

Gamma Remote Sensing AG

ANNUAL REPORT 2004

RESEARCH AND DEVELOPMENT

SIBERIA-II : Multi-sensor concepts for greenhouse gas accounting of northern Eurasia (2002 – 2005)

SIBERIA-II is a project in the frame of the EC Environment and Climate Programme, Framework 5, CEO. GAMMA's part is supported by the Swiss Federal Office for Science and Education. The overall objective of SIBERIA-II is to demonstrate the viability of full carbon accounting (including greenhouse gases (GHGs): CO₂, CO, CH₄, N₂O, NO_x) on a regional basis using the environmental tools and systems available to us today and in the near future. The region under study is Northern Eurasia, covering an area of 200 million ha and representing a significant part of the Earth's boreal biome which plays a critical role in global climate. The tools and systems to be employed include a selected yet spectrally and temporally diverse set of multi-sensor Earth Observation instruments, detailed existing databases of field information and some of the world's most advanced climate models to account for fluxes between land and atmosphere.

INTEGRAL (2004 – 2006)

INTEGRAL is a STREP project in the EC Framework 6 Programme, coordinated by Joanneum Research, Austria. The general objective of the INTEGRAL initiative is to promote an advanced observation technology for the unsupervised detection, precise measurement and variational analysis of ice motion on large European glaciers based on the complementary use of radar interferometry and interferometric altimetry with SAR data from post-operational, operational and upcoming systems such as E-SAR, ERS, SRTM, ENVISAT, RADARSAT and CRYOSAT.

ESA GSTP - Development of SAR Inversion Algorithms for Land Applications (2003 – 2005)

In cooperation with DISP, University Tor Vergata, Rome, Italy, CNR-ISSIA, Bari, Italy, Université Catholique de Louvain (UCL), Belgium, and LHMW, University of Ghent, Belgium, new prototype retrieval algorithms using advanced SAR data for the combined retrieval of vegetation and soil parameters are being developed. GAMMA acts as coordinator of this project.

ESTEC/17508/03/NL/LvH/bj – Flashing fields! A preliminary investigation (2003-2005)

In 2004 a 6-months ESA study was conducted to provide an initial characterisation of the "flashing field" anomalies, to place the anomalies in a wider context of historical observations, to suggest qualitative explanations for the effects seen, and to put forward potential strategies for reducing or eliminating them in future SAR missions. The "flashing field" anomalies concern strong, highly directional scatter effects observed on agricultural fields. For 2005 a small extension of this investigation is planned.

ESA – EOMD – UNOSAT (Nov. 2001 – 2004)

The UNOSAT project is a long term market development activity which addresses thematic mapping for humanitarian aid and international development. UNOSAT is lead by the United Nations Office for Projects Services (UNOPS), Switzerland. Project partners are Spot Image (F), Digitech (F), UNITAR (CH), and GAMMA. GAMMA acts as SAR specialist of the team.

ESA – DUP – SLAM II (2003 – 2005)

The objective of the SLAM II project is to develop EO based services and products as landslide motion survey, landslide displacement monitoring, and landslide susceptibility mapping, that can help operational activities of those institutions that are in charge of hydrogeological risk management. The project is coordinated by Planetek, Italy. Partners involved include TRE, Italy, University of Florence, Italy, Spacebel, Belgium, GEOTEST, Switzerland, and GAMMA, Switzerland. Within Switzerland GAMMA and GEOTEST generate SAR interferometry based landslide products for BWG and the cantons Bern, Freiburg, Valais, and Ticino.

ESA – DUE – EPIDEMIO (2003 – 2005)

EPIDEMIO is an ESA Data User Element (DUE) project with the objective to demonstrate uses of EO data in the context of support actions to reduce epidemic diseases in Africa. The project is coordinated by Jena Optronics, Germany. GAMMA contributes height and water body maps generated from ENVISAT ASAR and MERIS data.

ESA – EOMD – MINING: EO services development for the mining sector (2003-2006)

The objective of this EO Market Development activity is to achieve awareness and acceptance for EO-based integrated services for the mining, oil and gas sectors with DINSAR and IPTA based deformation information being a key element of these services. The project team consists of GAMMA (SAR specialist and project coordinator), DMT (Established market player offering geo-information services to mining sector and central node for the integrated service), MFB-Geoconsulting (optical EO, GIS, visualization specialist) and TU Clausthal (Prof. Busch acts as science reviewer). Interested potential users of the service participate to pre-commercial projects. Application cases covered include surface movement monitoring for hard coal mines (pre-mining, active mining, abandoned mines), lignite open cast mines (active mining, abandoned mines), salt mines (solution mining, abandoned caverns, caverns used for gas storage), and oil and gas fields.

ESA – EOMD –HYDRO: Environmental Information Services for Hydropower Plant Management (2003-2006)

The objective of this EO Market Development activity is to achieve awareness and acceptance of newest earth observation technologies for hydro power plant management. The project is coordinated by Carlo Gavazzi Space, Italy, with partners from Italy, Canada, Norway, and Switzerland. The main products developed in this project are snow cover maps, water content of snow and land displacement. On-line services will be provided for the Alps, Canada and Scandinavian countries for water resource monitoring and security management.

ESA – TESI – Mining subsidence (2003 –2005)

Within the TerraSAR Service Infrastructure (TESI) project, coordinated by Infoterra-Germany, GAMMA is responsible for the mining subsidence service. A series of L-band SAR data over a coal mining area was used to demonstrate the potential of L-band DINSAR to overcome important limitations identified for C-band DINSAR, namely spatial gaps in the deformation information for vegetated areas and in the case of high deformation gradients as observed for underground hard coal mining. The product quality and the service utility were assessed by DSK, Germany.

ESA – GMES – TERRAFIRMA (2004)

In 2004 GAMMA participated with a small contribution to the ESA GMES project TERRAFIRMA (coordinated by NPA, UK), which has the objective to map surface motion of a large number of European Cities.

Demonstration of L-band capabilities using JERS data (ESTEC 18311/04/NL/CB, 2004)

The scope of this 6-months project in cooperation with the University of Jena, Germany, and the Alfred Wegener Institute, Germany, was to illustrate with SAR data of the JERS satellite the capabilities of an L-Band SAR mission in three specific applications, namely landslide deformation monitoring, Kyoto protocol monitoring, and sea ice classification. GAMMA coordinated this project, processed the JERS SAR data, and was responsible for the landslide topic. The L-band SAR based examples, supported by comparisons with ground truth information and C-Band SAR data, serve for the demonstration of the capability of TerraSAR-L, a possible first European L-band SAR mission currently discussed.

PRODUCTS AND SERVICES

Deformation Maps, DEMs , Landcover/Landuse and Change/Hazard Products

A variety of mainly SAR based products were generated in 2004, using data of the ERS, ENVISAT, JERS, and Radarsat satellites. The Interferometric Point Target Analysis (IPTA) software was used to generate linear deformation maps, non-linear deformation histories, point heights, path delay maps in a pre-operational manner.

GAMMA also adapted its processing environment to be able to extract and process JERS-1 SAR data from the ESA archive at ESRIN. More than 100 JERS scenes coming from the ESRIN archive were processed for various European test sites.

Consulting

GAMMA's consulting activity included SAR and interferometric processing related aspects, application development support, and radar system engineering. In 2004 training courses for SAR, SAR interferometry, and Interferometric Point Target Analysis (IPTA) took place in Europe and North America.

GAMMA SOFTWARE

In 2004 GAMMA continued to provide licenses for its user-friendly and high quality software to support the entire processing from SAR raw data to products such as digital elevation models, deformation, and landuse maps. The software consists of the Modular SAR Processor (MSP), Interferometric SAR Processor (ISP), Differential Interferometry and Geocoding (DIFF&GEO), Land Application Tools (LAT), and Interferometric Point Target Analysis (IPTA), complemented by the stand-alone module for Geocoding and image registration (GEO). Upgrades included additional filtering tools in the LAT, improvements for ENVISAT ASAR and RADARSAT data processing as well as additional functionality in the IPTA package.

License sales activities were continued with new licenses sold in Europe, North America, and Asia. User contacts indicate that the advanced algorithms supported and our competent support are important features of our software. This is also confirmed by an increasing number of running maintenance contracts. On several occasions the software was presented to potential customers.

For the benefit of its software users GAMMA decided to better protect its intellectual property rights (IPR). Parts of the IPR used in the IPTA software were protected by pending patents.

LEGAL AFFAIRS

Politecnico di Milano (POLIMI) – Tele-Rilevamento Europa s.r.l. (T.R.E.) versus GAMMA:

In December 2003 we were informed by the Court of Trieste, Italy, that POLIMI and T.R.E. have asked the court to issue an immediate inhibition for GAMMA not to commercialize its IPTA software in Italy as it may infringe their Italian Patent 1.312.826 which protects a process to identify “permanent scatterers”. On 29. Dec. 2003 (!) the parties met at the court of Trieste. The judge did not follow the proposition of the complainants but suggested to have a competent technical expert answer questions on the validity of the POLIMI patent and a possible infringement or partial infringement of it by the GAMMA IPTA software.

A competent technical expert acceptable to both parties was selected, investigated the matter and reported to the judge. In an iterative manner the parties updated their positions and on 24. Nov. 2004 the judge of the court of Trieste made his verdict. All the complaints of POLIMI – T.R.E. were rejected. The IPTA software does not infringe Patent 1.312.826, nor is in interference with it.

VARIA

GAMMA has ongoing projects selected through Announcements of Opportunity to conduct ERS, ENVISAT, JERS, and ALOS, research and development projects.

GAMMA employees are members of national (SED) and international (IEEE, RSPSoc, AGU) organizations, acted as peer reviewers (various journals), and served on scientific committees (ENVISAT Symposium, BioGeo’04 Conference, ESA Cat-1 project evaluation, Science reviewer to EC Framework Project).

NEW ADDRESS PER 15. FEB. 2005

After almost 10 years at Thunstrasse 130, CH-3074 Muri, GAMMA will move on 15. Feb. to new offices in nearby Gümliigen. Our new address (per 15. Feb 2005):

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10 YEARS GAMMA

In January 2005 Gamma Remote Sensing AG will celebrate its 10th anniversary. With satisfaction and also some pride we look back on our achievements. GAMMA has become an established member of the “SAR community”. In our projects and services and through our GAMMA software license sales we interacted with several hundred (!) contacts at Universities, local to international public organizations, and industry reaching from single person companies to the huge space industry players. We supported individual students in their studies as well as space agencies in their planning of new missions.

All this was possible thanks to Gamma’s competent, motivated, and hardworking staff who also owns the company. Work was often very interesting and included a wide variety of applications and geographic regions. Almost unaffected from economic turbulence (“new economy”, “reorganization of space industry”) and politics (“high national deficits”, “increasing unemployment”, “budget cuts”, “introduction of the EURO”, “development of the European Community”, “relation Switzerland - European Community”) GAMMA followed its strategy, paid salaries on time, and will be able to present for the tenth time a positive balance.

PUBLICATIONS

Articles in journals and books:

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