Soil respiration is a major flux of C in the terrestrial carbon cycle. Since a large part of the terrestrial C stock is stored in the soils of northern forest ecosystems, even small changes in soil respiration rates in these ecosystems could have an effect on atmospheric CO2 concentrations. Soil respiration can be divided into autotrophic respiration (from roots, mycorrhizal hyphae and associated microbes) and heterotrophic respiration (from decomposers of organic material). An important question is whether the two components of soil respiration respond differently to changing abiotic factors. In my thesis, in order to separate the two components, I used both manipulated and natural variations in $\delta^{13}$C as a marker for autotrophic respiration. The effect of elevated atmospheric CO2 concentration and elevated temperature on soil respiration was studied in a whole tree chamber experiment conducted in a Norway spruce forest in northern Sweden. In another spruce forest, day-to-day variations of soil respiration rate and $\delta^{13}$C of soil respired CO2 were explained by above and below ground abiotic conditions. Also, a trenching experiment was conducted in the latter forest. Elevated CO2 concentration, while not elevated temperature, increased soil respiration rates, and $\delta^{13}$C data suggest the increase mostly resulted from autotrophic respiration. The day-to-day variations in soil respiration rate and $\delta^{13}$C seemed to be strongly linked to recent weather, with a shorter lag for soil respiration rate than for $\delta^{13}$C. However, the tightness of the link seemed to be dependent on good weather conditions up to a week before sampling. I concluded that soil- and autotrophic respiration in N-limited forest ecosystems is to a large degree influenced by the availability of newly produced photoassimilates being transported to the roots and to a less degree dependent on temperature.