Geophysical Research Abstracts, Vol. 9, 07626, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-07626

Geoscientific Earth Observation with HALO in the Aegean region (GEOHALO)

U. Casten (1), M. Scheinert (2), J. Kusche (3), G. Boedecker (4), R. Hackney (5), A. Geiger (6), G. Beyerle (3), M. Rothacher (3), R. Dietrich (2), U. Meyer (7), D. Steinhage (8)

(1) U Bochum, (2) TU Dresden, (3) GFZ Potsdam, (4) BADW München, (5) U Kiel, (6) ETH Zürich, (7) BGR Hannover, (8) AWI Bremerhaven (casten@geophysik.ruhr-uni-bochum.de)

The „High Altitude – Long Range Research Aircraft“ (HALO) will be a new research platform based on a Gulfstream 550 aircraft and managed by the German Aerospace Center. With its unique properties, HALO will provide excellent opportunities for the geoscience community to conduct interdisciplinary research projects. HALO's long-range capability is especially important because it allows extensive surveys to be carried out in remote areas.

The first HALO geoscience mission will cover the Aegean region, a region characterised by high earthquake and tsunami risk that is related to various active plate boundaries. The geoscientific observations will help to better understand the Hellenic subduction zone and the North-Anatolian fault zone and to improve the Aegean gravity field, which provides an important constraint on lithospheric structure and plate kinematics. Six parallel flight lines are planned, each 800 km long and flown at an elevation of 2.5 km. HALO's capability for high-altitude observations will be tested along an additional line flown at the highest possible elevation (15 km), thereby bridging the gap between terrestrial and satellite-based observations of the Earth, especially of its gravity and magnetic field.

Four related GEOHALO projects have recently been proposed within the German Priority Program 1294 (Atmosphere and Earth System Research with HALO):

Gravity field determination with HALO:

This project will focus on the Aegean gravity field and geoid, as well as its interpre-

tation in terms of mean dynamic topography and bathymetry. Using state-of-the-art equipment (gravimeters, laser altimeter, GNSS zenith antennas and receiver, and inertial navigation system), a sophisticated gravity survey will be carried out. The data will be used to compute the best-possible regional geoid model, to validate models derived from the CHAMP -, GRACE -, and GOCE satellites, and to derive additional products like the mean dynamic topography and ocean-bottom bathymetry.

Strapdown Airborne Gravimetry System on HALO:

The specific advantages of strapdown airborne gravimetry over the currently dominating scalar instruments include the ability to measure vector components, the potential for higher spatial resolution (1 mGal/1 km) and operational benefits, all of which will further evolve and be utilised during the GEOHALO mission. The SAGS4 includes the total acceleration vector sensor and ab initio GNNS components for observing inertial acceleration.

Structural and kinematic models of the Aegean based on HALO gravity and magnetic data:

The focus of this project is the preparation of magnetometers for HALO and the application of the HALO gravity and magnetic data to modelling and interpreting lithospheric structure and dynamics. Improved knowledge of these properties helps our understanding of earthquake and tsunami hazard associated with the Hellenic subduction zone and the North-Anatolian fault.

Airborne GNSS remote sensing:

Global change is of major interest to the public and scientific world. Key internationally-accepted issues include sea level change and its variability and climate and weather monitoring. The airborne GNNS project will push forward development of new technologies for monitoring sea level and water vapour distribution by reflectometry/scatterometry and occultation measurements. The knowledge of precise sea level will provide further constraints on the modelling of geodynamic processes.