Energetic particles transform photochemical system in polar regions during geomagnetic storms and solar proton events (SPEs) due to the additional production of NOx and Hox which destroy ozone. Then it leads to corresponding changes in temperature and dynamics. Such dynamical response after SPE of July 2000 was simulated earlier by Krivolutsky et al. (2006). The results of simulations of the dynamical and temperature response caused by ozone depletion, initiated by precipitating electrons and solar protons during famous period of October-November 2003 are presented. In order to calculate ionization rates induced by relativistic electrons and solar protons during October-November 2003, corresponding proton and electron fluxes in different energetic channels from GOES-10 and POES-15/16 have been used with using the Atmospheric Ionization Module Osnabrück - AIMOS (Wissing and Kallenrode, 2009). The response of atmospheric chemical composition was calculated with CAO 3D photochemical-transport model. MLT GCM (CAO/COMMA) was used to investigate changes in circulation, temperature and tidal components caused by particle-induced ozone variations. The results of simulations with GCM showed that Northern and Southern polar regions had different response.