In the Polar Regions, the effects of climate change are a matter of global concern. Climate change is intimately associated with the thinning and retreat of glaciers. The dynamic nature of the glaciers depends upon various factors like their thickness, surface slope and the bedrock slope. The movement of the glaciers builds up stress in the glaciers. Under impending climate change, the change in the glacier ice thickness as well as the rate of change in the surface and bedrock slope changes the stress pattern in the glaciers. Accordingly, the stress pattern remaining unequal throughout the glacier body is responsible for the formation of crevasses and tend to change their shape and intensity. In the northern hemisphere, Ny-Alesund area in the Svalbard archipelago and in the southern hemisphere, the Polar ice sheet near the Schirmacher Oasis in central Dronning Maud Land of Antarctica were studied for stress calculation. These studies were carried out by estimating the ice thickness and bedrock slope using Ground Penetrating Radar. At present about 60% of the land is covered by the glacier and perennial snow covers the Svalbard archipelago located within the Arctic Circle. The Vestre Broggerbreen (VB) glacier system in the Ny-Alesund area of this region is separated into the southern VB-I and the northern VB-II glaciers by a medial moraine with overall extension towards ENE. The glacier stress for the VB glacier system is calculated to be in the order of 20 to 60 kPa. In the VB-I glacier the highest stress of 60 kPa is calculated in a constricted zone towards the upper reach, whereas the least stress of 20 kPa is concentrated towards the glacier snout. In the VB-II glacier, the highest stress of 50-60 kPa is observed in a very small area towards the upper reaches. There are two distinct least stress zones observed both in the upper as well as lower reaches in VB-II glacier whereas a majority of the area in the upper reaches experiences 40-50 kPa.  The Polar ice sheet of Antarctica near the Schirmacher Oasis however shows a different type of stress pattern. This area show a variation in the ice sheet stress in the range of 25-100 kPa, but contrary to the case of the Arctic glaciers, the change in the stress pattern is uniform in the Polar ice sheet. The stress gradually reduces towards the northern side of the Polar ice sheet, which is in contact with the Schirmacher Oasis. The ice sheet thickness gradually increases towards the south, and the bedrock slope does not change abruptly over a large region. However, the change in the rate of surface slope drives the crevasse pattern. This study shows that the stress pattern in this glacier system is more dependent upon the bedrock slope than the surface slope, though the later one is responsible for the formation and modification of the crevasses.