The significant effect of solar wind dynamic pressure fronts on ionospheric convection and magnetospheric reconnection has been recently demonstrated by both ground and space born instruments. Past case studies have shown that solar wind pressure fronts induce significantly enhanced convection on the dayside ionosphere, implying enhanced magnetopause reconnection, while substantially reducing the size of the polar cap on the nightside, suggesting an enhancement of magnetotail reconnection. We present statistical studies of the response of ionospheric flows, the transpolar potential, and polar cap boundaries after solar wind dynamic pressure enhancements. The flow results show that the convection is enhanced within both the dayside and nightside ionosphere. The dayside response is more clear and immediate, while the response on the nightside is slower and more evident for low Interplanetary Magnetic Field (IMF) $B_y$ values. The overall convection, represented by the transpolar potential, has a strong response immediately after an increase in pressure, with magnitude and duration modulated by the background IMF $B_z$ conditions. Finally, the polar cap boundaries exhibit a poleward motion after the pressure jump, with specific events demonstrating a one to one correlation between the poleward motion of the boundary and ionospheric flow enhancements on the nightside. The closing of the polar cap on the nightside, combined with enhanced nightside flows that cross the boundary, indicate an enhancement of magnetotail reconnection after solar wind pressure fronts. We compare our results with simulations of specific events using the Lyon-Fedder-Mobarry magnetohydrodynamic model.