GEROS-ISS: Innovative GNSS based Remote Sensing aboard the International Space Station for GGOS


Abstract
GEROS-ISS (GEROS hereafter) stands for GNSS Reflectometry, Radio Occultation and Scatterometry onboard the International Space Station [3]. It is a scientific experiment, proposed to the European Space Agency (ESA) in 2011 for installation aboard the ISS. The main focus of GEROS is the dedicated use of signals from the currently available Global Navigation Satellite System (GNSS) for remote sensing of the System Earth with focus to Climate Change detection. Therefore GEROS will contribute to the Global Geodetic Observing System (GGOS). The GEROS mission idea and the current status are briefly reviewed.

Background
The European Space Agency Directorate of Human Space Flight and Operations (HSO) released an announcement of opportunity in July 2011 in coordination with the Directorate of Earth Observation Programmes (EOP) soliciting scientific experiments for the International Space Station relevant to global climate change studies. 25 Letters of intent were received from 237 science team members. After a peer-review of the received proposals and a scientific and technical evaluation, the GEROS-ISS proposal was accepted to proceed to Phase A feasibility studies.

Mission Idea
GEROS-ISS is a new and innovative ISS experiment primarily focused on exploiting reflected signals of opportunity from the GNSS satellites at L-band to measure key parameters of ocean surfaces which are relevant to characterise climate change. Secondary mission goals are global atmosphere and ionosphere observations using the GNSS radio occultation technique and the monitoring of land surface parameters utilizing reflected GNSS signals (see Fig. above). GEROS will also provide a sensor calibration/validation option for other upcoming satellite missions including, e.g., Sentinel-3, SWOT or FORMOSAT-7/COSMIC-II. The GNSS remote sensing data from GEROS will also complement the innovative GNSS scatterometry measurements from the U.S. mission CYGNSS, which is currently foreseen for launch in 2016. [2].

Scientific Studies
Sea surface topography of the Gulf of Mexico deduced within the GOS [1] after one month of artificial GEROS measurements using simulated GPS reflectometry data from the International Space Station (see text). The colors indicate mesoscale variations of the sea surface height (SSH) related to energetic eddies. The improved representation of these phenomena is a major GEROS mission goal.

Status
GEROS was selected in result of a complex review process, initiated by ESA. The review results and decision on further activities was officially announced end of 2012. An interdisciplinary and international Science Advisory Group (SAG) of acknowledged experts in Oceanography, Geodesy, Atmosphere and GNSS Science started to work in June 2013 on details of the preparation of the GEROS mission. This SAG consists of key members of the proposing GEROS team and additional experts, nominated by ESA. The begin of two competitive industrial phase A studies for the GEROS mission implementation is foreseen for early 2014. According to the current schedule and in case of successful preparatory studies and provision of appropriate funding, a launch of GEROS can be expected for 2018.

References