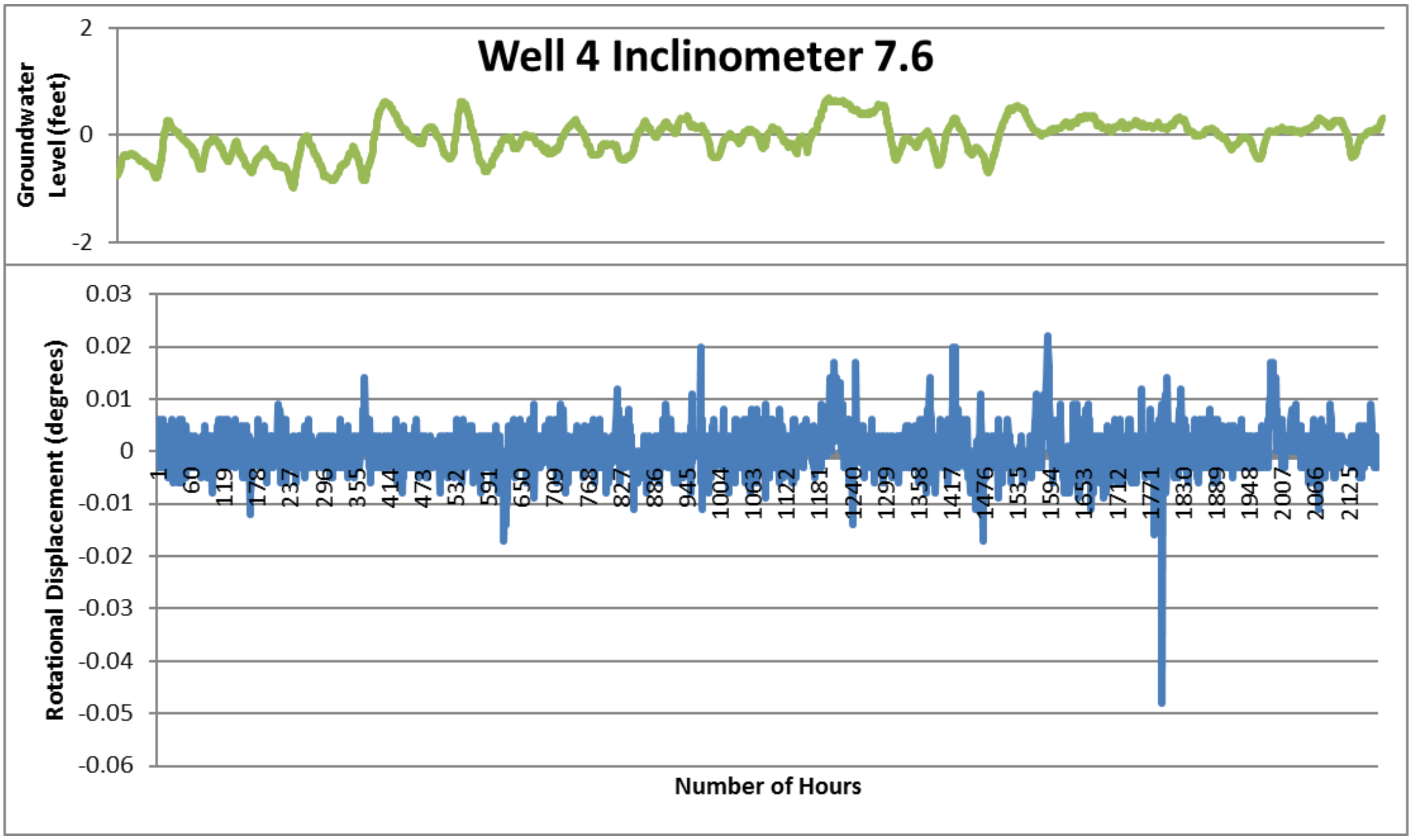

Figure 7: The relationship between the groundwater level and downslope displacement on a deep inclinometer. The short periods of anomalous downslope displacements tend to occur during times of positive groundwater levels. (Note: The groundwater level of 0 feet was the level of groundwater at the time of the piezometer installation, which occurred during the summer.)

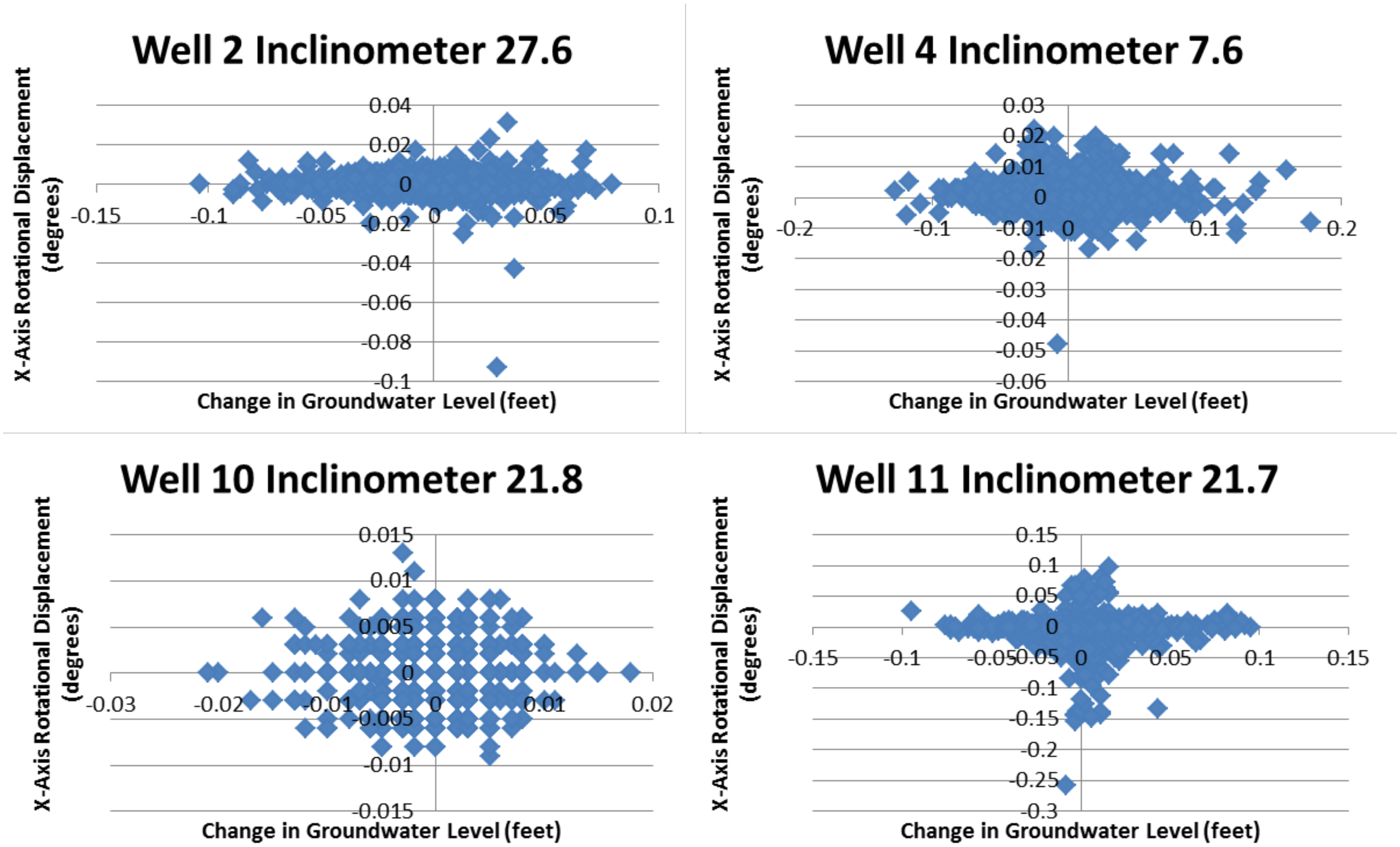

Figure 8: The hourly change in groundwater level with respect to the hourly change in downslope displacement. There are roughly one thousand points in each plot. There appears to be instrumentation error with the Well 10 Inclinometer 21.8 data and, therefore, that plot is useless. Further work will be done applying point-concentration contours lines further developing the correlation between temperature and downslope displacement.