The Earth's Ionospheric Response to the Complex Interplanetary Event of November 5-6, 2001

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Abstract: At ~115 UT 6 November, a fast forward shock overtook a magnetic cloud composed of a steady southwardly directed interplanetary magnetic field. The shock compression of this field caused intense Bs fields leading to a strong (dayside) eastwardly directed magnetospheric electric field and a major (D_{st} ~<-300 nT) magnetic storm. The interplanetary sheath fields steadily increased over the over the next ~2 hrs to reach a maximum of ~-80 nT. We explore the dayside ionospheric responses to this interplanetary event. We use GPS receivers onboard CHAMP (~400 km altitude, upward viewing), SAC-C (~700 km altitude, upward viewing), dual freqnency altimeter data from TOPEX (~1300 km altitude) and ~100 ground based GPS receiver data to determine the global ionospheric total electron content (TEC) as a function of the phase of the interplanetary event/magnetic storm. It will be shown that the shock generated prompt electric fields cause an immediate uplift of the entire dayside low latitude ionosphere. A few hours later, equatorial and low latitude ionospheric TEC increases occur. About ~6 hrs after the shock, there is a significant dayside TEC decrease. Signatures of the bottomside of the plasmasphere are evident in the CHAMP (~7 pm LT) data, and the inward motion of the plasmapause during the storm main phase can be tracked/identified. The interpretation of the results will be discussed in detail.