

## Geodetic Research & Development in MOLDPOS and Geomatics (MSc) Studies

([www.moldpos.eu](http://www.moldpos.eu), [www.g.hs-karlsruhe.de](http://www.g.hs-karlsruhe.de))

### Mathematical Geodesy and Physical Geodesy (DFHBF)

The research and development project DFHBF ([www.dfhbf.de](http://www.dfhbf.de)) aims at the computation of height reference surfaces (HRS) for height positioning in GNSS-services. The parameters of the finite element (FEM) based adjustment approach are stored as DFHBF databases (DB). DFHBF-DB provide the transition from GNSS-heights  $h$  to physical heights  $H$ . They are used both on GNSS-controllers and for broadcasting RTCM height transformation messages by GNSS-services. As sea-level heights  $H$  are interdisciplinary needed for lots of different tasks, DFHBF contributes essentially to the geodetic infrastructure of modern GNSS-services worldwide. High accurate DFHBF-DB were computed in international cooperation with companies and state agencies for Germany, further countries in Europe, Africa and USA. Present research and developments, including PhD and thesis, are dealing with the integration of gravity data and geo-potential models into the DFHBF approach.

### Geodetic Monitoring (GOCA)

The research and development project GOCA (GNSS/LPS/LS Online Control and Alarm System) ([www.goca.info](http://www.goca.info)) aims at geodetic monitoring. The developments in cooperation with companies and scientific institutions worldwide cover the complete geomonitoring chain, namely data-acquisition, modeling, reporting and reaction. The GOCA-software realizes a 3-step adjustment and deformation analysis procedure, using GNSS and terrestrial sensor (LPS) data, as well as local sensors (LS). Objectives of geomonitoring with GOCA are natural hazards, construction areas, buildings and geotechnical installations. The results of displacement and Kalman-filter estimations and forecasting are Web-visualized by GoogleEarth in the reporting step. An automatic alarm-management is part of the reaction step. GOCA is installed about 35-times worldwide (e.g. for early warning in the Alps) and used at 5 different universities for research. Present research and thesis are dealing with virtual-sensor modeling (e.g. Moscow Kremlin) and integrated geotechnical and structural health modelling.

### GNSS-Network Integrity Monitoring and Geodynamical Research (MONIKA)

The age of GNSS-positioning services requires, that changes in the reference station coordinates are detected immediately. The research and

development (RaD) project GNSS reference-station MONITORing by the KARlsruhe (MONIKA) ([www.monika.ag](http://www.monika.ag)) minds that task in cooperation with national and international agencies. The mathematical models of MONIKA are based on a coordinate-related three-dimensional multi-epoch and multivariate deformation analysis. Besides the control of GNSS reference-station coordinates of positioning services, MONIKA aims at geodynamical and disaster monitoring RaD. Here GNSS reference-stations serve as permanent geosensor networks, together with temporary GNSS-arrays. Since 2008 MONIKA is applied by the Baden-Württemberg state GNSS-positioning service SAPOS country-wide. The state of Rheinland-Pfalz implemented MONIKA in 2010 for SAPOS and, together with networked Belgium and Nordrhein-Westfalen GNSS reference-stations, for a volcano monitoring in Germany (Eifel). RaD and thesis are also dealing with virtual sensor modelling, e.g. uplift and tectonic models.

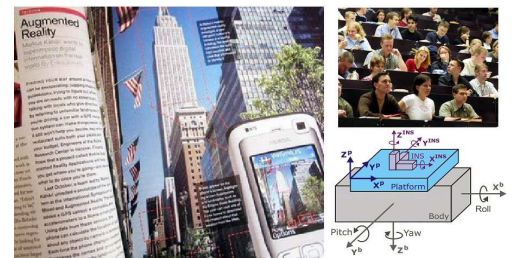
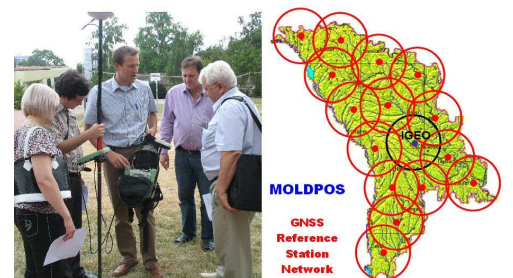
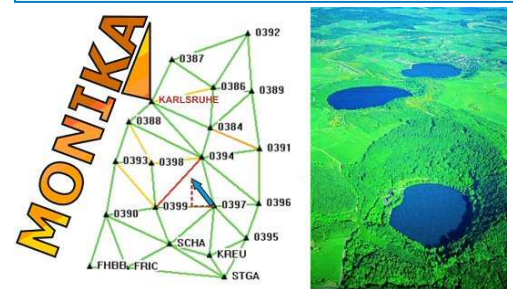
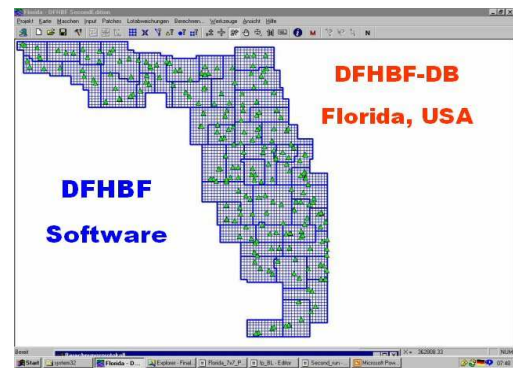
### BMBF-Project Real-Time GNSS-Positioning Service for Moldova (MOLDPOS)

The bilateral RaD project MOLDPOS between Germany and Moldova ([www.moldpos.eu](http://www.moldpos.eu)) is funded by the German Ministry of Education and Research (BMBF). MOLDPOS aims at the realisation of a complete geodetic infrastructure for the precise Moldavian GNSS-positioning service MOLDPOS, as it will become essential for any GNSS-service worldwide. One group of RaD is dealing with the transformation between the classical and the new GNSS-related ITRF datum, and the evaluation of the quasi-geoid for Moldova, both oriented at latest RTCM technology. As the GNSS reference-stations become the future main geodetic reference, they have to be monitored permanently. Together with local GNSS-arrays they constitute the basis of country-wide geosensor networks for various disaster and georisk mitigation tasks. MOLDPOS also deals with RaD on that geodetic infrastructure topic, including bilateral PhD and thesis in all components.

### Satellite Geodesy, Navigation and MIT

The RaD project titled SatNav&MIT on Satellite Geodesy, Navigation and Mobile IT (MIT) is involved in the Baden-Württemberg SatNav& MIT forum ([www.galileo-bw.de](http://www.galileo-bw.de)). That cluster of universities and industry under the patronage of the Ministry of Economics of Baden-Württemberg provides ideal conditions for fundamental and applied RaD. The main topics are robust algorithms for single and multi-sensor GNSS real-time positioning and navigation, and algorithms for hybrid MEMS sensor platforms. PhD and thesis work are directed to mobile GIS,

real-time data-acquisition platforms, seamless in/outdoor navigation systems, server-client navigation systems, and air-, water- and ground-borne robotic systems and drones.



Reiner Jäger. Head of R&D Projects and Geomatics (MSc) Pgm Member, 13-Aug-2010