Abstract:

This paper presents the mid- and low-latitudes ionospheric phenomenon that can potentially challenge our communications and navigation technologies. Plasmaspheric plumes have ionospheric signatures and are observed as storm enhanced density (SED) with a very sharp density gradient. These ionospheric signatures have been primarily observed over the American sector with a few limited examples over the European sector. This study examines the longitudinal occurrence frequency of plasmaspheric/SED plumes along with the possible driving mechanism for the formation of SED plume. GPS TEC, IMAGE EUV, TOPEX/JASON altimeter TEC, DMSP, and ground-based magnetometer data have been used to address the problem. The paper also presents a case and statistical study of the longitudinal variability of dayside equatorial electrojet (EEJ) and thus vertical drift for all local times using ground-based observations. While the formation of EEJ and its temporal variation is believed to be fairly well understood, the longitudinal variability at all local times is still unknown. Using the ion velocity meter (IVM) instrument onboard the C/NOFS satellite, we also observed significant longitudinal difference in the dusk sector pre-reversal drift, with stronger pre-reversal drift in the west-American sector compared to the African sector. On the other hand, previous satellite observations have continuously shown that the African sector is home to stronger and year-round ionospheric bubbles/irregularities compared to the American and Asian sectors. Our results raise potential question: if the vertical drift, which causes enhancement of Rayleigh-Taylor (RT) instability growth rate, is stronger in the American sector and weaker in the African sector – why are the occurrence and amplitude of equatorial irregularities stronger in African sector? Finally, in this presentation we will address the question – what cause for the formation of irregularities/bubbles during post-midnight sector, especially for magnetically quiet periods. If time allows; I’ll show some of my experiences from my recent scientific mission in African and Chile.