"GEORISK AND CLIMATE CHANGE"

2008 -2009 Annual Report of the PIMS Environmetrics Collaborative Research Group.

November 30, 2009

Submitted to the Pacific Institute for the Mathematical Sciences by

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PIMS Environmetrics CRG

The goal of this project is to develop a multi-site, distributed environmetrics research center. Activities of such a center would include conferences, workshops, summer schools, joint courses, a diploma/certificate program, and collaborative research. The present report addresses research accomplishments, both capacity building and results, in the first three sections. This is followed by a summary of activities to date. The activities reported in the 2007-2008 Report are indicated as such, and more detail is given for activities in 2008-2009.

RESEARCH

1. Research synergies: some examples

The activities listed in sections 4 to 9 have lead to new research associations. For example, because of leading the working group on extreme events at the Semiahmoo meeting, Paul Whitfield was invited to the Malta workshop where Peter Guttorp gave a presentation on analyzing long temperature series. This in turn lead to Whitfield and Guttorp jointly supervising the work of a Master's student, Jia Xu, at Simon Fraser University, analyzing a long time series of temperatures from Western Canada. There has been engagement between Chilean researchers (headed by Paul Sepúlveda) interested in forestry studies and those of the forestry subcomponent (headed by Charmaine Dean) in this CRG, including participation in each other's events (Chile/Canada) and collaborations leading to a broadening in scope of studies in Canada to encompass forestry needs of Chilean researchers. Agroclimate researchers in Regina have been collaborating with Jim Zidek on climate change impacts in agriculture in Saskatchewan and other Agriculture and Agri-Food Canada researchers in Summerland have been collaborating with Sylvia Esterby on microclimate effects on orchard insect pests.

An example of activities that foster interaction is the Special Session on Measuring and Managing Forestry Risks at the Summer School in Perceiving, measuring and managing risk: illiquidity, long-term risk, natural resources, UBC, June 30-July 7, 2008

Tuesday, July 8
1:00 - 5:00 Forestry (Charmaine Dean)
1:00 - 2:00 Steve Taylor
2:00 - 3:00 Haiganoush Preisler
3:00 - 3:30 Discussion: Dean, Taylor, Preisler, Van Kooten
3:30 - 4:00 Break
4:00 - 5:00 Kees van Kooten

2. Research projects of students and post docs partially supported by PIMS CRG

2.1 Completed in 2007 – 2008

Deterministic vs statistical modeling (Zhong Liu,PhD, UBC V).
PhD Thesis**:** Combining measurements with deterministic model outputs: predicting ground-level ozone.

Partially funded by PIMS as a Graduate Research Assistant, Zhong completed his PhD in the Department of Statistics, UBC, in Oct 2007. He has manuscripts on the appraisal of Bayesian melding for physical-statistical modeling, various aspects of spatial-temporal models for the prediction of ozone, and combing measurements with an ensemble of deterministic model outputs for probabilistic weather forecasting.

Environmental impacts (Zuzana Hrdlickova, PDF, UBC O)
Zuzana held a PIMS Postdoctoral Fellowship June 2007 – May 2008 at UBC O working on two projects. Analysis of fire weather index time series, focusing on clustering of the fire stations according to the temporal fire weather index trends is a collaborative project with Canadian Forest Service, Pacific Forestry Centre. A paper is in preparation on a new method of clustering based on the Maximum Autocorrelation Factors as well as a paper on regions of varying risk based on FWI. The regions identified using historical data will provide scenarios relevant to future risk under climate change. Modelling counts of codling moths with a focus on improved microclimate measurements through remote sensors is a continuing project with scientists from the Pacific Agri-Food Research Centre, Summerland. This uses the Sterile Insects Release (SIR) data and is relevant to the control program for the apple codling moth in the Okanagan region.

Further Modelling of Coding Moths (Jason Nielsen, PHD, SFU)
Modelling of codling moths and its importance was described above in discussing the research of Zuzana Hrdlicova at UBC-O. Jason Nielsen has also been investigating the use of mixtures of nonhomogeneous spline intensity functions to model the arrival rate of moths and to determine the effect of covariates discussed above. Jason Nielsen graduated in 2007 and the methodology for the analysis of such mixtures has been accepted for publication (three papers on this topic have been accepted). Work is ongoing in refinements required for the codling moth analysis.

The Analysis of Zero-heavy Data (Laurie Ainsworth, PhD, SFU)
Many environmental applications, such as species abundance studies, rainfall monitoring or tornado count reports, yield data with a preponderance of zero counts. This leads to what is called zero-inflation. This research develops models for correlated zero-inflated spatial data. One application was to the analysis of white pine weevil infestation data for spruce trees, a difficult problem for Canadian foresters. Laurie Ainsworth graduated in 2007 and two papers on this research have been accepted for publication while a third is under review.

Spatial Distribution of Asthma (Laurie Ainsworth, PhD, SFU)
This research is conducted jointly with colleagues at Vancouver General Hospital and with Paramjit Gill (UBC O). Asthma is a chronic inflammatory disease of the human respiratory system. Morbidity of asthma patients continues to increase and these increases are expected to be substantial under some scenarios of climate change. Hierarchical or multilevel models are used to study the spatial variation and identify areas of greatest risk. This research is currently ongoing.

2.2 Ongoing or completed in 2009

Agroclimate Risk Management (Reza Hosseini, PhD, UBC V)
PhD Thesis**:** Statistical models for agroclimate risk analysis.

One component of the CRG environmetrics program was funded by the National Institute for Complex Data Systems. That funding partially funded the work done by Reza Hosseni who completed his PhD in the Department of Statistics in Nov 2009. Reza worked on models for climate data. That work began with an analysis of Canadian climate data from 1895 to 2006. In a pre-analysis of that data, he found that the daily minimum temperature over the summer has increased over the past century in the province of Alberta. Following that he investigated the Markovian character of the precipitation process (dry/wet) since long sequences in the dry state characterize drought. He has proposed a new method for selecting the order of Markov chain using the logistic function and using the generalized linear models for time series. An advantage of this model over existing competitors is it does not need the stationarity assumption and it reflects the spatial nature of the process. The model can be used to investigate extreme climate events (both precipitation and temperature) by letting the binary process to be extreme/not extreme for a given day. Reza has also worked on models to study the spatial temporal process of precipitation. The reports and manuscripts resulting from his work are listed in the Publications Section.

Modeling space – time environmental fields (Yiping Dou, PDF, UBC V).
PhD Thesis**:** Dynamic Bayes models for modelling environmental space-time fields.

Yiping Dou completed for UBC Statistics PhD in 2008. Yiping began her PIMS Postdoctoral Fellowship research on Apr 1, 2008 and spent time working on landscape modelling related to water resources at CSIRO, Australia. She has manuscripts on modelling hourly ozone concentration fields, model comparison: DLM and BSP, temporal prediction using the Bayesian spatial prediction after pre—filtering, Bayesian empirical orthogonal function method and its application, Generalized Bayesian spatial prediction method and its application

Forest Fire Risk (Doug Woolford, PDF, SFU)
Quantifying the spatio-temporal seasonal effects of forest fire regime characteristics is important for fire management planning. Of particular interest is the determination of when and where fires occur, how seasonality effects monitoring fire risk have changed over time, and specifically determining regional seasonality effects. Woolford's research investigates these effects and provide predictions of site-specific seasonality trends as well as confidence intervals for these effects. The work also develops methods for testing for climate-caused shifts in fire risk. Invited presentations on this work were made in Malta (by Dean) in February 2009, at a Climate Change Impacts Research Meeting in Vancouver (by Dean) in March 2009, and at the Statistical Society of Canada annual meeting (by Woolford) in June 2009. This research led to participation (Woolford and Dean) in a Climate Change and Fire Management Research Strategy Forum held by the BC Ministry of Forests in 2009.

Forest Management Simulation (Soyean Kim, MSc, SFU)
Thesis topic**:** Imputation based on local likelihood density estimation for interval censored survival data with application to tree mortality in British Columbia.

Development of methods for joint modeling and analysis of longitudinal tree growth and tree survival data is important for the Ministry of Forests Tree and Stand Simulator; this

simulator is utilized for decision-making with regard forest management practice in BC and for planning purposes with regard climate change scenarios. Currently a main drawback with tree growth is that growth and survival are considered independent processes, whereas evidence and scientific understanding of processes involved point to the contrary. Based on data from a forestry field program, this research developed and evaluated methods for such joint analysis. Of interest was the development of methods to handle features of the data which are not common in considerations of joint analyses. A main feature is interval censoring of the survival response and there is also the need to account for spatial effects jointly in the survival and longitudinal outcomes. Invited presentations (by Dean) based on this work were made at the Statistical Society of Canada annual meeting in June 2009, at an International Symposium in Statistics in Newfoundland in July 2009, and at a BIRS Workshop in August 2009. This work was conducted jointly with statistical and scientific collaborators at the BC Ministry of Forests.

Smoke Exposure for Health Effect Studies (Victoria Wan, MSc, SFU)
Thesis topic**:** Smoke plume estimation from satellite images for smoke exposure studies in health

Identifying accurate measures of exposure to forest fire smoke is important for assessment of health risk. Estimating exposure from air quality monitors is challenging because of the sparseness of the monitoring networks in remote areas. However, satellite imagery can provide estimates of fire location and visual information on smoke plumes. This research discussed statistical techniques for obtaining estimates of forest fire smoke plumes using classification and smoothing mechanisms on data from satellite imagery in order to develop automated processes for identifying exposure. This work was joint with researchers Mike Brauer and Sarah Henderson, who have considerable expertise in investigating asthma outcomes from smoke exposure. An invited presentation on this research (by Wan and Dean) was made at the GEOMED meeting in Charleston, SC in November, 2009.

Design of Monitoring Programs (Wendell Challenger, MSc, SFU)
To better understand the effect global warming has on the world's ecosystems, monitoring programs are needed that are relatively inexpensive and easy to employ. The rockfish occupancy model aims to provide a framework for a monitoring program that is easy to implement, yet will be powerful enough to detect subtle environmental changes attributable to changes such as global warming. Since direct measures of abundance, although desirable, are often prohibitively costly to implement, we put forth an approach for monitoring rockfish species changes that measures relative abundance, while estimating misdetection through repeat visits to selected sites.

3. Publications

3.1 Publications 2008 and 2007:

Nathoo, F. and Dean, C.B. (2008), Spatial Multi-State Transitional Models for Longitudinal Event Data, *Biometrics 64*, 271-279, doi:10.1111/j.1541-0420.2007.00785.x.

Ainsworth, L.M. and Dean, C.B. (2007), Detection of Local and Global Outliers in Mapping Studies, *Environmetrics 19*, 21-37, doi:10.1002/env.851.

Nathoo, F. and Dean, C.B. (2007), A Mixed Mover-Stayer Model for Spatio-Temporal Two-State Processes, *Biometrics, 63*, 979-986;\\doi:10.1111/j.1541-0420.2007.00752.x.

Dean, C.B., Nathoo, F., Nielsen, J.D. (2007), Spatial and Mixture Models for Recurrent Event Processes, *Environmetrics, 18*, 713-725.

3.2 Publications 2009

Related to CRG activities in forestry:
Woolford, D.G., Cao, J., Dean, C.B., and Martell, D.L. (2009), Looking for Climate Change Signals in the Canadian Forest Fire Ignition Record. Under revision for *Environmetrics*.

Ainsworth, L.M. and Dean, C.B. (2009), Zero-inflated Spatial models. Under revision for *Environmental and Ecological Statistics*.

Woolford, D.G., Dean, C.B., Martell, D.L., and Braun, W.L. (2009), A Modelling Framework for the Seasonal Variation of Forest Fire Characteristics. Under revision for *Environmetrics*.

Lee, T.C.K., Zeng, L. and Dean, C.B. (2009), An Imputation Based Method for Joint Modelling of Interval Censored Tree Growth and Mortality Data To appear in *The Canadian Journal of Statistics*.

Woolford, D.G., Braun, W.L., Dean, C.B., and Martell, D.L. (2009), Site-Specific Seasonal Baselines for Fire Risk in Ontario. To appear in *Geomatica*.

Z. Hrdlickova, S. R. Esterby and S. Taylor. (2009). Classification of regions with respect to fire risk based on historical spatio-temporal data. Paper in preparation for submission.

Research Synergies (SFU and U Washington)
P. Guttorp and J. Xiu (2009): Climate change, trends in extremes, and model assessment for a long temperature time series from Sweden.Submitted to Environmetrics.

J. Xiu, P. Guttorp and P. Whitfield: On dependence and homogenization of weather series. To be submitted

As a result of the spatial course
R. Onorati, P. D. Sampson and P. Guttorp (2009): A spatio-temporal model based on the SVD to analyze large spatio-temporal datasets. Submitted to Environmetrics.

Related to CRG activities in Agriculture

Z. Hrdlickova, S.R. Esterby, P. Gill, H. Thistlewood, D. Neilson and S. Smith. (2009). Kriging for thermal microclimate network in the Okanagan Valley. Paper in preparation for submission.

Agroclimate Risk Management

Technical reports:

Hosseini, R (2009). Extracting Canadian Climate Data from Environment Canada Dataset. TR244, Department of Statistics, U British Columbia.

Hosseini, R, Le, ND and Zidek, JV (2009). An Analysis of Alberta's climate. Part I: Non-homogenized data. TR245, Department of Statistics, U British Columbia.

Hosseini, R, Le, ND and Zidek, JV (2009). An Analysis of Alberta's climate. Part II: Homogenized data. TR246, Department of Statistics, U British Columbia.

Hosseini, R, Le, ND and Zidek, JV (2009). r-th order categorical Markov chains. TR248, Department of Statistics, U British Columbia. Paper in preparation for submission.

Papers in preparation:

Hosseini, R, Le, ND and Zidek, JV (2010). r-th order categorical Markov chain models

Hosseini, R, Le, ND and Zidek, JV (2010). Model selection for the binary precipitation process.

Hosseini, R, Le, ND and Zidek, JV (2010). Analyzing extremely high or low temperature occurences.

Hosseini, R, Le, ND and Zidek, JV (2010). On the definition of 'quantile' and its properties.

Hosseini, R. (2010). Approximating the quantiles of very large datasets.

Hosseini, R. (2010). Quantile distance and estimation with the probability loss function

Deterministic vs statistical modeling

Technical Reports

Liu, Z, Le, ND, Zidek,JV (2007). Calibrating Deterministic Modeling Output With Application Of Ozone Fields. TR232, Department of Statistics, U British Columbia

Liu, Z, Le, ND, Zidek,JV (2007). An Appraisal of Bayesian Melding for Physical-Statistical Modeling Fields. TR233, Department of Statistics, U British Columbia

Liu, Z, Le, ND, Zidek,JV (2008). Combining Measurements and Physical Model Outputs for the Spatial Prediction of Hourly Ozone Space - Time Fields. TR239, Department of Statistics, U British Columbia

Liu, Z, Le, ND, Zidek,JV (2008). Recalibrating ozone chemical transport models. TR242, Department of Statistics, U British Columbia

Papers submitted or in preparation

Zhong, L, Le, ND, and Zidek, JV. (2008). A physical – statistical approach to modeling ozone pollution fields. Under revision.

Zhong, L, Le, ND, and Zidek, JV (2008). Combining data and simulated data for space – time fields: Application to Ozone. Submitted.

Zhong, L, Le, ND, and Zidek, JV (2010). Bayesian melding from deterministic model ensembles with application to probabilistic weather forecasting. In preparation.

Modeling space – time environmental fields

Technical reports

Dou, Y, Le, ND, Zidek,JV (2007). A Dynamic Linear Model for Hourly Ozone Concentrations. TR228, Department of Statistics, U British Columbia

Dou, Y, Le, ND, Zidek,JV (2007). Temporal prediction with a Bayesian spatial predictor: an application to ozone fields. TR249, Department of Statistics, U British Columbia.

Dou, Y, Le, ND, Zidek,JV (2007). Bayesian Empirical Orthogonal Functions. TR250, Department of Statistics, U British Columbia. Paper in preparation for submission.

Papers submittted or in preparation

Dou, Y, Le, ND and Zidek, JV. (2009). Modeling hourly ozone concentration fields. Tentatively accepted Annals of Applied Statistics. Submitted.

Dou, Y. Le, N.D. and Zidek, JV (2009). Temporal forecasting with a Bayesian spatial predictor: Application to ozone. Submitted

Dou, Y. Le, N.D. and Zidek, JV (2009). A generalized Bayesian spatial predictor. In preparation.

LIST OF ACTIVITIES

4. Inaugural group meeting at Semiahmoo January 23 -24, 2007 (2007-2008 Report)

The first activity of the Environmetrics CRG was a group meeting with nearly 100 participants from Washington, British Columbia and Alberta. The meeting took place at the conveniently located Semiahmoo conference facility, near the border between Washington and British Columbia. In addition to illustrating the research breadth in the region, and illustrating some surprising commonalities between different research areas, the participants spent time in working groups discussing issues such as public policy, space-time models, education and leadership/administration.

5. TIES meetings.

Meetings of the International Environmetrics Society are particularly useful for members of this CRG, as they cover precisely the issues we are interested in and work on.

5.1 TIES NA07 Seattle June 19 – 21, 2007 (2007-2008 Report)

This meeting was co-funded with NOAA and NSF. The PIMS funding enabled the organizers to provide travel grants for several Canadian participants to boost Canadian activity at this event. This was the inaugural North American Regional Meeting of The International Environmetrics Society. The topics covered climate issues, ecology, public health, and public policy. .

5.2 TIES 2008 Kelowna June 8 – 13, 2008 (see appendix for report)

This CRG provided leadership for the TIES 2008 meeting which attracted a large international audience from 17 countries. The PIMS funding was primarily used for the short course held in conjuction with the conference, Modelling Environmental Extremes, given by David Walshaw and Lee Fawcett, Newcastle University UK. There were 29 registrants, including regional graduate students as well as national and international participants. The conference program covered a mix of methodology and applications, including extremes of climate, turbulent dispersion, temperature, precipitation, and wind speeds; spatio-temporal modelling in environmental health, air quality and epidemiology, precipitation, river networks and weather forecasts; and sampling designs for populations including wildlife, fisheries and forests. Topics particularly relevant to British Columbia included sessions on the pine beetle, forests and fire spread.

6. International workshops

6.1 Data-driven and physically-based models for characterization of processes in hydrology, hydraulics, oceanography and climate change, Singapore, January 6 – 28, 2008. (2007-2008 Report)

The workshop, co-sponsored by PIMS & Singapore's Institute of Mathematical Sciences in Singapore with representation from the Japan's Institute of Statistical Mathematics had a 3-week program consisting of seminars/lectures and research discussions aimed at developing research collaboration. A total of 23 overseas and 5 local lecturers shared their expertise in this workshop. 22 overseas graduate students/professionals (China, Korea, Vietnam, Thailand, Malaysia, Indonesia, Germany) and 17 local graduate students/professionals took part in the workshop. Three main topics were covered in the program: "Development of a fully integrated data driven and physical-based models for water resources management"; "Dynamic and Statistical Downscaling on Climate Change Study"; "Nonlinear Wave Dynamics and Tsunami Modeling". The PIMS CRG on environmetrics was represented by Jim Zidek, who stayed for the duration of the workshop,

6.2 BIRS: Climate Change Impacts on Ecology and the Environment, May 4 - 8, 2008 (see appendix for report)

A mix of subject matter and quantitative scientists participated in this meeting, which featured Francis Zwiers as leading speaker, and had Myles Allen participate via videolink from the UK. In addition, Peter Guttorp participated by speakerphone in a panel discussion on communicating uncertainty in climate issues. There were 40 participants from five nations.

6.3 Workshop - Effects of climate change: coastal systems, policy implications, and the role of statistics, and Intense Course – Statistical software for climate research, March 16 -20, 2009 (see appendix for report)

This multidisciplinary workshop was held on Malta in March 2009. The workshop was co-sponsored by PIMS, the European SEAMOCS, ENCORA and QUEST4D programs and a Swedish STINT grant. In all PIMS funded six participants from Simon Fraser University and University of Washington, and another University of Washington participant was funded by STINT.

7. National Workshop
Workshop on Applications of Climate Statistics in Agriculture June 5-7, 2007 (2007-2008 Report)

The climate statistics workshop provided a venue for scientific researchers and end users to discuss how statistical information can benefit agriculture, water and other climate sensitive operations. Applied scientific presentations increased understanding of what can be provided analytically using 'easy to understand statistics.' The usefulness and limitations of the tools were assessed by the user community, including users of climate information, who engaged researchers in a dialogue aimed at suggesting appropriate statistical techniques for risk reduction. Participants included university researchers, representatives of government departments, commodity brokers, financial representatives and community groups whose activities are impacted by weather and climate.

8. Summer schools
The summer schools have been a resounding success. Indeed all the training aspects of this CRG have been extremely well-received. Two particularly successful events were the following.

8.1 PIMS International Graduate Institute on Modeling Environmental Space – Time Processes July 9 – 13, 2007 (2007-2008 Report)

This summer school held at the University of Washington in Seattle was taught by Jim Zidek and Douw Steyn, UBC, and Peter Guttorp and Paul Sampson, UW. It had 24 participants from 10 universities in five countries.

8.2 Statistics and Climate Summer School August 9 - 13, 2008 (see appendix for report).

Held at NCAR, Boulder, the Instructors for this course, which emphasized analyzing climate model output, were Stephan Sain, Doug Nychka, Caspar Ammann and Gerald Meehl, NCAR, Claudia Tebaldi, Climate Central, Bo Li, Purdue University and Richard Furrer, Colorado School of Mines.

9. Cybercourses and certificate/diploma program in Environmetrics

In addition, the CRG has piloted the hosting of videoconferenced courses. Two courses on different aspects of spatial statistics, one with focus on air quality and one on agriculture, have been offered using videoconferencing tools. The former, taught by Peter Guttorp from

the University of Washington, had participants from the UBC campuses in Vancouver and Kelowna, Simon Fraser University, and the University of Washington. In terms of the number of registered students this course could not have been offered separately at each of the universities. The second, taught by Nathaniel Newland from Agriculture Canada out of the University of Lethbridge, had students at UBC Vancouver and Simon Fraser University. Synergy, The Journal of UBC Science published an article about the courses in the January 1, 2009 issue (http://www.science.ubc.ca/sites/science.ubc.ca/files/synergy/synergy-2009-1.pdf).

At the inaugural Semiahmoo meeting there was considerable enthusiasm regarding developing a certificate/diploma program jointly between the PIMS universities. The steering committee of the CRG has discussed this issue, and decided that it is a priority for the regions and that some paid time needs to be dedicated to this task to make it successful. There has been considerable interest from government agencies in both Canada and the US in such a program, in particular if part of it can be available online.

Appendix A

A.1 Climate Change Impacts on Ecology and the Environment

Organizers: Charmaine Dean - Simon Fraser University, Sylvia Esterby - University of British Columbia Okanagan, Peter Guttorp - University of Washington, Jim Zidek - University of British Columbia
Location: BIRS
Dates: May 4 - 8, 2008
Aims and Scope:
The purpose of the proposed workshop is to engage climate change researchers in the scientific enterprise of developing novel methods for addressing these problems. It is envisioned that the proposed workshop would build upon collaborative initiatives already conceived through the environmetrics collaborative research group. Gaps in methodological developments will be identified, for example, methods for isolating the species and ecosystems most vulnerable to climate change. In addition, some techniques discussed will cross several of the themes, for example, detection of changes when observations are available at several spatial and temporal scales. This workshop will also play the important role of providing opportunity for discussion of timelines and progress toward the goals identified in the collaborative research group application on ``Georisk and climate change" by these organizers and will provide a forum for interim reporting on research objectives of that collaborative research group. It is envisaged that this workshop will bring together researcher in diverse scientific fields. It will also have a strong focus on student participation, bringing together students working in this area in a unique networking opportunity including both environmental and statistical sciences.**:**

Program: available from CRG Environmetrics pages on PIMS web page
Participants

Name	Affiliation
Bingham, Derek	Simon Fraser University
Braun, John	University of Western Ontario
Cannon, Alex	Meteorological Service of Canada
Cao, Jiguo	Simon Fraser University
Chen, Louis	National University of Singapore
Chiu, Grace	University of Waterloo
Conquest, Loveday	University of Washington
Dou, Yiping	University of British Columbia
Esterby, Sylvia	University of British Columbia Okanagan
Feng, Cindy	Simon Fraser University
Fleming, Richard	Canadian Forest Service
Flower, Aquila	Pacific Climate Impacts Consortium
Fu, Frances	University of Western Ontario
Gneiting, Tilmann	University of Washington
Higdon, Dave	Los Alamos National Laboratory
Horst, Ulrich	Humboldt University Berlin
Hosseini, Reza	University of British Columbia
Hrdlicková, Zuzana	University of British Columbia Okanagan
Liu, Zhong	University of British Columbia

Loeppky, Jason	University of British Columbia Okanagan
Martell, David	University of Toronto
Newlands, Nathaniel	Agriculture and Agri-Food Canada
Petkau, A. John	University of British Columbia
Picka, Jeffrey	University of New Brunswick
Podur, Justin	York University
Ramsay, Jim	McGill University
Reese, Shane	Brigham Young University
Routledge, Rick	Simon Fraser University
Sampson, Paul D	University of Washington
Scott, Marian	University of Glasgow
Sheppard, Lianne	University of Washington
Smith, Ron	Centre for Ecology and Hydrology
Stocks, Brian	B.J. Stocks Wildfire Investigations Ltd.
Welch, Will	University of British Columbia
Woolford, Douglas	Simon Fraser University
Wotton, Mike	University of Toronto
Zidek, Jim	University of British Columbia
Zwiers, Francis	Environment Canada

A.2 TIES 2008, the 19th Annual Conference of The International Environmetrics Society

Co-Chairs: Sylvia Esterby, University of British Columbia Okanagan and David Brillinger, University of California Berkeley
Location: University of British Columbia Okanagan, Kelowna BC
Dates: June 8-13, 2008
Sponsors: PIMS and Irving K. Barber School of Arts and Sciences, Mathematics Statistics and Physics, and IT Services of University of British Columbia Okanagan
Scientific Committee: Teresa Alpuim, Portugal; Daniela Cocchi, Italy; Charmaine Dean, Canada; Michael Dowd, Canada; Abdel El-Shaarawi, Canada; Montserrat Fuentes, USA; Lelys Geunni, Venezuela; Anders Grimvall, Sweden; Peter Guttorp, USA; Bronwyn Harch, Australia; Ivana Horova, Czech Republic; Marian Scott, UK; Eric Smith, USA; Don Stevens, USA; Kristina Voigt, Germany; Jim Zidek, Canada.
Local Organizing Committee: Sylvia Esterby, Zuzana Hrdlickova, Paramjit Gill, Jason Loeppky, Loveday Conquest

The theme of the conference, Quantitative Methods for Environmental Sustainability, was covered very broadly in the forty-four oral sessions, the poster sessions, and the short course. The conference drew 173 participants from 17 countries. Awards for the Best Student Paper and the Best Poster and two Abdel El-Shaarawi Young Researcher Awards were presented.

Short Course

The Sunday short course, Modelling Environmental Extremes, was given by David Walshaw and Lee Fawcett, University of Newcastle UK. The 29 registrants included regional graduate students as well as national and international participants. The morning sessions covered classical and threshold models, dependence and non-stationarity and included a hands-on R session in the computer lab to analyse some data on weather

extremes. In the afternoon, multivariate extremes, point processes and Bayesian inferences were covered, with another lab session for these topics.

Conference Program

Special Lectures: The Hunter Lecture, Change Point Analysis of Extreme Values, was given by Jef Teugels, Katholieke Universiteit Leuven. The President's Invited Lecture, The Role of Statisticians in International Science Policy, was delivered by Peter Guttorp University of Washington.

Reflecting the importance of extremes in climate change, the topic of extremes was addressed from both the methodological aspect and the relevance to particular environmental problems. In addition to the Short Course and Hunter Lecture, other sessions addressed extremes of climate, extremes in modelling turbulent dispersion, return values, and extremes of temperature, precipitation, atmospheric processes and wind speeds.

Six invited sessions on spatial-temporal modelling covered methodology and applications to environmental health, air quality and epidemiology, precipitation, river networks and weather forecasts. Four invited sessions on sampling included a broad range of designs and populations in the areas of wildlife, fisheries and forests. Topics particularly relevant to British Columbia were the sessions on the pine beetle, forests and fire spread. Other methodological topics included papers on trend and change-point analysis, monitoring design and analysis, analysis of count data, point processes, risk analysis, computer models and positive matrix factorization. Additional areas of application were included in papers on ozone, health effects, water and air quality, marine ecology, and emission projections, receptor models and source apportionment.

TIES conferences have a tradition of including panel sessions and of covering topics such as interdisciplinary communication and the impact of the field of Environmetrics. These sessions were as follows: Communication of Risk and Uncertainty, organized by Peter Guttorp; the panel discussion, Current Research Challenges in Environmetrics organized by Jim Zidek; and the panel discussion, Training for a Career in Environmetrics, organized by Laurie Ainsworth, Carolyn Huston and Doug Woolford, currently either post doctoral fellow or graduate student at SFU.

A mini-symposium organized by Nathaniel Newlands of Agriculture and Agri-Food Canada, Ecosystem Models: Windows into an Uncertain Future ran as one of the concurrent session streams on Thursday. The talks had an agricultural focus and showcased research projects by scientists of Agriculture and Agri-Food Canada and their collaborators from across Canada, including scientists from the nearby Pacific Agri-Food Research Centre in Summerland.

Publications: A fully peer reviewed proceedings will be published as a special issue of Environmetrics.

Program and Presentation slides: The full program and slides, from interested presenters, are available on the conference website.
http://web.ubc.ca/okanagan/math/events/TIES2008.html

A.3 Workshop on Effects of climate change: coastal systems, policy implications, and the role of statistics
Intense course for Young Researchers: Statistical software for climate research

Organizers: Peter Guttorp - University of Washington, Hans Hanson - Lund University, Ulla Holst - Lund University, Georg Lindgren - Lund University, Jaak Monbaliu - K.U. Leuven, Tarmo Soomere -Tallinn University of Technology
Location: Sliema, Malta
Dates: Course- March 16-17, workshop March 18-20, 2009
Sponsors: PIMS, SEAMOCS, STINT, ENCORAQuest4D

Schedule:Short Course on Statistical Software and Extreme Value Analysis, Eric Gilleland
Monday, 16 March
16.00 R preliminaries
16.30 Practice with R
18.00 Convene
Tuesday, 17 March
9.00 Background on Extreme Value Analysis (EVA)
9.30 Generalized Extreme Value (GEV) Distribution (stationary case)
9.45 Practice with GEV
10.30 Break
10.45 Threshold Excess Models (stationary case)
11.05 Practice with threshold excess models
12.00 Risk Communication (stationary case)
12.30 Lunch
13.45 Non-stationary case (linear temporal trends)
14.00 Practice with linear (temporal trends)
15.00 Break
15.15 Annual cycles
15.30 Practice with annual cycles
16.30 Risk Communication under non-stationarity
16.40 Practice
17.30 Wrap-up

Workshop: Twenty invited talks were presented with substantial discussion time as well as 17 posters. Open questions and suggestions for attaching them were discussed each day.

Invited talks (link to slides http://www.maths.lth.se/seamocs/meetings/Malta_talklist.html)

Author	Affiliation	Title
Myles Allen	University of Oxford, Department of Physics	The treatment of uncertainty in climate analysis and prediction
Charmaine Dean	Simon Fraser University, Statistics and Actuarial Science	Looking for climate change in the Canadian forest fire ignition record
Tony Dolphin	University of East Anglia, Environmental Sciences	BLINKS: Beach LINKs to Sandbanks - Sandbanks, shorelines and coastal photography
Fredrik Gröndahl	KTH, Stockholm, Industrial Ecology	Sustainable use of Baltic Sea natural resources based on ecological engineering and biogas production

Peter Guttorp	University of Washington, Seattle, Statistics	Looking for climate change signals in extreme temperatures
Jens W. Hansen	Danish Ministry of the Environment	IGLOO: Indicators of GLObale climate change in mOnitoring data - Effects and indicators of climate change in Danish coastal waters
Hans Hansson	Lund University, Coastal Engineering	Coastal flooding and erosion
Rick Katz	National Center for Atmospheric Research, Boulder	Improving the treatment of extremes in the generation of climate change scenarios
Erik Kjellström	SMHI, Norrköping, Sweden	Changes in northern European wind climate: climate models and observational data
Johan Lindström	Lund University, Mathematical Statistics	Estimation of non-stationary fields; Applied to seabed data
Jaak Monbaliu	K.U.Leuven, Hydraulics Laboratory	Natural and anthropogenic influence on sediment dynamics in the Belgian coastal zone. Can they be separated and what are the policy implications in a changing climate?
Bo Ranneby	Swedish University of Agricultural Sciences, Umeå, Sweden	Probabilistic classifiers using nearest neighbor balls
Ulrika Roupé	SSPA, Göteborg	Coastal hazards management - a climate change challenge
Richard Smith	University of North Carolina, Chapel Hill, Statistics	Extreme precipitation trends over the continental United States
Andreas Sterl	KNMI, De Bilt, Netherlands	Hot temperatures and storm surges: Modelling the change in climate extremes
Gaute Storhaug	Det Norske Veritas, Hövik, Norway	IACS URS11 defines the dimensioning wave load for ship design, but what does it mean from a statistical point of view?
Tomas Torsvik	Bergen Center for Computational Science	Ship waves in Tallinn Bay: Experimental and numerical study
Dries Van den Eynde	MUMM, Management Unit of the North Sea Mathematical Models, Brussels	Evaluation of climate change impacts and adaption responses for marine activities
Paul Whitfield	Environment Canada, Meteorological Service of Canada	Floods in future climate - process and statistical issues
Judith Wolf	Proudman Oceanographic Laboratory, Liverpool	Wave climate changes on the NW European shelf from model downscaling

A.4 Statistics and Climate Summer School

Organizers: Peter Guttorp and NCAR collaborators
Location NCAR, Boulder
Dates: August 9 - 13, 2008
Sponsors: PIMS and University of Washington

The Graduate Institute's Summer School in 2008 was held at the National Center for Atmospheric Research. The Center has access to high-performance computational and observational facilities, such as supercomputers needed to improve human understanding of atmospheric and Earth system processes. Members of the IMAGe (Institute for Mathematics Applied to the Geosciences) have extensive experience with mathematical and statistical modeling as well as the development of requisite software for implementing them. This course introduced students to the topic of climate modeling. This included the types of outputs they produce, and what tools there are for visualizing and analyzing them.

Lecturer(s):

Stephan Sain, Geophysical Statistics Project, NCAR
Doug Nychka, IMAGe, NCAR
Claudia Tebaldi, Climate Central
Gerald Meehl, Climate and Global Dynamics Division, NCAR
Caspar Ammann, Climate and Global Dynamics Division, NCAR
Bo Li, Geophysical Statistics Project, NCAR and Department of Statistics, Pudue University
Richard Furrer, Colorado School of Mines

Schedule:

August 9 Saturday:
* Foundations and methods for estimating curves and surfaces. (Nychka)
* Working with spatial data in R

August 10 Sunday afternoon
* Accessing and working with climate data (Sain, Nychka)

August 11 Monday
* Climate system modeling and interpreting model experiments (Tebaldi, Meehl)
* Scientific supercomputering and visualization

August 12 Tuesday
* Field trip(s)
* Statisical problems in predicting climate change at a local scale (Sain)

August 13
* Reconstructing past climate (Ammann)
* Statistical methods for inverse problems with climate proxies (Li)

Appendix B TIES 2008 Conference Attendees: The participants list is given below.

Gopal	Achari	University of Calgary	Canada
Laurie	Ainsworth	Simon Fraser University	Canada
Bedii	Altug	University of Washington	United States
Jean-Francois	Angers	Universite de Montreal	Canada
Kara	Anlauf	Oregon Department of Fish and Wildlife	United States
Jaromir	Antoch	Charles University of Prague	Czech Republic
Brian	Aukema	Canadian Forest Service & UNBC	Canada
Sudipto	Banerjee	University of Minnesota	United States
David	Bolin	Lund University	Sweden
Willard	Braun	Western Ontario	Canada
David	Brillinger	University of California	United States
Agne	Burauskaite-Harju	Linköping University	Sweden
Catherine	Calder	The Ohio State University	United States
Elton	Chan	Government of Canada	Canada
Xin	Chen	Concordia University College	Canada
Yalin	Chen	McMaster University	Canada
Xin	Chen	University of Victoria	Canada
Monica	Chiogna	University of Padova	Italy
Grace	Chiu	U of Waterloo	Canada
William	Christensen	Brigham Young University	United States
lieven	clement	Ghent University	Belguim
Daniela	Cocchi	University of Bologna	Italy
Loveday	Conquest	University Of Washington	United States
Jeffrey	Dambacher	CSIRO	Australia
Reinder	De Jong	Agriculture and Agri-Food Canada	Canada
Charmaine	Dean	Simon Fraser University	Canada
Lauren	Dong	Statistics Canada	Canada
Yiping	Dou	University of British Columbia	Canada
Michael	Dowd	Dalhousie University	Canada
Abdel H.	El-Shaarawi	National Water Research Institute	Canada
Bianca	Eskelson	Oregon State University	United States
Sylvia	Esterby	University of British Columbia Okanagan	Canada
Yanan	Fan	University of New South Wales	Australia
Alessandro	Fasso	University of Bergamo	Italy
Lorenzo	Fattorini	Università degli Studi di Siena	Italy
Lee	Fawcett	Newcastle University	United Kingdom
XIN	FENG	Simon Fraser University	Canada
Julie	Firman	Oregon Department of Fish and Wildlife	United States
Marie	Forbelska	Masaryk University	Czech Republic
Sara	Franceschi	Università degli Studi di Siena	Italy
Grace	Frank	Agriculture and Agri-Food Canada	Canada
Montserrat	Fuentes	North Carolina State University	United States
Francis	Fujioka	USDA Forest Service	United States
Carlo	Gaetan	University Ca' Foscari - Venice	Italy
william	gaeuman	oregon state university	United States

Pierre	Gagnon	Environment Canada	Canada
Meng	Gao	Lanzou University	China
Ali	Gargoum	United Arab Emirates University	United Arab Emirates
Yulia	Gel	University of Waterloo	Canada
Xiaoyuan	Geng	Canadian Soil Information System	Canada
Marc	Genton	University of Geneva	Switzerland
Paramjit	Gill	UBC Okanagan	Canada
Eric	Gilleland	NCAR	United States
Tilmann	Gneiting	University of Washington	United States
Edit	Gombay	University of Alberta	Canada
Brian	Gray	US Geological Survey	United States
Nels	Grevstad	Metropolitan State College of Denver	United States
Peter	Guttorp	University of Washington	United States
Eric	Guttorp	University of Washington	United States
Temesgen	Hailemariam	Oregon State University	United States
Bronwyn	Harch	CSIRO	Australia
Fangliang	He	University of Alberta	Canada
Josh	Hemann	Visual Numerics, Inc	United States
Brent	Henderson	CSIRO	Australia
Dave	Higdon	Los Alamos National Laboratory	United States
Ulla	Holst	Lund University	Sweden
Joanna	Horabik	Polish Academy of Sciences	Poland
Ivana	Horova	Masaryk University	Czech Republic
Reza	Hosseini	UBC	Canada
Zuzana	Hrdlickova	University of British Columbia Okanagan	Canada
Bo	Hu	Beijing Normal University	China
Manuela	Huso	Oregon State University	United States
Carolyn	Huston	Simon Fraser University	Canada
Rosaria	Ignaccolo	Universita' degli Studi di Torino	Italy
Venkata	Jandhyala	Washington State University	United States
Henry	Janzen	Agriculture and Agri-Food Canada	Canada
Jolanta	Jarnicka	Polish Academy of Sciences	Poland
Daniela	Jaruskova	Czech Technical University	Czech Republic
giovanna	jona lasinio	university of rome "la sapienza"	Italy
Ruth	Joy	University of British Columbia	Canada
Elizabeth	Juarez	Simon Fraser University	Canada
Hyune-Ju	Kim	Syracuse University	United States
Cheryl	Kluck	University of Calgary	Canada
Mikko	Korpela	Helsinki University of Technology	Finland
Theodoro	Koulis	Centre Hospitalier de l'Université de Montréal (CHUM)	Canada
Jan	Kysely	Institute of Atmospheric Physics AS CR	Czech Republic
Duncan	Lee	University of Glasgow	United Kingdom
Subhash	Lele	University of Alberta	Canada
Tao	Li	Alberta Research Council	Canada
Hong	Li	University of Victoria	Canada

Bo	Li	National Center for Atmospheric Research	United States
Ernst	Linder	University of New Hampshire	United States
Georg	Lindgren	Lund University	Sweden
Finn	Lindgren	Lund University	Sweden
Johan	Lindström	Lund University	Sweden
XIAO	LING	UNIVERSITY OF VICTORIA	Canada
zhong	liu	University of British Columbia	Canada
Jason	Loeppky	UBC Okanagan	Canada
Thomas	Lumley	University of Washington	United States
Renjun	Ma	University of New Brunswick	Canada
Lisa	Madsen	Oregon State University	United States
Steen	Magnussen	Canadian Forest Service	Canada
Antonello	Maruotti	Università di Roma Tre	Italy
Armand	MAUL	University of Metz, France	France
Rob	McAlpine	Ontario Ministry of Natural Resources	Canada
Brian	McConkey	Agriculture and Agri-Food Canada	Canada
Ian	McLeod	University of Western Ontario	Canada
Ilaria	Meliconi	John Wiley & Sons	United Kingdom
Curtis	Miller	University of Florida	United States
Joanna	Mills Flemming	Dalhousie University	Canada
Scott	Mitchell	Carleton University	Canada
Nils	Mole	University of Sheffield	United Kingdom
Mitch	Murphy	Carleton University	Canada
Amy	Nail	North Carolina State University	United States
Farouk	Nathoo	University of Victoria	Canada
Denise	Neilsen	Agriculture and Agri-Food Canada	Canada
Nathaniel	Newlands	Agriculture and Agri-Food Canada	Canada
Donald	Noakes	Thompson Rivers Unversity	Canada
David	O'Donnell	The University of Glasgow	United Kingdom
Sam	Otukol	Ministry of Forests	Canada
Simone	Padoan	Ecole Polytechnique Federale de Lausanne	Switzerland
Christos	Papamichael	University of Bath	United Kingdom
sylvie	PAREY	EDF/R&D	France
Jan	Picek	Technical University of Liberec	Czech Republic
Darcy	Pickard	ESSA Technologies	Canada
Alessio	Pollice	Università di Bari	Italy
Karim	Rahim	Queen's University	Canada
M. do Rosário	Ramos	Universidade Aberta and CMAF	Portugal
Kiel	Rasp	University of Washington	United States
Soheil	Rastan	Statistics Canada	Canada
Shane	Reese	Brigham Young University	United States
Monika	Rencova	Czech Technical University	Czech Republic
Joel	Reynolds	U.S. Fish & Wildlife Service	United States
Shane	Rollans	Thompson Rivers University	Canada
Paul	Sampson	University of Washington	United States
ALEXANDRA	SCHMIDT	UFRJ	Brazil

carl	schwarz	Simon Fraser University	Canada
Gavin	Shaddick	University of Bath	United Kingdom
Quanxi	Shao	CSIRO	Australia
Guochun	Shen	Zhejiang University	China
Sackmone	Sirisack	Linköping University	Sweden
bruce	smith	Dalhousie University	Canada
Ward	Smith	Agriculture and Agri-Food Canada	Canada
Scott	Smith	Agriculture and Agri-Food Canada	Canada
Cliff	Spiegelman	Texas University	United States
Don	Stevens	Oregon State University	United States
ryan	stone	University of Victoria	Canada
paul	sullivan	University of Western Ontario	Canada
Jef	Teugels	Katholieke Universiteit Leuven	Belguim
olivier	thas	Ghent University	Belguim
Hoang	Thi Thu Huong	Université Paris Sud 11	France
Steve	Thompson	Simon Fraser University	Canada
Thordis L.	Thorarinsdottir	University of Washington	United States
Cordy	Tymstra	Alberta Sustainable Resource Development	Canada
Anton	van Heusden	Environment Canada	Canada
Lucie	Vincent	Environment Canada	Canada
Kristina	Voigt	Helmholtz Zentrum Muenchen	Germany
Jari	Walden	Finnish Meteorological Institute	Finland
Per	Wallenius	Integrated Land Management Bureau	Canada
David	Walshaw	Newcastle University	United Kingdom
HONG	WANG	Agriculture and Agri-Food Canada	Canada
Liqun	Wang	University of Manitoba	Canada
Stephen	Welsh	University of British Columbia Okanagan	Canada
Douglas	Woolford	Simon Fraser University	Canada
Mike	Wotton	Canadian Forest Service	Canada
Haojie	YAN	University of Bath, UK	United Kingdom
Kejiang	Zhang	University of Calgary	Canada
Ying	Zhang	Acadia University	Canada
Hao	Zhang	Purdue University	United States
Tonglin	Zhang	Purdue University	United States
Yanbing	Zheng	University of Kentucky	United States
Rong	Zhu	McMaster University	Canada
James	Zidek	University of British Columbia	Canada