



FROM THE CHAIR

Dear Pedometricians,
Pierre and I prepared this newsletter mainly to keep you informed about the voting of the Best Paper in Pedometrics 1997, for which you all were invited to participate, and the program of Pedometrics '99 in Sydney. We congratulate the winning team for their superb paper, they will receive a certificate during the Pedometrics '99 conference later this year. Winning the Best Paper in Pedometrics is a recognition of excellence in this field, but so is also to be among the best five selected. Therefore we would like to extend our congratulations also to the other teams for their outstanding work. **Dr. Gerard Heuvelink** is currently making a new selection for the Best Paper for 1998, so we will be able to hand over two Best Paper awards in Sydney. This would bring us in schedule since we plan to organize a Pedometrics conference every second year. This issue further contains the latest information about the Pedometrics '99 conference and an announcement for the 4th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences to be held in July 2000 in Amsterdam.

Looking forward to meeting you all in Sydney !

Marc Van Meirvenne Chairman of the WG-PM

Best Paper Award 1997

Like last year, the best Pedometrics paper award for 1997 has been won by Dutch researchers and scholars, namely **J.J. De Gruijter**, **D.J.J. Walvoort** and **P.F.M. van Gaans**. Their paper, published in *Geoderma* Volume 77 pages 169-195, was among five papers nominated by **Dr. M. Bierkens**. It is noteworthy that all five papers get at least one maximum vote (score 5), which indicates that the competition was tight this year. The abstracts of the winning paper is given below.

J.J. De Gruijter, **D.J.J. Walvoort** & **P.F.M. van Gaans** 1997. Continuous soil maps - a fuzzy set approach to bridge the gap between aggregation levels of process and distribution models. *Geoderma* 77: 169-195.

Abstract

Soil maps as multi-purpose models of spatial soil distribution have a much higher level of aggregation (map units) than the models of soil processes and land-use effects that need input from soil maps. This mismatch between aggregation levels is particularly detrimental in the context of precision agriculture. It is argued that, in order to bridge the gap, soil distribution modelling should be based on a new classification paradigm: that of fuzzy set theory. In geographic space, this enables representation of gradual as well as abrupt transitions, i.e., soil distribution models that can predict variables at pedon level.

In a case study we used fuzzy k-means with extragrades to derive a continuous classification from data on thicknesses of 25 layers measured in 552 soil profiles. For interpolation of the class memberships we developed a new method. Compositional Kriging, which takes into account that the memberships have the structure of compositional data: they must be positive and add up to a constant (1) for each individual. These conditions were added to the regular Kriging equations. For cartographic representation of the continuous soil distribution models we developed a new technique, the Pixel Mixture technique, by which we generated a large number of small coloured pixels in each raster cell of the map. The colours of the pixels symbolize the classes, and the proportions of iso-coloured pixels in a cell symbolize the grades of the class memberships as predicted for that cell.

The combination of continuous classification and Compositional Kriging convincingly bridged the gap between aggregation levels, and with the aid of the Pixel Mixture technique the resulting soil distribution model could also be visualized at the appropriate level of aggregation.

INSIDE THIS ISSUE

- 1 From the chair
- 1 Best paper award 1997
- 2 Certificate best paper 1996
- 2 L'unité du 1
- 2 Program of Pedometrics '99
- 6 ACCURACY 2000 - announcement

The continuous soil map showed both the general landscape structure, as well as the varying degree of variability within the study area. Based on this multi-purpose continuous soil model, functional models of soil processes and land-use effects can be developed.

Certificate Best Paper 1996



Arnold Bregt receiving his certificate for the 1996 Best Paper in Pedometrics Award from the former working Group chair, Alex McBratney. The presentation was made on top of the tower of the former Surveying Department in Wageningen. Alex, who is terrified of heights, said, 'this is the most I'm prepared to do for Pedometrics'. Arnold, who is the Professor of Geo-information Science at WAU is the last occupant of the building which has the most wonderful views over the Rhine. The University is selling it for a much more worthy use by a bank or insurance company. No doubt they will appreciate the subtleties of the landscape better than earth scientists.

L'UNITÉ DU 1

À l'époque,
Il n'y avait qu'un seul sol,
Dans tous nos mondes.

Pour moi,
Ce fut un sol lessivé,
Dans une forêt de chêne,
Près de Boulemont.

Pas besoin de cartes,
Pas de doutes,
Pas de polémiques.

Pourquoi avons nous eu besoin d'en
Trouver un autre,
Puis encore un autre?

- David van der Linden



IUSS-PM '99

3rd Conference of the Working Group on Pedometrics of the International Union of Soil Sciences (IUSS) Sydney, Australia September 27-29, 1999

Web page:
<http://www.usyd.edu.au/su/agric/news/pedoconf.html>

PROGRAM

Sunday 26 September 1999

15.00 - 20.00 Registration

Monday 27 September 1999

8.00 - 9.00 Registration

Opening Session 9.00 -10.05

Chair: Professor A.B. McBratney

9.10 - 9.20 Welcome address **Professor M. van Meirvenne (Pedometrics Chair) (BELGIUM)**

9.20 - 10.05 Plenary Lecture: Pedometrics in the new millennium. **Professor R. Webster (THE UK)**

10.05 -10.35 COFFEE BREAK

Session 1: Quantifying uncertainty in spatial models of soil

Chair: Professor A. Stein

Session keynote paper

10.35 - 11.05 Geostatistical modelling of uncertainty in soil science. **Pierre Goovaerts (USA)**

Contributing Papers

11.05 - 11.30 A set of polygon map quality attributes. **C. J. Moran and E. N. Bui (AUSTRALIA)**

Continued on page 3

- 11.30 - 11.55 A procedure for optimizing quality and reliability of soil physical characteristics obtained through pedotransfer functions and measurements. **H.W.G. Booltink, B.J. van Alphen and J. Bouma (THE NETHERLANDS)**
- 11.55 - 12.20 A possibility theory approach for mapping soil hydraulic properties from imprecise information contained in a soil map. **D.R. Cazemier, P. Lagacherie, R. Martin-Clouaire and M. Bornand (FRANCE)**
- 12.20 - 12.45 Using soil map information as a categorical external drift for kriging quantitative soil properties. **P. Monestiez, M. Voltz, D. Allard and P. Lagacherie (FRANCE)**
- 12.45 - 14.00 LUNCH
- 14.00 - 14.25 Evaluating the practical implications of the new soil information paradigm on land suitability assessment results: geostatistical estimation, fuzzy boundary representation and ungeneralized databases in GIS vs. Conventional soil survey data in GIS. **R. Ponce-Hernandez, D. Ponce de Leon, C. Balmaseda and S. Segreera (CANADA)**
- 14.25 - 14.50 Determining the autocorrelation distance and variance of soil. **By LI Guojun (SINGAPORE)**

Session 2: Sampling for land resource modelling

Chair: Dr J.J. de Gruijter

Session keynote paper

- 14.50 - 15.20 The use of regression models in design-based estimation of spatial means of soil properties. **By D.J. Brus (THE NETHERLANDS)**

Contributing papers

- 15.20 - 15.45 Mapping soil carbon using Expecto in the South Island high country, NZ. **By Allan Hewitt and Linda Lilburne (NEW ZEALAND)**
- 15.45 - 16.00 Optimising variogram estimation vs. optimising variogram use. **By J.W. v. Groenigen and A. Stein (THE NETHERLANDS)**

16.00 - 16.30 TEA BREAK

Poster Session

1. Uncertainty analysis of soil modelling in bottomland wetlands. **By WALTER Christian, CHAPLOT Vincent, CURMI Pierre (FRANCE)**
2. Survey design for predicting the distribution of soil hydraulic properties across small forested catchments in southeast NSW, Australia. **By D.A. O'Connell, N.J. McKenzie and P.J. Ryan (AUSTRALIA)**
3. Spatial prediction of compositional soil data. **By Alison Todd and Inakwu O. A. Odeh (AUSTRALIA)**
4. Variable selection by principal components and semivariograms to simplify land evaluation mapping process. **By Laurano Rangel and Manuel Henríquez (VENEZUELA)**
5. The use of drainage maps in precision farming for more accurate soil predictions - an example from Sweden. **By Mats Soderstrom (SWEDEN)**
6. Deconvolution and filtering of multi-spectral satellite images for use as covariates for inventory of soil attributes. **By Inakwu O.A. Odeh, Marian S. Dunbar and Alex. B. McBratney (AUSTRALIA)**
7. Coregionalization of synthetic aperture radar data and soil moisture measurements. **By S. Depuydt and M. Van Meirvenne (BELGIUM)**
8. Relationship between soil properties and landscape in a Brazilian high weathering soil. **By J. Marques Júnior, H. T. Meirelles, G. T. Pereira and M. Scatolin (BRAZIL)**
9. Comparison of methods for dealing with non-stationary pH data. **By R.A. Viscarra Rossel and A.B. McBratney (AUSTRALIA)**
10. Improving the estimation of a soil variable using multi-external drifts. **By H. Bourennane, D. King (FRANCE)**

Continued on page 4

Tuesday 28 September 1999

Session 3: Soil spatial models using environmental correlation

Chair: Dr Allan Hewitt

Session keynote paper

9.00 - 9.30 Using auxiliary information to adjust fuzzy membership functions for improved mapping of soil qualities. By **Thomas Oberthür and Achim Dobermann (PHILIPPINES)**

Contributing papers

9.30 - 9.55 Three-dimensional GIS-based modelling of soils by fuzzy rules and horizons. By **Jürgen Lamp and Martin Ameskamp (GERMANY)**

9.55 - 10.20 Mapping soil landscapes using digital elevation data. By **Ramsis B. Salama and Robert W. Fitzpatrick (AUSTRALIA)**

10.20 - 10.55 Application of a profile cone penetrometer to distinguish between soil materials. By **S. Grunwald D.J. Rooney, K. McSweeney, and B. Lowery (USA)**

10.55 - 11.25 COFFEE BREAK

11.25 - 11.50 Analysis and the use of satellite images for modelling the trends of soil attributes at regional extent. By **Marian S. Dunbar, Inakwu O.A. Odeh and Alex. B. McBratney (AUSTRALIA)**

11.50 - 12.15 Macro and meso scale spatial dependency of physico-chemical and biological properties of farm soils. By **Takashi Kosaki, Junta Yanai, Ken-ichiro Kumagai and Karl Ritz (JAPAN)**

12.15 - 12.40 The relative value of ancillary information for soil prediction in precision agriculture. By **T.F.A. Bishop and A.B. McBratney (AUSTRALIA)**

12.40 - 14.00 LUNCH

Session 4: Aggregation and disaggregation in spatial dimensions

Chair: Dr M. Voltz

Session Keynote paper

14.00 - 14.30 Within- and between-field soil variation in intensively cultivated landscapes and consequences for precision agriculture. By **Marc Van Meirvenne (BELGIUM)**

Contributing papers

14.30 - 14.55 Scale issues in spatial modelling of soil properties. By **Linda R. Lilburne, George L. Benwell and Allan Hewitt (NEW ZEALAND)**

14.55 - 15.20 Disaggregating soil maps to make the most out of existing data. By **Elisabeth Bui (AUSTRALIA)**

15.20 - 15.55 Reliability of small-scale land quality maps as a function of the upscaling procedure used for soil data. By **V. Hennings (GERMANY)**

15.55 - 16.20 The information content of digital soil maps. By **Alex. B. McBratney and T.F.A. Bishop (AUSTRALIA)**

16.20 - 16.40 TEA BREAK

16.40 - 17.50 **Poster session**

1. The aggregation of soil data at different spatial scales for land suitability assessment for sugar cane production: semi-variograms and nested intrinsic variance components for choosing estimation technique. By **R. Ponce-Hernandez, D. Ponce de Leon, C. Balsameda and S. Segrera (CANADA)**

2. Monitoring of phytoextraction on different spatial scales: uncertainty analysis of heavy metal mass balances. By **Armin Keller, Achim Kayser, Berchtold von Steiger and Rainer Schulin (GERMANY)**

Continued on page 5

3. A multi-variate analysis to reveal soil-landscape relations as a basis to downscale soil survey data. By **J.J. Stoorvogel, J. Bouma and F. Van Soest (THE NETHERLANDS)**
4. Spatial variability in the respiration of a Brazilian bare soil. By **N. La Scala Jr., J. Marques Júnior, G. T. Pereira and J. E. Corá (BRAZIL)**
5. Prediction of soil hydraulic properties in small forested catchments using environmental correlation. By **D.A. O'Connell, N.J. McKenzie and P.J. Ryan (AUSTRALIA)**
6. Establishment of statistics metrics and graphics signatures to soils characterization. By **Jesus Fernando Mansilla B., Celso Manzatto, Silvio B. Bhering, and Onofre Andrade J. (BRAZIL)**

19.00 CONFERENCE DINNER

Wednesday 29 September 1999

Session 5: Modelling spatio-temporal variability in soil

Chair: Dr N.J. McKenzie

Session keynote paper

9.00 - 9.30 Opportunities for spatio-temporal Kalman filtering in soil science. By **Gerard B.M. Heuvelink (THE NETHERLANDS)**

Contributing papers

9.30 - 9.55 Spatio-temporal modelling of the soil water balance using a stochastic model and soil profile descriptions. By **M.F.P. Bierkens and D.J.J. Walvoort (THE NETHERLANDS)**

9.55 - 10.20 Dependence modelling of soil environmental variables and estimating the consequences on predicting in space and time. By **A. Stein (THE NETHERLANDS)**

10.20 - 10.50 How to manage the spatial variability in soils: a global perspective. By **J.J. Stoorvogel, J. van Alphen, J. Bouma and P. Gicheru (THE NETHERLANDS)**

10.50 - 11.10 Assessment of scale dependence of spatial variability of pH and organic carbon content in a clay soil. By **Sidney R. Vieira, Chang Wang and G. Clarke Topp (BRAZIL)**

11.10 - 11.40 COFFEE BREAK

Session 6: Deterministic/mechanistic and stochastic/empirical models in soil science

Chair: Professor Jürgen Lamp

Session keynote paper

11.40 - 12.10 A stochastic differential equation for modelling the soil water balance at a single location. By **M.F.P. Bierkens (THE NETHERLANDS)**

Contributing papers

12.10 - 12.35 Geostatistical modelling and simulation of preferential flow fields in sandy soils for environmental risk analysis. By **J.J. de Gruijter and C.J. Ritsema (THE NETHERLANDS)**

12.35 - 13.00 Investigation of fractal characteristics of pore-solid interface in comparison with hydraulic parameters. By **Annette Dathe (GERMANY)**

13.00 - 14.00 LUNCH

14.00 - 14.25 A two-dimensional mechanistic model for soil production and landscape development. By **Budiman Minasny and Alex. B. McBratney (AUSTRALIA)**

14.25 - 14.50 The relationship between time series models for water table depth and physical information. By **Martin Kotters and Marc F.P. Bierkens (THE NETHERLANDS)**

14.50 - 15.20 Analysing skewed spatial data. By **G.M. Laslett (AUSTRALIA)** *Continued on page 6*

15.20 - 15.50 TEA BREAK

15.50 **Rejoinder/Discussion session**

Panel: Dr Pierre Goovaerts (Chair)

**Dr Gerard B.M. Heuvelink , Dr Sidney R. Vieira, Dr V. Hennings, Dr Chris Moran,
Dr Inakwu Odeh & Dr Annette Dathe**

17.00 Close

ACCURACY 2000 - 4th International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences

July 12-14, 2000, Amsterdam, The Netherlands

AIM AND SCOPE OF THE SYMPOSIUM

Within the environmental sciences - whether it be hydrology, soil science, geomorphology, oceanography, forestry, climatology, geo-ecology or any other branch that one may think of - much use is made of spatially distributed data. These data, frequently stored as maps in a spatial data base or Geographical Information System (GIS), are rarely, if ever, truly free of error. Furthermore, these data are often used as inputs to various models of environmental processes that are themselves also subject to uncertainty. Spatial statistics and stochastic systems theory offer methodologies to handle these uncertainties, but the successful implementation and application of these methods requires the joint efforts of scientists from various disciplines. The aim of this Symposium is to bring together experts from environmental science, spatial statistics and geographic information science to further develop theory and practical application of methods for handling spatial uncertainty in the environmental sciences.

Building on the success of the previous symposia in Williamsburg, Virginia (1994), Fort Collins, Colorado (1996) and Quebec City, Canada (1998), this Symposium is THE international meeting place for experts taking special interests in the assessment, modelling, visualisation and propagation of uncertainty in spatial data and spatial process models.

TOPICS

Topics of interest include:

- development of error-sensitive GIS
- theory and application of uncertainty propagation in spatial modelling
- handling uncertainty in remotely sensed images and classification
- design-based and model-based approaches to spatial uncertainty assessment
- stochastic spatial simulation
- handling spatio-temporal uncertainty
- spatial uncertainty modelling for categorical data
- visualisation of spatial uncertainty
- effect of aggregation and generalisation on spatial uncertainty assessment
- incorporating uncertainty in spatial decision making
- inverse estimation techniques for calibrating spatial process models
- simultaneous handling of positional and attribute uncertainty
- discretisation and up-scaling effects for global environmental models
- model validation with imperfect ground truth data

ABSTRACT SUBMISSION

An extended abstract of 500-600 words including key words should be received by 1 October 1999. Authors will be informed about acceptance for oral or poster presentation by 1 December 1999. Papers based on the accepted extended abstracts should be received by 15 March 2000 and will be published in book form, handed out to all delegates at the start of the Symposium. Abstracts should clearly mention the name, address, phone number and e-mail of the corresponding author.

MORE INFORMATION : e-mail: accuracy@frw.uva.nl or <http://www.gis.wau.nl/Accuracy2000>