

# Geodetics Measurements Within the Scope of Current and Future Perspectives of GNSS–Reflectometry and GNSS–Radio Occultation

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**Key words:** GNSS/GPS; Remote sensing; GNSS-Reflectometry; GNSS-Radio Occultation

## SUMMARY

The main operational use of GNSS is geo-spatial positioning; nowadays the potential of reflected, refracted and scattered GNSS signal could be also successfully used in remote sensing application. Under the Global Navigation Satellite Systems, GPS is the one which almost fully covers the globe. So, GPS gives the opportunity to be used for GNSS-Reflectometry (GNSS-R) and GNSS-Radio Occultation's (GNSS-RO) experimental researches. The GNSS-R is in an ascending way to obtain accurate results compare to the other Earth observation's techniques. The GNSS-R technology showed its ability for sensing the ocean and sea roughness, land and soil moisture, atmosphere, ionosphere and cryosphere, and monitoring wind speed and wind-driven waves. Another approach of GNSS-R is to the Remote sensing application for monitoring the Earth's environmental traversing of snow thicknesses and ice altimetry, impacted by the global warming. Using GNSS-RO technique is also one of the interesting integration of GPS signals in space applicative sectors is for weather and climate forecasting. On the research way, GNSS-RO signals are used for observation atmospheric sounding which include water vapor, temperature and pressure. For ionospheric sensing, occultation's measurements have been proven also good and accurate results compare to the results given by number of meteorological centers around the world. The work concept of GPS Occultation accommodate GPS receiver which is based in LEO satellite and tracks transmitted GPS signals that pass through the Earth's atmosphere. Due to the motion, both GPS transmitters and GPS receivers, GPS signal is bent and travels through different atmospherics' layers which give instantaneous depictions of the weather conditions. The paper will focus on investigation of direct, reflected and bent GPS signals using the instrumentation and theoretical principles to collect and process data during different missions. It will be discussed about implementation of GNSS-reflected and bent measurements in monitoring the current situation and future disasters prediction such as prediction of tsunami, monitoring ocean eddies, flooding and the other observations of the Earth. The space geodetic techniques and new mathematical approaches take benefit from the Global Geodetic Observing System to improve the accuracy of the measurements in remote sensing application using this GNSS-R and technology. Analysis will also focus on the capabilities of this technique in terrestrials measurements and if it is possible to replace by the present techniques of remote sensing. In the near future, GNSS-R and GNSS-RO are expected to flourish as an emerging application in the field of remote sensing obtaining fast and accurate results.