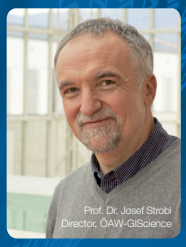
ÖAW
Austrian Academy of Sciences

INSTITUTE FOR GEOGRAPHIC INFORMATION SCIENCE

GIScience
Institute for Geographic Information Science

supported by

STADT : SALZBURG · Land Salzburg · UNIVERSITY of SALZBURG



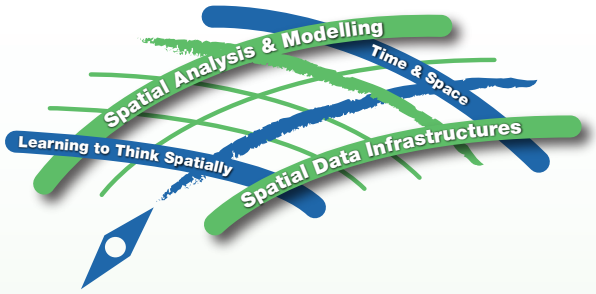
"Our goal is to advance Geographic Information Science through interdisciplinary research with a strong focus on conceptual and methodological aspects."

Interdisciplinary Team

Geoinformatics
Geodesy
Spatial Economics
Geography
Geography Education
Ecology
Geology
Technical Physics
Environmental Technology
Global Change

Research Programme

"Key topics at the leading edge in Geographical Information Science"



Spatial Analysis and Modelling

Research questions address segmentation-based information extraction from remotely sensed imagery, multidimensional geostatistics and the modelling of dynamic processes. Methods for flexible regionalisation, the analysis of mobility patterns and work with multi-scalar data receive special consideration.

Time and Space

Traditionally, these meta-dimensions have not been treated from integrated perspectives. Full temporal enabling of data models and analytical strategies is indispensable for spatial monitoring, analysis of mobility and the rapidly changing dynamics in natural and social spaces.

Learning to Think Spatially

Successful communication of spatial knowledge is required across all segments of society. Starting from cognitive aspects, facets of situated learning and interaction with visual stimuli lead to research questions important for a (Geo-) Information Society.

Spatial Data Infrastructures

Building spatially enabled 'information highways' is a requirement for better management of our societies and environments. Our contributions aim at the specification of advanced multi-dimensional data models, the integration of real-time sensor input and open interfacing across system architectures.

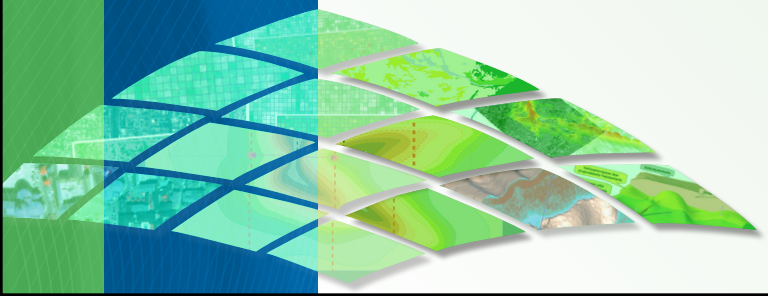
ÖAW-GIScience, a partner
of the GIScience Research Cluster Salzburg

GIScience Research Cluster Salzburg

with about hundred Geographic Information Science researchers at the Salzburg hub for GIScience

ÖAW GIScience — Basic
PLUS Z_GIS — Applied
RSA iSPACE — R&D

Research Knowledge Chain



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Institute for Geographic Information Science
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Austrian Academy of Sciences

Annual Report 2011

Institute for Geographic Information Science

REPORTING PERIOD:	1.1.2011 – 31.12.2011
DIRECTOR OF THE REPORTING RESEARCH INSTITUTION:	Prof. Dr. Josef STROBL
ADDRESS:	Schillerstraße 30 5020 Salzburg www.oeaw.ac.at/GIScience

Content

1. Mission Statement

Geographic Information Science, serving as the common ground for trans-disciplinary basic research at ÖAW GIScience, is understood as the foundation and keystone of the spatial component in today's information and knowledge society.

Based on fundamental concepts from Geography and frameworks from information and communication sciences, GIScience is developing theoretical concepts, methods, algorithms and strategies for modeling the spatial and temporal dimensions of the real world.

Demands for making spatial perspectives explicit arise from numerous application domains, ÖAW GIScience has decided to focus on a research programme led by the search for common ground in concepts and methods, independent from particular application logics.

This common ground of a spatial view is leveraging ubiquitous georeferencing as a key to integrate information from disparate sources, joining natural and social science inputs, combining technical with geographical approaches to achieve innovative outcomes.

Today, we are very obviously in need of crossing borders of scientific disciplines and traditions. The extent of space is one non-extensible resource our globe is offering. Thus we better manage it well to sustain our futures. GIScience is indispensable in this endeavour.

Prof. Dr. Josef Strobl, Director

2. Scientific Activity 2011

2.1 Summary of the scientific report 2011

Fundamental research was furthered through results from collective projects within the ÖAW-GIScience research program and is reflected in various peer-reviewed publications and presentations. These outcomes primarily result from a highly motivated and dedicated team of researchers and can be seen as an indicator of the institute's research activities. Research work continued within several third party funded projects EU FP 7 "Nature SDI*plus*", EU Comenius "digital:earth:eu", national funded research projects such as "SESAAM", "GEOKOM-PEP", and a new FFG project called "AccessibleMap". The ÖAW-GIScience institute acquired an average share of 29 per cent of *third-party research funding* between 2009 and 2011.

In July, the EU FP7 project NATURE-SDI*plus,* an open network which has broadened from the initial 30 contractual members (17 countries) to 60 members from 20 countries, was successfully finished. The network is continuing after the conclusion of the project, to support the implementation of the EU INSPIRE Directive for the nature conservation aspects. Please see for further information http://www.nature-sdi.eu/newsletters/NATURE-SDIplus_Newsletter_4_July_2011.pdf .

A major development has been the start of the FWF Doctoral College on "Geographic Information Science" (http://dk-giscience.zgis.net/) which is partly staffed by ÖAW-GIScience senior scientists.

A new original and interdisciplinary research design combining GIScience, Plant Physiology, Soil Science, Mineralogy, Spectroscopy and Spatial Statistics has been developed and published in the SCI Journal "Water, Air, & Soil Pollution" (Springer). Geographic Information Systems and Science allow for large-scale assessment of transfer of radionuclides from fallout into plants after a nuclear accident. Based on experimental research, multivariate statistical evaluation and interdisciplinary modeling, this paper has established two formulae, first for the adsorption of radioactive cesium to soil and second for the transfer of radioactive cesium from soil to plants. Such results can be made operational for global radiation protection in virtual globes or other Geographic Information Systems: Water, Air, & Soil Pollution doi:10.1007/s11270-011-1044-x.

Research into spatial citizenship which refers to the main transversal research theme 'Learning to think spatially' was successfully continued in the "I am Here" and "GEOKOM-PEP" Sparkling Science projects. One major outcome was the acceptance of a paper in the SCI journal "Cartographica". This article explores starting points for spatial citizenship education and discusses fields of competence needed for active spatial citizenship: Cartographica 47:1, 2012, pp. 2–12 doi:10.3138/carto.47.1.2.

The GeoObjects project combines projects activities from Macro to Micro Geospatial research at the Institute for Geographic Information Science. Parts of this research are the GeoPET, the GeoNT and the GeoSMT projects. Macro-scale Geospatial research is strongly linked to the classical 'geographical' range of scales. However, essential geospatial information goes beyond this range into the micro- and nano scales. Fundamental multidimensional methodologies are developed and applied by reaching out beyond traditional domains. 2011, was dedicated to foster the collaboration with external project partners such as the Technical Universities of Vienna and Munich, the University of Salzburg and the Johann Radon Institute for Computational and Applied Mathematics (RICAM) in Linz. The projects research activities have been presented at international conferences and workshops.

A PhD project focuses on semantic mapping between the ontology classes formalizing the spatial entities and the field representation of geographic reality in order to produce transferable knowledge. Further efforts have been put in the field of semantic mapping between the ontology

classes, formalizing the spatial entities and the field representation of geographic reality in order to produce transferable knowledge. 2011 the outcomes have been published and presented in several journal, workshops and conferences. Spatial Data Infrastructures (SDI) are a new perspective on geospatial information, supporting our societies, environments and economies. Increasingly we focus on geoportals – the user interfaces for spatial data infrastructures and on finding solutions for overcoming semantic problems occurring while sharing data cross communities and enterprises. These activities are in line with INSPIRE Directive aiming at integrating spatial information islands across European Members. Semantics are indispensable for linking human minds with digital information, and thus a key research topic!

In June, a PhD project was successfully finished and defended. This research has developed a new "Individual Based Model" for "Spatio-temporal modelling of natural reforestation". The outcomes have been published in the SCI indexed journal "Ecological Modelling" and several peer-reviewed journals and a paper on "Putting Theory into Practice: Uncertainty in Model Validation" has been accepted by the "International Journal of Geographic Information Science".

From September 5-9 2011, the institute organized the annual conference of the International Association for Mathematical Geosciences (IAMG). The IAMG2011 conference (http://www.iamg2011.at/) was a forum for exchanging ideas on theory and the practical application of a broad spectrum of mathematical geosciences concepts, addressing a wide range of geoscientists and civil engineers, and providing opportunities for students and young scientists to engage with some of the best geosciences minds in the world.

The Institute for Geographic Information Science bringing in its expertise in basic GIScience research together with the GIScience Research Cluster Salzburg (http://www.giscience-research.org) are contributing towards a critical mass of about hundred Geographic Information Science researchers at the Salzburg hub for GIScience. They have continued to provide platforms for high-quality international research and outreach activities, while fostering communication and application of research results through conference organization, teaching and training activities and international cooperation.

These activities include:

- Chairing the programme committees of the Geoinformatics Forum, IAMG2011 and Learning with Geoinformation conferences.
- Contributing to raising awareness about geographic information science through participation and organization of popular science events (GIS Day and in service teacher training).
- Welcoming and hosting numerous visitors and delegations from a range of countries and presenting highlights from current research and starting new research initiatives.

2.2 Highlights 2011

Awards

Starting February 2011, Adrijana Car, a senior researcher at ÖAW-GIScience, has been appointed to the position of Associate Professor in GIS at the Faculty of Economics, Department of Sustainable Tourism and Regional Development, German University of Technology, Muscat, Oman.

The "Alpine Space – Man and Environment" award from the University of Innsbruck for interdisciplinary research went to Gudrun Wallentin for her Phd dissertation "Modelling alpine tree line dynamics". From February 2007 to August 2001 Gudrun work on her PhD and coordinated the ÖAW-GIScience partnership in an EU econtentplus project. Starting September 2011, Gudrun Wallentin, has been appointed to the position of Director of Studies for the UNIGIS MSc programme at the University of Salzburg, Centre for Geoinformatics. The UNIGIS association of worldwide partner institutions is offering postgraduate distance learning programmes for in-service GIS professionals with an MSc degree. >> http://www.unigis.ac.at.

During the summer semester 2011, Thomas Jekel, senior researcher at ÖAW-GIScience, has been invited as Guest Lecturer at the Department of Geography, University of Jena, Germany. He taught three courses on Geography Didactics.

Scientific Research

2011, a new original and interdisciplinary research design combining GIScience, Plant Physiology, Soil Science, Mineralogy, Spectroscopy and Spatial Statistics has been developed and published in the SCI Journal "Water, Air, & Soil Pollution" (Springer). Geographic Information Systems and Science allow for large-scale assessment of transfer of radionuclides from fallout into plants after a nuclear accident. Based on experimental research, multivariate statistical evaluation and interdisciplinary modeling, this paper has established two formulae, first for the adsorption of radioactive cesium to soil and second for the transfer of radioactive cesium from soil to plants. Such results can be made operational for global radiation protection in virtual globes or other Geographic Information Systems: Water, Air, & Soil Pollution doi:10.1007/s11270-011-1044-x.

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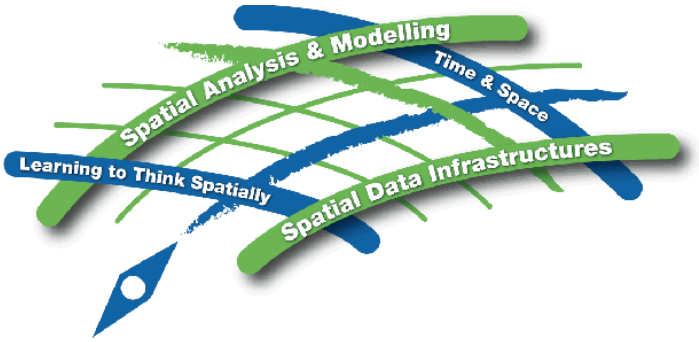
Operational

A major development has been the start of the FWF Doctoral College on "Geographic Information Science" (http://dk-giscience.zgis.net/) which is partly staffed by ÖAW-GIScience senior scientists.

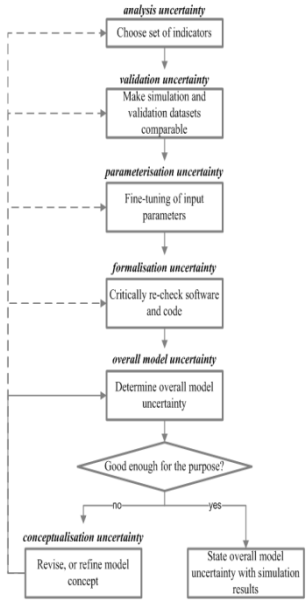
2.3 Report on the scientific activity during 2011

Project based research

Our goal is to advance Geographic Information Science through interdisciplinary research with a strong focus on conceptual and methodological aspects.
The ÖAW Institute for GIScience will be a leading research unit recognized for its contributions to and international leadership in the foundations of Geoinformatics
This is being achieved by addressing carefully selected key topics at the leading edge of international research in GIScience:



Space and Time: A team within the GIScience department explores the cognitive, social and operational aspects of space and time in GIScience, issues that currently are at the centre of the research debate in the GIScience community. Our work includes models of both social and physical spaces and their consequences for spatio-temporal analysis and spatial data infrastructures. Our focus is on the conceptualization and formalization of space and time and thus emphasizes the interdisciplinary approach at the GIScience department.



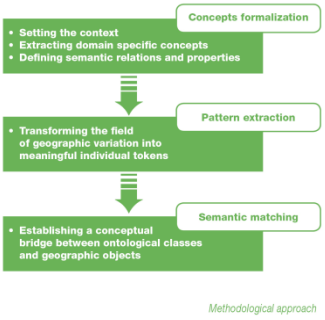
2011 Research Focus: Space and time are intrinsic properties of geographical phenomena but they have rarely been treated in an integrative manner. Increasing research efforts are being made towards full temporal enabling of data models and analytical strategies, as this is indispensable for spatial monitoring, analysis of mobility, and the modeling of dynamic processes.

These are reflected in applications such as spatio-temporal, dynamic and mobile GIS; OpenGIS and spatial data infrastructure (SDI); public participation GIS and spatial decision support systems as well as learning environments with GI.

Spatial Data Infrastructures: Building spatially enabled 'information highways' is a requirement for better management of our societies and environments. Our contributions aim at the specification of advanced multi-dimensional data models, the integration of realtime sensor input and open interfacing across systems architectures.

2011 Research Focus: Spatial Data Infrastructures (SDI) – a new perspective on geospatial information, supporting our societies,

environments and economies. Increasingly we work with geoportals – the user interfaces for spatial data infrastructures. Semantics are indispensable for linking human minds with digital information, and thus a key research topic!



Key SDI projects at the GIScience Research Cluster Salzburg:

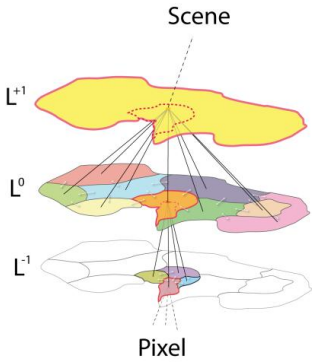
- NatureSDIplus (eContent+ Programme)

- National Geoportal Prototype: AGEOportal

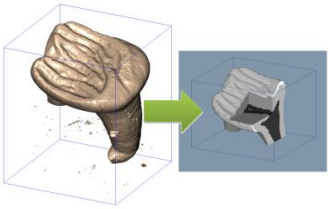
- Concepts for SAGIS 3.0

- Semantic Enrichment of Geodata

Spatial Analysis, Modelling and Simulation: Research questions address segmentation-based information extraction from remotely sensed imagery, multidimensional geostatistics and the regionalization of dynamic processes. Methods for flexible regionalization, the analysis of mobility patterns and work with multi-scalar data receive special consideration.

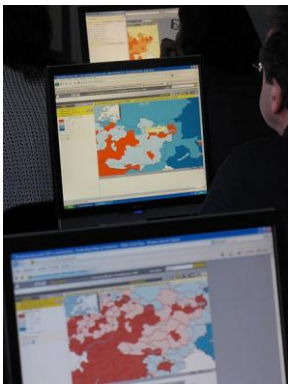


2011 Research Focus: The integration of (world-) knowledge and of formal concepts (ontologies) into OBIA. The possibility of "translation" of formal concepts into OBIA rule- sets? Are there canonical ontologies and rules, which are image dependent and to what degree?



As long-term vision and long-term aims the following points can be addressed: (1)to investigate the integration of formalized space-temporal domain expert knowledge in OBIA to enhance monitoring and monitoring results. (2) to develop methods for creating robust auto-adaptive rule sets to increase the automation of image analysis and enabling to automatically analyze huge image archives reliably.

Learning to Think Spatially: Successful communication of spatial knowledge is required across all segments of society. Starting from cognitive aspects, facets of situated learning and interaction with visual stimuli lead to research questions important for a (Geo-) Information Society. Spatial thinking is thought to consist of three aspects, namely (a) concepts of space, (b) tools of representation and (c) processes of reasoning. Together, it is argued, these dimensions help solving a variety of mainly technical problems and should therefore be taught at secondary school level.



2011 Research Focus: The research focus is to theoretically and practically widen the idea towards a concept of spatial citizenship that includes the social aspects of geoinformation and concentrates on communication aspects allowing for active participation in both social and political processes.

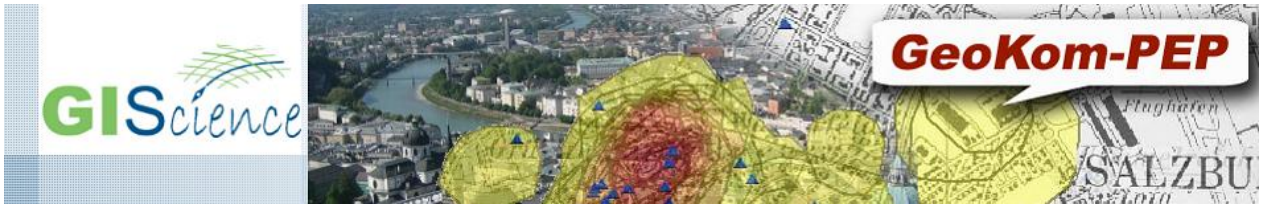
Developing and evaluating GI-based, collaborative learning – as well as participatory planning environments is a very recent R&D field. Thinking spatially by using GI here is thought to enhance problem solving capabilities, in both scientific and everyday settings, especially for laypeople. Learning to think spatially by developing a sense of spatial citizenship is a transversal research theme at ÖAW-GIScience.

Funded projects 2011 (please have a look at www.oeaw.ac.at/GIScience/projects)

digital:earth:eu Comenius Network for Teaching with GeoInformation in Schools.
November 2010 – October 2013, *European Commission, Lifelong Learning, Comenius Programme*

Within the project ÖAW-GIScience leads a WP on the development of classroom pedagogies using GI and contributes in the fields of quality assurance and conference organization.

GEOKOM-PEP Geovisualisation and Communication in Participatory Decision Processes
October 2009 – March 2012, *Austrian Federal Ministry of Science and Research. Sparkling Science Programme*



ÖAW-GIScience is coordinating this project with a focus on spatial citizenship and develops a collaborative and discursive spatial planning environment based on virtual globes.

SESAAM Geo-Spatially Enhanced Situational Awareness for Airport Management
March 2010 – August 2012, *Austrian Federal Ministry for Transport, Innovation and Technology. Austrian Aeronautics Research and Technology Programme* TAKE OFF

The ÖAW-GIScience team will contribute its expertise in 3D and 4D modelling, as well as user optimized visualization and analysis. The project is coordinated by the Centre for Geoinformatics (Z_GIS), University of Salzburg.

I AM HERE! Participative Approaches to Analyze the Spatial Behavior of Adolescents in the City
September 2010 – July 2012. *Austrian Federal Ministry of Science and Research. Sparkling Science Programme*

ÖAW-GIScience will bring in its expertise in spatial citizenship and develop the pedagogic concept coordinated by the University of Natural Ressources and Life Sciences, Institute for Landscape Development, Recreation and Conservation Planning.

Nature-SDIplus Best Practice Network for SDI in Nature Conservation
October 2008 – July 2011, *Commission of the European Communities. Directorate-General Information Society and Media. eContentplus Programme*

The project is coordinated by GISIG. Based on the affordances of nature data users, best practice examples and in close collaboration with INSPIRE, ÖAW-GIScience develops in this project data models and metadata profiles for an SDI on nature conservation in order to harmonise national and sectoral datasets across Europe.

raum:planen Online Learning and Teaching Platform
01.10.2010 - 31.07.2011, *Provincial Government of Salzburg*

raum:planen developed a platform to access spatial planning data of the Provincial Government of Salzburg for use in secondary education. The collaborative Z_GIS/GIScience project allows pupils and lay people to easily access locally relevant data and bring spatial planning into schools more prominently. It aims at educating pupils for active citizenship by helping them to participate in public

decision making. raum:planen is funded by Provincial Government of Salzburg. Flyer and material raum:planen: http://www.digitalearth.at/aktuelle-schulprojekte

Accessible Map Web-based maps for visually impaired people.
01.04.2011 - 31.03.2013, *Austrian Federal Ministry for Transport, Innovation and Technology. Programme BENEFIT*

AccessibleMap aims to give better access to online web-based maps, especially city maps, for people with visual impairments. The goal is to improve the orientation of the target group in cities, and therefore to support their mobility and independence. AccessibleMap focuses on a semantic spatial description based on the user's needs and requirements. ÖAW-GIScience as scientific partner contributes with developing methods to create cognitive or mental maps that include relevant information.

EPU 2011/2012 - **Impact on Climate Change on Mountain Environments** – Faculty Development Workshop and Conference. February 9-15, 2012. *Eurasia-Pacific Uninet*

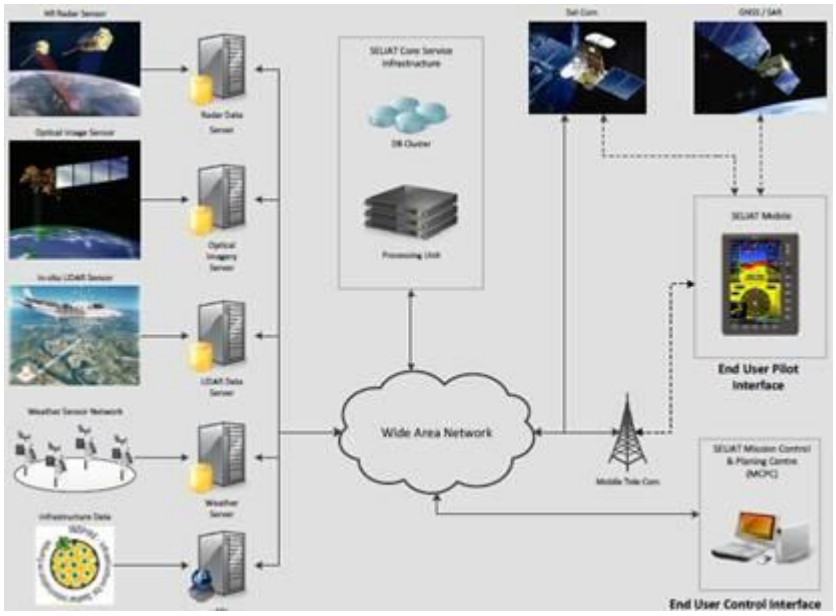
The GIScience Institute of the Austrian Academy of Sciences and the Centre for Geoinformatics cooperate in organizing a regional workshop in Lobesa, Bhutan, led by Prof. Strobl and Dr. Shahnawaz from February 9-15. Hosted by the College of Natural Resources (CNR, Royal University of Bhutan - RUB) and supported by the Eurasia-Pacific Uninet, this GIScience-based advanced training for teachers and professionals brings together participants from Bhutan, Nepal, India and Austria.

After the opening ceremony introduced by CNR Director Dorji Wangchuck and chaired by the RUB Vice Chancellor Dasho Dr. Pema Thinley, participants followed a series of lectures exploring the foundations of climate change impacts on mountain environments, and concepts for spatial analysis methodologies. Due to a diverse range of backgrounds in Geography, Forestry, Ecology, Hydrology and Development Research, participants created a unique environment for exchanging experiences and viewpoints.

The majority of time was dedicated to practical work on several case studies, building practical experience with functionalities of GIS required for researching and monitoring climate change effects with a particular focus on mountain environments. Lectures and trainings all were conducted at CNR's beautifully situated campus in the Punakha valley, providing an excellent backdrop to a unique learning experience for all participants. Special thanks go to Mr. Ugyen Thinley from CNR for the perfect organisation of this workshop!

Project Proposals

SELIAT Safe Emergency Landing in Alpine Terrain



Emergency landing outside an airfield in the alpine region involves high risks, whereby several fatal accidents have been occurred during search and rescue operations, commercial and private flights. These risks could be fairly reduced by an autonomous classification and pre-selection of potential landing fields relative to aircraft's position and surrounding topography. In the case of rescue operations where seconds count, a pre-selection of best suitable landing fields at the accident location could optimise flight routing and therefore the process as a whole.
All these should be met by SELIAT, a service for Safe Emergency Landing in Alpine Terrain. SELIAT combines the space assets optical imagery, high resolution radar data, satellite communication and global navigation satellite system service under the umbrella of one service. End users of the proposed service will be search and rescue services, general aviation, private and sport aviation, operating in alpine regions.
ESA IAP (Artes 20) *http://telecom.esa.int/telecom/www/area/index.cfm?fareaid=58*

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SPATIAL ANALYSIS & MODELLING

Can spatial analysis make a difference?

Incorporating the **spatial dimension** of data yields more meaningful results when it comes to analysis, modelling, simulation and interpretation – no matter in the megascopic or microscopic scales. While the **spatial aspect of data** is obvious in Geography and Geosciences, a broad palette of Natural-, Life- and Technical Sciences inherently relies on **two- or three-dimensional spatial data.**

Spatial analysis is a common language adopting various scale ranges, involving different acquisition methods and data precisions and implementing specific algorithms.

One major concern of GIScience is the cross-disciplinary application, evaluation and enhancement of spatial analysis methods for better data extraction, object and pattern recognition and multidimensional spatial modelling & simulation.

Indeed, spatial analysis can make a difference.

Yes, it can!

Learn more about our projects:

- **GeoMS**
- **GeoPET**
- **GeoNT**
- **GeoSMT**
- **OBIA**
- **SESAAM**

from the associated posters.

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TIME & SPACE IN GISCIENCE

Are Space & Time
intrinsic properties of real world phenomena?

„Think of your personal participation in everyday life, like traffic, work, study and spare-time activities. Your daily routines are positioned and defined by space and time.“

We consider full temporal enabling of spatial data models and related analysis methods as indispensable for representing real-world dynamic spatial systems! This is mandatory for the analysis, simulation and modeling of processes typically found in ecosystems, mobility, migration or global change.

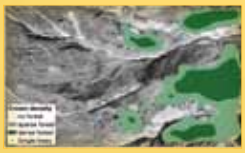
Research Strategy –
projects from all research areas are used as case studies to specify basic concepts:

Fundamental Theories of Space-Time Research



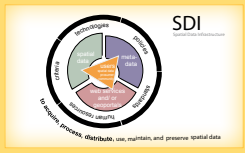
Research into Spatialities and Temporalities


Spatio-Temporal Analysis



Conceptualization of Spatial Data Infrastructures





Space & Time are inherent to all real world aspects, they need to be considered simultaneously in analysis of change.

Learn more about our projects:

- **Global Change**
- **Time & Space**
- **GeoICT & Society**
- **GeoMS**
- **OBIA**

from the associated posters.

GIScience explores and develops relevant theories, data infrastructures and methods!

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SPATIAL CITIZENSHIP / LEARNING TO THINK SPATIALLY

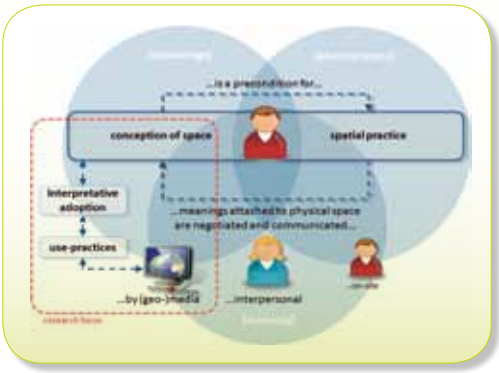
What's *spatial* about citizenship?

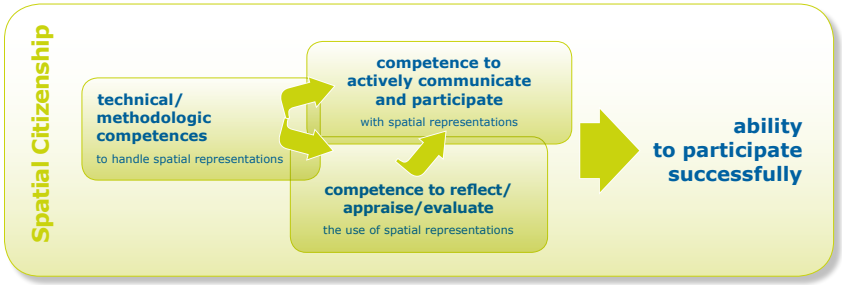
The permanent accessibility of geoinformation fosters the development of a geoinformation society. We need to reconsider the meaning of space when using available (geo)media on a day-to-day basis and learn to rebuild and communicate new personal world views. An emerging geoinformation society warrants new competences to successfully participate as a responsible citizen.

Spatial Citizenship Research

focuses the relationship of society and space in the geoinformation age and formulates concepts and tools for education.

*"A **SPATIAL CITIZEN** should be able to interpret and critically reflect on spatial representations, communicate with the aid of maps and other spatial representations, and express location-specific opinions using geo-media. **SPATIAL COMMUNICATION** should therefore be a main target for primary and secondary education."*





Through case studies we develop and evaluate corresponding competence models, tools and learning environments for school education.

Learn more about our projects:

- **GeoICT & Society**
- **GEOKOM-PEP**
- **digital:earth**
- **Schools on Ice**

from the associated posters.

Citizens participate in society based on location!

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SPATIAL DATA INFRASTRUCTURES

How to share spatial data?

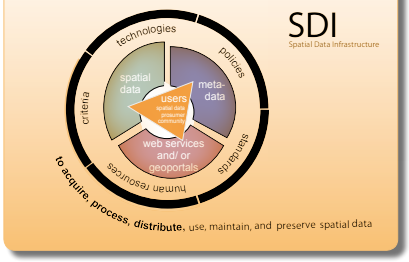
From spatial data islands to spatial data sharing platforms

Spatial Data Infrastructures (SDI) are sustained frameworks that facilitate data sharing across applications, enterprise and community boundaries. Our research focuses on the implementation of interoperable services, on developing user-centric sharing platforms and on overcoming semantic heterogeneity challenges:

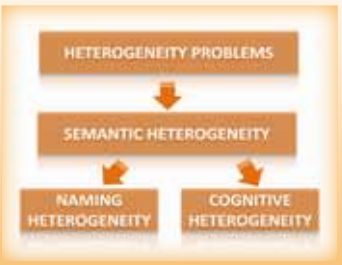
Interoperable solutions for data documentation

Improving searching capabilities

User–centric SDI Conceptualization



Overcoming semantic challenges



By improving communication between geospatial data providers and end users!

Learn more about our projects:

- **AccessibleMap**
- **GeoBIM**
- **GeoICT & Society**
- **NatureSDI*plus***
- **SDI Semantics**

from the associated posters.

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2.4 Publications/talks/poster presentations 2011

A full bibliographic listing of the publications and presentations from ÖAW-GIScience researchers can be followed here: http://www.oeaw-giscience.org/publications

ISI Journal Articles 2011

Ahamer, G. (accepted 2011): Geo-referenceable model for the transfer of radioactive fallout from sediments to plants. Water, Air and Soil Pollution (impact factor 1.7), Springer Verlag, doi:10.1007/s11270-011-1044-x.

Gerçek, D., V., Toprak & J., Strobl (2011): Object-based classification of landforms based on their local geometry and geomorphometric context, International Journal of Geographical Information Science, 25:6, 1011-1023. Link to this article: http://dx.doi.org/10.1080/13658816.2011.558845

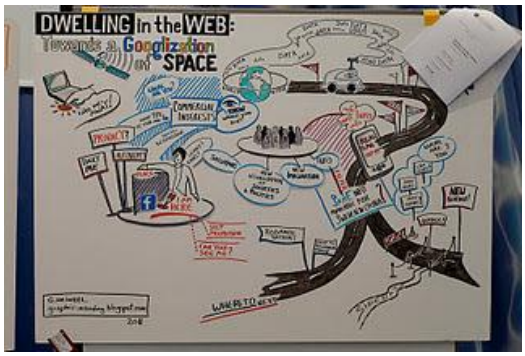
Gryl, I. & Jekel, T. (accepted 2011): Re-centering GI in secondary education. Towards a spatial citizenship approach. In: Cartographica 47, 1, Cartographica 47:1, 2012, pp. 2–12 doi:10.3138/carto.47.1.2

Hofmann, P; Blaschke, T; Strobl, J (2011: Quantifying the robustness of fuzzy rule sets in object based image analysis. International Journal of Remote Sensing, Bd. 32 (22), S. 7359-7381 http://www.tandf.co.uk/journals/titles/01431161.asp

Invited Lecture @ RICAM

Robert Marschallinger has been invited to give a presentation on *Multi-scale 3D and 4D modelling and simulation in Geosciences* at the Austrian Academy of Sciences Radon Institute (RICAM Linz, Oct. 04). In the course of the Special Semester on Multiscale Simulation & Analysis in Energy and the Environment, RICAM offers a workshop on "Simulation of Flow in Porous Media and Applications in Waste Management and CO_2 Sequestration" (Oct. 03 – 07).

Exploring the digital future



Robert Vogler (ÖAW-GIScience) and Florian Fischer (ÖAW-GIScience) attended the 1st Berlin Symposium on Internet and Society at the newly-established Alexander von Humboldt Institute for Internet and Society. They organized a workshop on the googlization of space to discuss the interlinkages of the geoweb, society and space. The workshop and symposium brings together internet researchers from various disciplines to discuss and bring forth the hot topics for future research on internet and society, 25.October - 28.October 2011.

2.5 Scientific Events 2011 and public access to Science

International Conference Organization

The ÖAW-GIScience research team contributes to numerous conferences and also chairs and organises GI symposia bringing together an international community of scientists working towards a spatially enabled future.

GI_Forum 2011 - GI Community in Focus, July 5-8, 2011 in Salzburg

The University of Salzburg Centre for Geoinformatics and the Institute for GIScience at the Austrian Academy of Sciences offer an annual forum to the worldwide geoinformatics community, bringing together English-speaking researchers and practitioners across disciplines and industries. Simultaneously, the GI_Forum connects participants into a well-established co-located regional symposium - Applied Geoinformatics (AGIT) - sharing the state-of-the art AGIT-EXPO exhibit. > www.gi-forum.org

Real Time Forum at the GI_Forum 2011

The panel discussion "The Real-time City: Technology – Innovation – Society" aimed to debate these challenges and generate new ideas viewing the city as a complex near real-time control system, creating a feedback loop between the city itself, the city management and – most importantly – the citizens. **> www.agit.at/realtime**

"Learning with Geoinformation" July 4-8, 2011 in Salzburg

Learning with Geoinformation is a yearly three day conference within the framework of the AGIT-Symposium and the GI_Forum, organised by the ÖAW-GIScience Institute. It addresses both researchers and practitioners in education with a strong focus on secondary education, including both scientific contributions as well as vocational training through a series of workshops for teachers. > www.gi-forum.org/Learning

IAMG2011, September 5-9, 2011 in Salzburg

From September 5-9 2011, the institute organized the annual conference of the International Association for Mathematical Geosciences (IAMG, www.iamg.org). The IAMG2011 conference (http://www.iamg2011.at/) was a forum for exchanging ideas on theory and the practical application of a broad spectrum of mathematical geosciences concepts, addressing a wide range of geoscientists and civil engineers, and providing opportunities for students and young scientists to engage with some of the best geosciences minds in the world.

- In terms of attendee numbers, IAMG 2011 attracted 235 delegates from 37 countries, with 85% making their way from abroad; regarding provenance, 53% of delegates came from EU countries, 12% from the US, 7% from China, 5% from Iran, 2% from Canada and 21% came from the remaining countries.
- The broad thematic range of IAMG 2011 was organized in 22 sessions with a total of 164 high-quality, peer-reviewed contributions: besides covering IAMG core topics like geostatistics, reservoir modeling, 3D modeling or geo-process simulation, contributions addressed applied mathematical geosciences issues with a specific reference to alpine regions - simulation and modeling in hydrogeology and engineering geology as well as geohazard modeling.

All digital conference proceedings were distributed on USB memory sticks in PDF format and as flash-based flipping book. This enables communicating new geomathematical ideas not only in a sequential, static manner but including animations, interactive 3D-worlds or high-resolution color imagery. As such, the IAMG2011 proceedings mirror the “go green” idea - the production of analogue proceedings volumes, each copy comprising more than 1500 pages could be avoided.

GISDay 2011 (www.gisday.at)

In Austria, the global GIS Day is playing a vital role in creating geographic awareness throughout secondary education. 2011, 330 pupils actively participated in 15 thematic sessions in the

GIS Day open house at the University of Salzburg on November 16th, 2011. The event was organized by digital:earth:at, a joint cooperation of the GIScience Research Cluster Salzburg and the University of Education Salzburg.

2.6 Scientific cooperation 2011

GIScience Research Cluster Salzburg (www.giscience-research.org)

In Salzburg, three research institutions with a core focus on Geographic Information Science (GIScience) are collaborating to advance innovation and develop new concepts and methods. Between the Centre for Geoinformatics (Z_GIS) at the University of Salzburg, the Research Studio iSPACE and the Institute for GIScience of the Austrian Academy of Sciences numerous cooperations and joint projects are contributing towards a critical mass of about eighty Geographic Information Science researchers at the Salzburg hub for GIScience.

Memberships

- Applied Geoinformatics - academic mobility network for Central and Eastern Europe (CEEPUS)
- digital:earth:at (Centre for learning and teaching Geography and Geoinformatics)
- GIS-Cluster Salzburg
- GIScience Research Cluster Salzburg

Memorandum of Understanding and Formal Agreements

- Bulgarian Academy of Sciences, Institute of Geography
- Chinese Academy of Sciences, Department of Geography and Ecology, Urumqi
- National Academy of Sciences of the Kyrgyz Republic
- Twinning Project on Water Framework Directive between Slovenia, Germany and Austria

Partners in funded joint projects

- Akademisches Gymnasium
- AviBit
- BG Salzburg-Nonntal
- CEIT ALANOVA gemeinnützige GmbH
- Danube University Krems
- digital:earth:at - Centre for learning and teaching Geography and Geoinformatics

- Engineering Geodesy Group, Institute of Geodesy and Geophysics, Vienna University of Technology
- Eurasia-Pacific Uninet
- Federal Chancellery Austria
- Geographical Information Systems International Group (GISIG)
- INRP Lyon
- International Centre for Integrated Mountain Development (ICIMOD)
- Jagiellonian University, Institute of Geography and Spatial Management
- National Park Berchtesgaden
- Salzburg Airport
- University of Education Salzburg, Department of Secondary Schools
- University of Koblenz, „Lehreinheit Geographie“
- University of Natural Resources and Life Sciences, Institute for Landscape Development, Recreation and Conservation Planning
- University of Salzburg, Z_GIS Centre for Geoinformatics
- University of Zagreb, Faculty of Geodesy
- Vienna University of Technology, Institute of Geodesy and Geophysics

Informal project work without funding

- Austria-Central Asia Centre for GIScience (ACA*GIScience), Bishkek, Kyrgyzstan
- Christian Doppler Klinik, Neurological Department
- Ludwig-Maximilians University Munich, Department of Geo- and Environmental Sciences
- Middle East Technical University, Department of Geodetic and Geographic Information Technologies
- Natural History Museum Vienna, Department of Geology & Palaeontology
- Research Reactor FRM-II, Technical University Munich, Germany
- Researchstudios Austria - Studio iSPACE
- Statistik Austria
- University of Innsbruck, Department of Ecology
- University of Texas, High-Resolution X-ray Computed Tomography Facility
- University of Vienna, Department of Geography & Regional Science

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Austrian Academy of Sciences

INSTITUTE FOR GEOGRAPHIC INFORMATION SCIENCE

Networking Activities

International visibility through research cooperation

Progress in research today is only achievable when reaching critical mass. Part of this is contributed through exchange within a network of partner institutions sharing common goals and topical orientation. We intensively work on building up a valuable and strong network of ties to related institutions of interest worldwide. These partners join ÖAW-GIScience in international projects, through exchange of faculty, offering mutual support in individual projects, or serving as application domain experts for the validation of research outcomes in applied contexts.

www.oeaw.ac.at/GIScience/projects

Developing visions for a spatially enabled future

Scientific conferences greatly contribute to the dissemination of research findings, to networking and collaboration. Such conferences facilitate links between scientists, professionals, and users, often leading to new project ideas and research directions.

Prof. Dr. Josef Strobl,
Director ÖAW-GIScience

Scientific Conferences annually in Salzburg

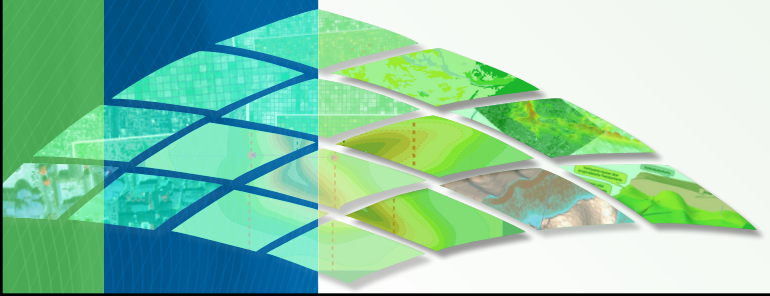
The ÖAW-GIScience research team contributes to numerous conferences and also chairs and organises GI symposia bringing together an international community of scientists working towards a spatially enabled future.

GI_Forum Geoinformatics Forum Salzburg
www.gi-forum.org

www.gi-forum.org/learning

COGEO WWW.COGEO.AT
www.cogeo.at

Salzburg IAMG 2011
www.iamg2011.at



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3. Attachment: Data report from AkademIS (CD-ROM)