



Milos Conferences

# StatGIS 2009

Geoinformatics for Environment Surveillance

17-19 June 2009 / Milos island, Greece

Program

Venue:



<http://milos.conferences.gr/statgis2009>

# Welcome Message

**Dear friends and colleagues,**

Welcome to Milos on the occasion of the fourth StatGIS Conference, which is titled this year "Geoinformatics for Environmental Surveillance". This time the conference is organized by the University of Klagenfurt (Austria), the Technical University of Crete (Greece), Muenster University (Germany), Aston University (United Kingdom), and the Joint Research Centre of the European Commission, with the support of Heliotopos and of DG INFSO of the European Commission.

Those used to the tradition of StatGIS being an important meeting to learn about the latest developments in geostatistics and spatial statistics will not be disappointed by the challenging problems that will be discussed in Milos. For what concerns technological issues, StatGIS 2009 will focus on generic solutions based on Open Source technology and interoperability of systems for the spatial analysis of environmental data.

The applications we will discuss cover a wide range of topics, among which air quality, climate change, biodiversity, environmental radioactivity, health risks, wildfires, and earthquakes. With your participation, we hope StatGIS09 will provide an opportunity for all to meet, discuss and exchange ideas about the latest developments in spatial statistics and GIS, as well as to reflect on the future of Geoinformatics.

Thank you for joining us, and we wish you a fruitful conference and an enjoyable stay in Milos.

Dr. Gregoire Dubois (on behalf of the Organizing Committee)



DG Joint Research Centre - European Commission  
Institute for Environment and Sustainability

## Organizing

Cornford, Dan (Aston University, UK)  
Dubois, Gregoire (JRC, European Commission)  
Hristopulos, Dionisis (Technical University of Crete, Greece)  
Pebesma, Edzer (University of Mönster, Germany)  
Pilz, Juergen (University of Klagenfurt, Austria)

## Scientific

Allard, Denis (INRA, France)  
Atkinson, Peter (University of Southampton, UK)  
Bogaert, Patrick (Universiti Catholique de Louvain, Belgium)  
Brenning, Alexander (University of Waterloo, Canada)  
Brus, Dick (Wageningen University and Research Centre, The Netherlands)  
Christakos, George (San Diego State University, USA)  
Cornford, Dan (Aston University, UK)  
Diggle, Peter (Lancaster University and Johns Hopkins University School of Public Health, UK and US)  
Dubois, Gregoire (JRC, European Commission)  
Fortin, Marie-Josée (University of Toronto, Canada)  
Ghosh, Sujit K. (North Carolina State University, USA)  
Goodchild, Michael F. (University of California Santa Barbara, USA)  
Goovaerts Pierre (BioMedware, USA)  
Griffith, Daniel A. (University of Texas at Dallas, USA)  
Havlik, Denis (Austrian Research Centres GmbH - ARC, Austria)  
Heuvelink, Gerard (Wageningen University, The Netherlands)  
Hristopulos, Dionisis (Technical University of Crete, Greece)  
Kyriakidis, Phaedon (University of California Santa Barbara, USA)  
Lark, Murray (Rothamsted Research, UK)  
Myers, Wayne (The Pennsylvania State University, USA)  
Neteler, Markus (Fondazione Mach - Centre for Alpine Ecology, Italy)  
Nativi, Stefano (CNR-IMAA, University of Firenze, Italy)  
Papritz, Andreas (ETH Zurich, Switzerland)  
Patil, Ganapati P. (The Pennsylvania State University, USA)  
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Schouppe, Michel (DG INFSO, European Commission)  
Stein, Alfred (ITC, The Netherlands)  
Stöhlker, Ulrich (BFS, Germany)  
Switzer, Paul (Stanford University, USA)  
van den Boogaart, Gerald (TU Bergakademie Freiberg, Germany)  
Wackernagel, Hans (Ecole des Mines de Paris, France)

**Stefano Nativi** *CNR-IMAA, University of Florence, Italy*

*Talk: Multidisciplinary interoperability architectures, some GEOSS and GMES experiences*

## Biography

Stefano Nativi received a 1st and 2nd (Laurea) degree and a Ph.D from the University of Florence (IT). He had a PDRA grant from the University of Bristol (UK). He is President of the Earth and Space Sciences Informatics (ESSI) division of the European Geosciences Union (EGU). He is co-leader of GEOSS IP3 (Interoperability Process Pilot Project), chair of the Climate Change & Biodiversity WG of GEOSS AIP-2 (Architecture Implementation Pilot – phase 2), and member of the GEOSS Standards and Interoperability Forum (SIF). He is member of the “Metadata Core Drafting Team” for the Implementing Rules of the INSPIRE initiative. He is coordinator of the ESSI Laboratory - Institute of Methodologies Environmental Analysis of the Italian National Research Council (CNR - IMAA). He is member of the National Inter-university Consortium for Telecommunications (CNIT) Scientific Committee. He is professor of “Web services management” (University of Florence - Faculty of Electronic and Telecommunications Engineering, Information Engineering 1st degree). He is professor of “Systems for land management” (University of Padua -Faculty of Mathematics, Informatics 2nd degree). He is Co-PI of the OGC GALEON (Geo-interface to Atmosphere, Land, Earth, Ocean netCDF) IE.

**Havard Rue** *Norwegian University of Science and Technology, Norway*

*Talk: Bayesian Geostatistics with Gaussian Markov random fields: models and inference*

## Biography

Havard Rue is a Professor in Statistics at the Norwegian University of Science and Technology. His main interest is spatial and computational statistics, and Bayesian inference. He has co authored a book “Gaussian Markov random fields: Theory and applications” on the monographs on Statistics and Applied probability series of Chapman & Hall, and presented a read-paper for RSS about approximative Bayesian inference in 2008. He serves (and has served) as an associated editor for Journal of Royal Statistical Society Series B, Scandinavian Journal of Statistics, Annals of Statistics, Environmetrics, and Statistics Surveys.

**Hans Wackernagel** *Ecole des Mines de Paris, France*

*Talk: Data assimilation for epidemiological surveillance*

## Biography

Hans Wackernagel is a Senior Research Scientist within the Geostatistics Group of the Geoscience Center of Ecole des Mines de Paris (MINES-ParisTech). He received his Doctoral degree in geostatistics from Ecole des Mines de Paris in 1985 and he obtained a Habilitation à Diriger des Recherches diploma in 2004 from Université Pierre et Marie Curie, Paris. Dr Wackernagel, well-known by his book on Multivariate Geostatistics (3 editions, Japanese translation), has been involved in several multidisciplinary national and inter-national projects on data assimilation and statistical modelling in such different fields like oceanography, climate, air pollution, radio-electric exposure estimation, epidemiology (non-contagious, contagious and vector-borne diseases), to mention but a few.

# Program of Wednesday 17 June

08:30 - 09:00

Registration

08:50 - 09:00

WELCOME: DAY 1

09:00 - 10:00

*KEYNOTE Talk 1: Hans Wackernagel*  
*"Data assimilation for epidemiological surveillance"*

Chair: G. Heuvelink

10:00 - 13:00

Plenary Session

*Topic A. Monitoring networks and SensorWebs*

Chair: D. Cornford

10:00 - 10:20

Prediction of PM10 Concentrations using a Modular Neural Network System and Integration with an Online Air Quality Management System [Kapageridis]

10:20 - 10:40

Spatial monitoring of soil phosphorus in the Florida Everglades [Marchant]

10:40 - 11:00

Network optimization algorithms and scenarios in the context of automatic mapping [Baume]

11:00 - 11:20

Coffee break

11:20 - 11:40

Optimization for the design of environmental monitoring networks in routine and emergency settings [Melles]

11:40 - 12:00

Anomalies of spatial variables [Bossew]

12:00 - 12:20

INTAMAP: an interoperable automated interpolation web service [Pebesma]

12:20 - 12:40

An OGC web service architecture for near real-time interpolation of air quality over Europe [Henneböhl]

12:40 - 13:00

A Web Processing Service for the Validation of Interpolation [Mendes de Jesus]

13:00 - 14:00

Lunch

14:00 - 15:20

## Poster Session 1

1. Effects of Climate on Malaria in Burundi [Nkurunziza]
2. Radiological Monitoring Network Design Using a Multi-Objective Genetic Algorithm [Fraleay]
3. KARTOTRAK: a GIS platform for real-time characterization of radiological contaminations [Attiogbe]
4. Hierarchical Bayesian Interpolation for Precipitation of Pakistan [Hussain]
5. Modeling and Interpolation of Non-Gaussian Spatial Data: A Comparative Study [Spöck]
6. Quantitative interdependency between landscape and agricultural land price dynamics [Grandgirard]
7. Estimating and modeling variograms of compositional data with occasional missing variables in R. [Tolosana-Delgado]
8. Integrated use of GIS, GPS and Sensor Technology for managing water losses in the water distribution network of the Paphos Municipality in Cyprus [Achilleos]
9. Estimating the space-time distribution of radioactivity levels by combining monitoring network data and atmospheric transport models [Hiemstra]

15:20 - 16:20

## Plenary Session

*Topic A. (cont'd). Monitoring networks and SensorWebs*

Chair: D. Cornford

15:20 - 15:40

Automatic processing, quality assurance and serving of real-time weather data over lightweight protocols [Williams]

15:40 - 16:00

Real-time mapping for environmental surveillance: a decision-maker's perspective [Stöhlker]

16:00 - 16:20

Beyond Service Oriented Architecture [Havlik]

16:20 - 16:40

Coffee break

16:40 - 18:20

### Parallel Session 1

#### *Topic B. Geoinformatics for Environmental application*

Chair: G. Dubois

16:40 - 17:00 Climate-based dengue predictions for Brazil [Lowe]

17:00 - 17:20 Spatial upscaling of process-based vegetation models: An overview of common methods and a case-study for the U.K. [van Oijen]

17:20 - 17:40 Automatic Classification of Landsat Timeseries using Geostatistics and Discriminant Analysis [Goovaerts]

17:40 - 18:00 Geostatistical Estimation of Contaminated Sediment Volumes: Review of Common Challenges and Solutions [Goovaerts]

18:00 - 18:20 Fault interactions and patterns of short-term fault growth due to micro-earthquakes [Mouslopoulou]

16:40 - 18:20

### Parallel Session 2

#### *Topic C. Spatio Temporal Developments*

Chair: E. Pebesma

16:40 - 17:00 A framework for comparing spatio-temporal interpolators [Bisier]

17:00 - 17:20 Deriving space-time variograms from space-time autoregressive (STAR) model specification [Griffith]

17:20 - 17:40 Spatiotemporal Analysis of Solar Radiation for Sustainable Research in the Presence of Uncertain Measurements [Kolovos]

17:40 - 18:00 An application of spatiotemporal BME analysis to the estimation of rainfall in north-western Greece [Modis]

18:00 - 18:20 An automatic approach to the mean and covariance estimations of spatiotemporal non stationary processes [Yu]

### Plenary Session

18:20 - 18:40 Presentation by S&B Industrial Minerals S.A. Milos Conferences Partner [Papasotiriou]

18:40 Welcome Reception

End of Day 1

# Program of Thursday 18 June

08:50 - 09:00

## WELCOME: DAY 2

09:00 - 10:00

**KEYNOTE Talk 2: Stefano Nativi**  
*"Multidisciplinary interoperability architectures,  
some GEOSS and GMES experiences"*

Chair: D. Cornford

10:00 - 11:00

**Parallel Session 1**  
*Topic B (cont'd). Geoinformatics for Environmental application*

Chair: D. Cornford

10:00 - 10:20

Wildfire Prevention and Management in a 3D Virtual Environment [Sanchez Perez]

10:20 - 10:40

Spatio-temporal analysis of NDFF records: generating dynamic distribution maps of flora and fauna species [Hengl]

10:40 - 11:00

Geoinformatics for the Environmental Surveillance of Protected Areas in Africa [Dubois]

10:00 - 11:00

**Parallel Session 2**  
*Topic D. Spatial patterns*

Chair: D. Hristopulos

10:00 - 10:20

Ocean eddy tracking with circlets [Wackernagel]

10:20 - 10:40

Testing Spatial Isotropy by Using a Non Parametric Bootstrap Approach [Miranda]

10:40 - 11:00

Conditional Simulations of Anisotropic Spatial Data with Global Gradient-Curvature Constraints [Zukovic]

11:00 - 11:20

Coffee break

11:20 - 13:00

**Plenary Session**  
*Topic A. Estimations & Predictions*

Chair: J. Pilz

11:20 - 11:40

The Codispersion Coefficient: An Application in the Evaluation of the Performance of Different Spatial Interpolators [Vallejos]

11:40 - 12:00

Limitations of Indicator Kriging for Predicting Data with Trend [Papritz]

12:00 - 12:20

Bayesian spatial modeling and interpolation using copulas [Kazianka]

12:20 - 12:40

Bayesian locally stationary trans-Gaussian Kriging using generalized Voronoi tessellations [Spöck]

12:40 - 13:00

Projected Sequential Gaussian Processes: Flexible Interpolation for Large Data Sets [Cornford]

13:00 - 14:00

Lunch



14:00 - 15:20

## Poster Session 2

1. Spatial structure of monthly and annual maximum daily precipitation totals from the area of Poland [Stach]
2. Measurement frequency optimization at the environmental monitoring networks [Orlov]
3. Conception and implementation of a monitoring network at a former base metal mining and ore processing site (Kirki Mines, Greece) [Lemiere]
4. rtop - an R package for interpolation of data with a non-point support [Skøien]
5. Use of wavelet-transform for analysis of urbanized groundwater regime [Batrak]
6. A preliminary analysis of GIS-based Decision Support System to monitor climate aridity and drought in a Mediterranean country [Salvati]
7. Saharan dust over France [Mitivier]
8. The Integrated Information System on Water Resources: The Italian Experience from Official Statistics [Tersigni]
9. Landslide monitoring and mechanical-mathematical modeling for sediment movement. [Svalova]
10. Analyzing the effect of different aggregation approaches on classified remotely sensed images [Raj]

15:20 - 17:40

## Plenary Session

### Topic A. (cont'd). Estimations & Predictions

Chair: E. Pebesma

15:20 - 15:40 Extending Minimum Curvature Estimators Using Spartan Spatial Random Fields [Hristopulos]

15:40 - 16:00 Spatio-temporal predictions of agricultural land prices. Application to France [Carre]

16:00 - 16:20 Higher Order Co-occurrences in Point Pattern Analysis and Decision Tree Clustering [Leibovici]

16:20 - 16:40 **Coffee break**

16:40 - 17:00 Wave data assimilation using non-stationary kriging [Tolosana-Delgado]

17:00 - 17:20 Non-parametric estimation of geometric anisotropy in scattered data from environmental sensor network measurements [Petrakis]

17:20 - 17:40 Monte Carlo and spatial sampling effects in regional uncertainty propagation analyses [Heuvelink]

**10 min break**

17:50 - 18:50

### KEYNOTE Talk 3: Harvard Rue

**"Bayesian Geostatistics with Gaussian Markov random fields: models and inference"**

Chair: E. Pebesma

21:00

**Conference Dinner, Alevromilos Restaurant**

**End of Day 2**

# Program of Friday 19 June

08:50 - 09:00

**WELCOME: DAY 3**

09:00 - 11:00

**WORKSHOPS**

**INTAMAP**

*A Web Service for Automatic Interpolation*

Universities of Utrecht and Aston, the Joint Research Centre of the European Commission and the German Federal office for Radioprotection

Workshop 1 will present INTAMAP, a web service for the real time mapping of environmental data. The main objective of INTAMAP was to develop an interoperable framework for real time automatic mapping of critical environmental variables by extending spatial statistical methods and employing open, web-based, data exchange and visualisation tools. To illustrate the potential of the framework at the European scale, the framework was applied to produce a system for automatic mapping of radiation levels reported by 29 European countries that participate in the European radiological data exchange platform (EURDEP).

11:00 - 11:20

**Coffee break**

11:20 - 13:00

**Parallel Workshop 1**

*UncertML and WPS in practice*

Aston University

This workshop will introduce the concept and usage of UncertML using a variety of examples from domains including meteorology, radioactivity monitoring, epidemiology and user contributed data. We'll show you can use UncertML to encode uncertainty in a range of scenarios. If you want to bring your own problems we will be happy to discuss how UncertML might be used in your scenarios. We'll also show how to use this in practice in the INTAMAP setting and describe what might come next with web processing services and the model web, and where UncertML might fit.

11:20 - 13:00

**Parallel Workshop 2**  
*An introduction to Anisotropy detection and estimation methods*  
Technical University of Crete

This workshop will introduce the concept of anisotropy in its various manifestations. Then, we will briefly review existing methods for the estimation of anisotropy from 2D scattered data. We will show how the anisotropy can be estimated using the method of covariance tensor identity (CTI). We will explain how the CTI is used in the frame of Intamap. We will also demonstrate the application of CTI in various data sets generated in the framework of Intamap; in relation to these case studies we will highlight advantages of the method as well as remaining issues for further development.

13:00 - 14:00 **Lunch**

14:00 - 16:00

**Bayesian geostatistics**  
*Tools and methods for detecting and handling extreme event*  
University of Klagenfurt

This workshop will present the main concepts, tools and methods of Bayesian geostatistics. We will start with classical Bayes ordinary Kriging, extend the ideas to include uncertainty with respect to variogram parameters and then present the main ideas of modern model-based Bayesian geostatistics. Finally, we introduce the new concept of copula-based geostatistics, which is particularly well suited to deal with extreme observations. The use of this concept is demonstrated by analyzing real data with the copula R-package that has been developed within the INTAMAP project.

16:00 - 16:20 **Coffee break**

16:20 - 18:00

**Monitoring networks**  
*Optimization of sampling designs*  
Wageningen University

Optimization of spatial sampling designs is concerned with the choice of the number and spatial configuration of observation locations. These must be chosen such that a pre-defined criterion is optimized. In this workshop you will learn about the various criteria that may be used and the many numerical algorithms that have been developed to seek the optimal design. You will design a sampling design by hand for two simplified case studies, see whether these designs can be improved using a numerical optimization algorithm and reflect on the spatial pattern of the resulting designs.

## Sponsors



INTAMAP



Technical University of Crete



## Milos Conferences Partner

**S&B**

**S&B Βιομηχανικά Ορυκτά Α.Ε.**  
**S&B Industrial Minerals S.A.**

## Conference Secretariat

*Heliotopos Conferences*

28, Ypsilantou str. | GR-17236, Greece  
Tel: +302109730697 | Fax: +302109767208  
E-mail: statgis2009@heliotopos.net

<http://milos.conferences.gr/statgis2009>