A STUDY OF ATMOSPHERIC AND PLASMA DISTURBANCES IMPACTS ON JUNO RADIO/GRAVITY SCIENCE. Yang, Yu-Ming, Dustin Buccino, Kamal Oudrhiri, Meegyeong Paik, Daniel S Kahan, Jet Propulsion Laboratory, Radio Science Systems Group, California Institute of Technology, Pasadena, CA.

Atmospheric and plasma disturbances can have significant impacts on radio frequency signal propagation such as communication links between Deep Space Network and spacecrafts. Previous studies indicate that space weather, earth or plentary surface, and interior processes (such as seismic activities, meteor impacts, and volcanic eruptions), are able to trigger atmospheric acoustic and gravity waves (AGWs), which could potentially couple with plasma electrons resulting in plasame disturbances. These disturbances are relatively small to the background of plasma/ionosphere electron profiles but are subsequently observable to radio frequency signals.

Juno is a National Aeronautics and Space Administration's (NASA) New Frontiers mission to learn about Jupiter's atmospheric composition, atmospheric structure, magnetic field, gravity field, and polar magnetosphere. The primary goals of Gravity Science instrument is to measure the gravity field to constrain the mass of the core, probe the centrifugal response of the planet to investigate the deep zonal flow, and investigate the tidal response from Io. The Juno's Gravity Science instrument includes two radio science components: the X-band telecommunications system and a Ka-band Translator [1]. The X- and Ka-band dual frequency links provide an opportunity to investigate the impact of the Juno radio science measurements due to plasma disturbances associated with space weather and atmospheric gravity waves [2].

In this research, we investigate perturbations of plasma electron content using X and Ka-band radio links during five years of Juno's interplanetary cruise to study the impact on Juno radio science measurements and to have a better undstanding of the coupling between space weather, atmospheric waves, plasama disturbances, and Juno gravity science data. The coupling between planetary interior, surface, and atmosphere will benefit from innovative radio science techniques for future space missions such as planetary seismology[3].

References:

[1] Mukai, Ryan, Hansen, David, Mittskus, Anthony, Taylor, Jim, and Monika Danos. Juno Telecommunications. Vol. 16. Pasadena: Jet Propulsion Laboratory, 2012.

[2] Yang, Yu-Ming, Meegyeong Paik, Kamal Oudrhiri, Dustin Buccino, Daniel S Kahan (2016), Remote Sensing of Atmospheric and Ionospheric Disturbances using Radio Science Techniques, SA44A-05, 2016 AGU Fall Meeting. San Francisco, December 12-16 (abstract and oral presentation).

[3] P. Lognonne, F. Karakostas, L. Rolland, and Y. Nishikawa, "Modeling of atmospheric-coupled Rayleigh waves on planets with atmosphere: From Earth observation to Mars and Venus perspectives," J. Acoust. Soc. Am. 140, 1447–1468 (2016).