To make a science poster

Elisabeth Långström
Director of Studies at
Biology Education Centre
Information & communication

What is a poster?

- An enlarged book page/article page or something completely different?
  - Simplify and focus – should not tell the full story
- Why do we make posters?
  - Inform about and create an interest for your subject
  - Show who you are and market your research/ subject
  - Make contacts – network

What is a poster?

- Reaction in yor audience:
  - Know
  - Think
  - Feel
  - Do
  - Change their mind

See your poster as an ad

- An ad for your project! A teaser with just the essence of your project.

- What is done?
- Who did it?
- Conclusion

} Should be understood in a few seconds by the reader

UPPSALA UNIVERSITET

General about posters

- If you are not seen, you do not exist.
- Do not hide your message in too much text

General about posters

- If you are not seen, you do not exist.
- Do not hide your message in too much text
- Use illustrations
  - A picture says more than a thousand words

General about posters

- If you are not seen, you do not exist.
- Do not hide your message in too much text
- Use illustrations
  - A picture says more than a thousand words

General about posters

General about posters

- If you are not seen, you do not exist.
- Do not hide your message in too much text
- Use illustrations
  - A picture says more than a thousand words
- Focus on your main header, aim and conclusion
  - These should show what was done and what the findings were

How much time have you got?

- For how long time does one look at the poster before deciding to read it?
- How long time does one then spend reading the poster?

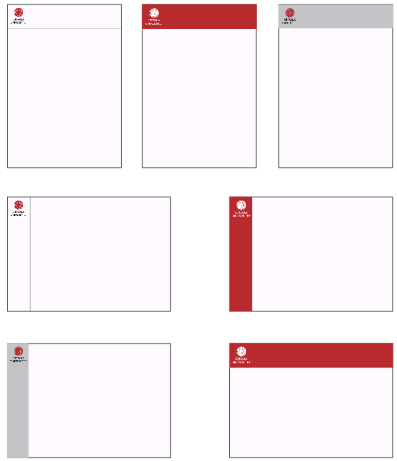
The practical work

The poster: Think before you start making it

- What is your message?
- Focus on your audience
  - Who are the target persons?
  - Adapt you message to your target group
- How can you make people come to your poster?
- Always tell the most important first
  - You need to make you audience interested
- The headline and the general apperance decides if people want to keep reading

Uppsala University graphical profile

- Layout
  - 70 x 90 cm
  - Landscape or portrait
  - No images in the margin/top border
  - 2-4 colmns
  - Classic reading pattern: top left-> bottom right
- Logo
- Fonts
- Colours



Skyline COLLEGE

Poster title goes here, containing strictly only the essential number of words...

Author's Name Goes Here, Author's Name Goes Here
Biology Department, Skyline College, San Bruno CA

Abstract

First…

Check with conference organisers on their specifications of size and orientation, before you start your poster eg. maximum poster size, landscape, portrait or square.

The page size of this poster template is A0 (84x119cm), landscape (horizontal) format. Do not change this page size, the printer can scale-to-fit a smaller or larger size, when printing. If you need a different shape start with either a portrait (vertical) or a square poster template.

Bear in mind you do not need to fill up the whole space allocated by some conference organisers (eg. 8ftx4ft in the USA). Do not make your poster bigger than necessary just to fill that given size.

Aim

Background

How to use this poster template…

Simply highlight this text and replace it by typing in your own text, or copy and paste your text from a MS Word document or a PowerPoint slide presentation.

The body text / font size should be between 24 and 32 points. Arial, Helvetica or equivalent.

Keep body text left-aligned, do **not** justify text.

The color of the text, title and poster background can be changed to the color of your choice.

Illustrate the procedure in figure (flow chart)

Methods

Tips for making a successful poster…

- Re-write your paper into poster format ie. Simplify everything, avoid data overkill.
- Headings of more than 6 words should be in upper and lower case, not all capitals.
- Never do whole sentences in capitals or underline to stress your point, use **bold** characters instead.
- When laying out your poster leave breathing space around you text. Don't overcrowd your poster.
- Try using photographs or colored graphs. Avoid long numerical tables.
- Spell check and get someone else to proof-read.

Captions to be set in Times or Times New Roman or equivalent, italic, between 18 and 24 points. Left aligned if it refers to a figure on its left. Caption starts right at the top edge of the picture (graph or photo).

Captions to be set in Times or Times New Roman or equivalent, italic, between 18 and 24 points. Right aligned if it refers to a figure on its right. Caption starts right at the top edge of the picture (graph or photo).

Captions to be set in Times or Times New Roman or equivalent, italic, 18 to 24 points, to the length of the column in case a figure takes more than 2/3 of column width.

Results

Importing / inserting files…

Images such as photographs, graphs, diagrams, logos, etc, can be added to the poster.

To insert scanned images into your poster, go through the menus as follows: Insert / Picture / From File… then find the file on your computer, select it, and press OK.

The best type of image files to insert are JPEG or TIFF, JPEG is the preferred format.

Be aware of the image size you are importing. The average color photo (13 x 18cm at 180dpi) would be about 3Mb (1Mb for B/W greyscale).

Notes about graphs…

For graphs use MS Excel

Captions to be set in Times or Times New Roman or equivalent, italic, between 18 and 24 points. Left aligned if it refers to a figure on its left. Caption starts right at the top edge of the picture (graph or photo).

Captions to be set in Times or Times New Roman or equivalent, italic, 18 to 24 points, to the length of the column in case a figure takes more than 2/3 of column width.

Discussion & Conclusion

Printing and Laminating…

Note: Do not leave your poster until the last minute.

Simply highlight this text and replace.

Literature Cited

Acknowledgements

Just highlight this text and replace with your own text. Replace this with your text.

UPPSALA UNIVERSITET

What should you include?

- Pictures (relevant photos, tables etc)
- Text (title, attracting lead, subtitles, body text)
- Image captions
- References – not always necessary – depends …
- Contact information
- Acknowledgements (important contributions, funding)
- Picture of the author (small)
- Handout optional
- White space!!!

Figures/Diagrams

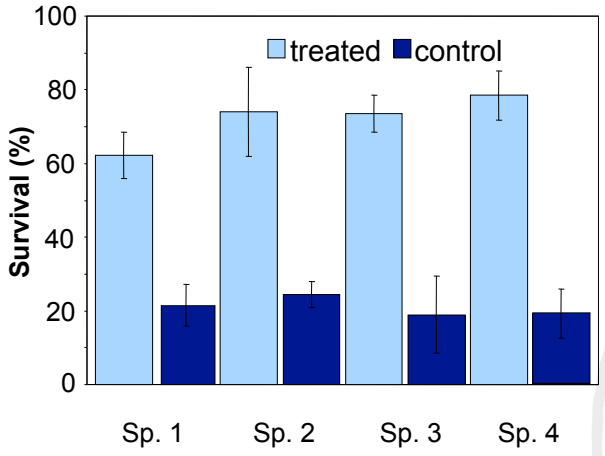


Fig. 1. The suvival increased after treatment for all species. The bars show the ± sd.

- Avoid complex diagrams
- At least A5 size
- Explanation in the caption, not in the text.

The text – be concise…

- Do not use too much text
- Every word on the poster should be important. ”Wash” your text carefully.
- Aim for short concise sentences illustrated by the images.
- Also image captions should be short and readable (well written, adapted to the audience, good size).

The text

- Short striking header (lowe case/upper case) – ca 4–5 cm high – try it by printing parts in full size!
- Conclusions and intro
- Explaining subtitles –> a little less text
- Running text: all that information you want to give and write about – leave it out – ”*Kill your darlings”* ☺
- Length of text lines – ca 35-40 letters (never more than 60), and up to ca 6 lines per paragraph
- References smaller font size (if included)
- Text adjustment left or straight right margin?
- Use a clean font without feet (sans serif) – not more than two different on one screen. UU: Times New Roman and Arial

Pictures

- **Images**
  - Start with high resolution pictures (300 dpi or more) since posters are quite large and you might have to use large pictures.
  - Try printing parts of the images in full poster format on a regular printer to get and idea about the resulting quality.
- **Copyright**
  - You have to have permission to reproduce someone elses images and tables.
  - You have to give references also to images (that you have permission to reproduce).

Handouts

- Handouts and business cards in a box or plastic folder hanging by your poster is a possibility
- It is a good idea to have handouts with the main message, explanation and contact information. It may be a small size copy of the poster.

Some examples

STRATEGIC PLANNING TOOLS FOR MOUNTAIN CARIBOU CONSERVATION

CLAYTON APPS[1], TREVOR KINLEY[2], JOE SCOTT[3], CANDACE BATYCKI[4], JOHN BERGENSKE[5]

[1] Aspen Wildlife Research Inc (clayton.apps@telus.net); [2] Sylvan Consulting Ltd (sylvan@rockies.net);
[3] Northwest Ecosystem Alliance (scott@ecosystem.org); [4] ForestEthics (candace@forestethics.org);
[5] East Kootenay Environmental Society (jbergenske@telus.net)

MOUNTAIN CARIBOU & OLD-GROWTH FORESTS

Mountain caribou are woodland caribou native to the mountainous region of cedar-hemlock and spruce-subalpine fir forests in southeastern and east-central BC and adjacent parts of Montana, Idaho and Washington. This globally endangered race is often called the interior Wet Belt or the Inland Rainforest. Mountain caribou are distinguished from other types of caribou by their dependence for late-winter food on hair lichens ("old-man's beard") growing on old trees at high elevations. They require this food because the 3-m snowpacks typical of this region rapidly bury ground-based foods. During spring and early winter, caribou often descend from subalpine fir–spruce forests to cedar–hemlock stands on valley bottoms. Regardless of season, mountain caribou are virtually always in landscapes dominated by old-growth forest.

Mitti Burnham

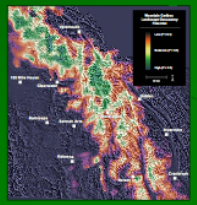
LOSING GROUND

Over many centuries, the moist climate and infrequent fires of the interior Wet Belt allowed large tracts of old forest to develop, supporting healthy populations of mountain caribou. In fact, the distribution and ecological requirements of mountain caribou almost perfectly matched the location and conditions of this wet inland ecosystem. Impacts to mountain caribou began almost 150 years ago. Early on, over-hunting, large fires, and the building of railroads, towns, highways, and reservoirs reduced populations and fragmented forests. The progression of industrial forestry is now causing long-term losses of old-growth habitat. It takes several hundred years for a forest to accumulate enough hair lichen to support mountain caribou, and old forests also provide forage in other seasons, so the loss of old-growth affects food supply. Other implications of habitat loss are of even greater concern:

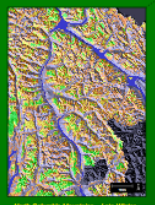
- Habitat loss has caused caribou to become more susceptible to predation. Formerly, caribou lived in areas dominated by old forest, while most large prey species occurred in or near disturbed sites, such as meadows, young forest, burns and avalanche tracks. By separating themselves from other prey, caribou avoided the cougars and wolves that followed those species. This has now changed. Region-wide expansions of white-tailed deer, elk and moose have been compounded by forest cutblocks, access roads and human-caused fires that have improved local conditions for those species within prime caribou habitat. By continuing to fragment the remaining patches of old forest, we put caribou in contact with the predators that are drawn to the elk, moose and deer. One result of this habitat change has been unsustainable levels of caribou predation in many areas.
- As habitat has been lost and fragmented, what may once have been a single population of mountain caribou has become isolated into many smaller groups. These small herds are susceptible to periodic catastrophes such as avalanches or years of high predation. Human-caused barriers often prevent the exchange of animals and genes among groups. The result has been a steady loss of herds, causing ongoing reductions in the total range and numbers of mountain caribou. There are now only about 1800 animals covering less than half of their former range, and the rate of decline may be accelerating.

IDENTIFYING HABITAT

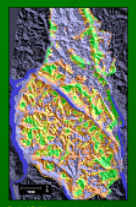
In recent years, researchers have developed tools to predict mountain caribou habitat quality and population distribution across a range of spatial scales. These models are based on sampling of caribou occurrence and relative density, and of habitat use by each herd. Sample data are evaluated against habitat and human-use variables taken from various inventory systems that include forest, terrain, climatic, and human attributes. A quantification of these ecological relationships allows predictions of landscape quality and population distribution. Such models have now been completed for most mountain caribou herds and can inform decisions related to (1) maintaining or restoring habitat quality or connectivity at landscape scales, (2) minimizing unsustainable predation risk, and (3) restoring or augmenting populations.



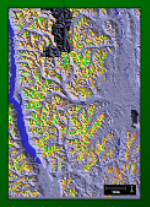
Broadest-scale empirical modeling of the distribution and connectivity of landscapes that may potentially support mountain caribou (Apps & McLellan 2004).



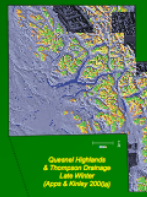
North Columbia Mountains – Late Winter (Apps et al. 2001)



Central Selkirk Mountains – All Seasons (Hamilton et al. 2000)

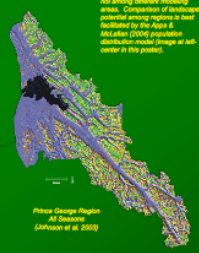


Southern Purcell Mountains – All Seasons (Apps & Kinley 2000b)



Conservation planning for mountain caribou must occur at all levels of land management. It is critical that strategies consider landscape conditions across the range of each herd because mountain caribou are affected by processes in the entire ecosystem. Management must consider not only attributes within forest stands, but the distribution of stand types within larger landscapes and their influence on caribou habitat and population connectivity, as well as predation risk.

Queenel Highlands & Thompson Drainage Late Winter (Apps & Kinley 2000a)



Prince George Region All Seasons (Johnson et al. 2003)

HABITAT QUALITY CLASSES FOR INDIVIDUAL MODELING AREAS

NIA · Good · Water · Better · Poor · Best

Four classes of habitat quality are shown for each caribou subpopulation model. Because each model was developed independently, habitat quality and abundance can only be compared within each model and not among different modeling areas. Comparison of landscape potential among regions is best facilitated by the Apps & McLellan (2004) population distribution model (image at left-center in this poster).

WHAT DO THE MODELS SHOW?

Models indicate landscapes where mountain caribou are most likely to benefit from habitat protection. Retaining the quality of suitable landscapes is a minimum requirement for rebuilding the rapidly declining population of 1900 to even the modest target of 2500–3000 cited in British Columbia's recovery strategy (MCTAC 2002). More specifically:

1) Landscapes of high quality habitat can only be retained through management guidelines that protect large, contiguous tracts of old-growth forest, the key element of habitat models for each herd.

2) Landscape connectivity must be retained or restored to reverse population fragmentation. Coupled with knowledge of remaining caribou distribution, habitat models can suggest whether this is best achieved by protecting or restoring suitable habitat existing between herds, or by reintroducing caribou to reestablish population connections.

LITERATURE CITED

Apps, C. D., and T. A. Kinley. 2000a. Multi-scale habitat modeling for mountain caribou in the Columbia Highlands and Northern Columbia Mountains ecoregions, British Columbia. Ministry of Environment, Lands and Parks, Williams Lake, BC.

Apps, C. D., and T. A. Kinley. 2000b. Multi-scale habitat associations of mountain caribou in the southern Purcell Mountains, British Columbia. East Kootenay Environmental Society, Kimberley and Creston/ok Forest Industries, Creston/ok, BC.

Apps, C. D., and B. N. McLellan. 2004. Factors influencing the fragmentation of mountain caribou populations. Ministry of Forests, Revelstoke, BC.

Apps, C. D., B. N. McLellan, T. A. Kinley, and J. P. Flaa. 2001. Scale-dependent habitat selection by mountain caribou, Columbia Mountains, British Columbia. Journal of Wildlife Management 65:65-77.

Hamilton, D., S. F. Wilson, and G. Smith. 2000. Mountain caribou habitat use and population characteristics for the central Selkirks caribou inventory project. Nuroo Consulting Ltd., Nelson, BC.

Johnson, C. J., D. R. Seip, and M. S. Boyce. 2003. A quantitative approach to conservation planning: using resource selection functions to map the distribution of mountain caribou at multiple spatial scales. Journal of Applied Ecology. Submitted.

MCTAC. 2002. A strategy for the recovery of mountain caribou in British Columbia, ver 1.0. Ministry of Water, Land and Air Protection, Victoria, BC.

UPPSALA UNIVERSITET

Complexity in the antisense regulation of SOS-induced toxicity in *E. coli*

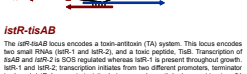
Cecilia Unoson[1], Fabien Darfeuille[1], Jörg Vogel[2], and E. Gerhart H. Wagner[1]

[1]Institute of Cell & Molecular Biology, Uppsala University, Uppsala, Sweden.

[2]Max Planck Institute for Infection Biology, Berlin, Germany

E-mail:
cecilia.unoson@icm.uu.se
fabien.darfeuille@icm.uu.se
gerhart.wagner@icm.uu.se

Web:
http://www.icm.uu.se



istR-tisAB

The *istR-tisAB* locus encodes a toxin-antitoxin (TA) system. This locus encodes two small RNAs (IstR-1 and IstR-2), and a toxic peptide, TisB. Transcription of *tisAB* and *istR-2* is SOS regulated whereas IstR-1 is present throughout growth. IstR-1 and IstR-2 transcription initiates from two different promoters, terminator is shared. IstR-1 prevents toxicity during normal growth by base-pairing to a 21 nt long region in the divergently transcribed *tisAB* mRNA. This antisense interaction occurs 100 nt upstream of the *tisB ORF*, entailing RNase III cleavage. This inactivates the mRNA and toxicity is prevented. In the absence of the SOS response, IstR-1 is present in high access over *tisAB* mRNA. Upon SOS induction, the IstR-1 pool is depleted, *tisAB* mRNA accumulates, and toxicity is conferred. [1, 2] This is the first reported case where an sRNA acts as an antitoxin involved in the SOS response.

1. Argaman, L., Hershberg, R., Vogel, J., Bejerano, G., Wagner, E.G.H., Margalit, H. & Altuvia, S. (2001) *Curr. Biol.* **11**, 941-950
2. Vogel, J, Wagner, E.G.H. & Altuvia, S. (2004) *Curr. Biol.* **14**, 2271-6

Only TisB is translated from *tisAB* mRNA

There are two ORFs (TisA and TisB) in *tisAB*. Mutational analyses had shown before that toxicity resides in TisB, but translational coupling could be an option, since the sRNA binds near *tisA* RBS, upstream of TisB to inhibit toxicity. Differential labelling showed that only TisB is translated (Fig. 1). This was also confirmed by mutational analyses (Fig. 1). Thus, translational coupling does not occur.

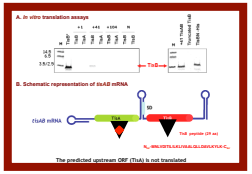


Fig 1. A) Differential labelling for TisA and TisB (pet 1) and a mutational analysis for TisB (pet 2). [^{35}S]-Isoleucine was used as a control (TisAB), [^{35}S]-arginine was used to detect TisA and [^{14}C]-aspartic acid was used to detect TisB. The truncated TisB has a premature stop codon inserted in *tisB* and TisBM-His has a his-tag inserted in *tisB*. B) Schematic picture of the *tisAB* mRNA.

TisB – the toxin

TisB is a small (29 aa) hydrophobic, entirely helical peptide with a predicted membrane localization. Preliminary *in vivo* studies suggest that TisB inhibits replication, transcription and translation (pulse labelling experiments), and that membrane integrity is affected (Sytox green staining). Loss of proton motive force might inhibit macromolecular synthesis during SOS. The toxicity of TisB also seems to be reversible. Thus, TisB would slow down growth due to DNA damage to facilitate SOS-related adjustments of metabolism.

An active *tisAB* mRNA species

In the cell, *tisAB* mRNA appears as three species with different 5'-ends. *In vitro* experiments show that both the full-length and the RNase III-cleaved mRNA fail to be translated, whereas a 5'-processed version is highly active – and thus must be the active mRNA (Fig. 1 and 2). Activity in the translation assay matches toeprinting signals at the *tisB* RBS (Fig. 2B).

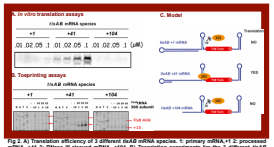


Fig 2. A) Translation efficiency of 3 different *tisAB* mRNA species. 1: primary mRNA,+1 2: processed mRNA, +41 3: RNase III-cleaved mRNA, +104. B) Toeprinting experiments for the 3 different *tisAB* mRNA species. C) Schematic model of the 3 mRNA species. Note that in all cases, the TisB SD is not accessible and is located in a very stable stem loop (data not shown).

IstR-1 is the primary inhibitor

IstR-1 is the primary inhibitor of *tisAB* toxicity (IstR-1 is constitutively expressed). *In vitro*, IstR-1 is an effective inhibitor of TisB translation, whereas IstR-2 is much less effective. This is shown by *in vitro* translation assays (Fig. 3), and confirmed by on-rate determinations. Fig. 3 also demonstrates IstR-1 specificity: when either the IstR-1 or *tisAB* interaction sequence is mutated (M6 mutation), inhibition is lost. When both carry the mutation, inhibition is restored. Thus, translation assays mirror regulatory effects seen *in vivo*.

Why is IstR-2 ineffective in spite of containing the entire antisense sequence? Fig. 4 shows secondary structure based on *in vitro* probing. In IstR-2, several nucleotides in this region have become sequestered. Thus, we propose that IstR-2, when induced by SOS, acts on another target.

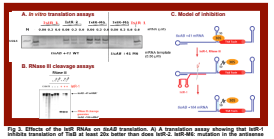


Fig 3. Effects of the IstR RNAs on *tisAB* translation. A) A translation assay showing that IstR-1 inhibits translation of TisB at least 20x better than does IstR-2. IstR-M6 mutation in the antisense sequence to *tisAB* mRNA. *tisAB* +41-M6 has a compensatory mutation. B) RNase III cleavage assays showing how *tisAB* +104 mRNA is generated. C) A schematic model.

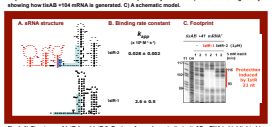


Fig 4. A) Structures of IstR-1 and IstR-2. Region of complementarity to *tisAB* mRNA is highlighted in blue. This region is more accessible in IstR-1 compared to IstR-2. B) Binding rate constants for IstR-1 and IstR-2. C) Footprinting experiment. Primary IstR-1 generates a protected site, a footprint.

Three different ways to inhibit TisB translation

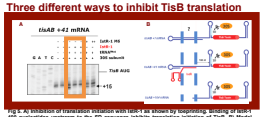
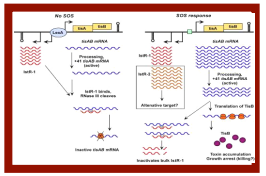


Fig 5. A) Inhibition of translation initiation with IstR-1 as shown by toeprinting. Binding of IstR-1 166 nucleotides upstream to the SD sequence inhibits translation initiation of TisB. B) Model that shows three different ways to inhibit TisB translation. In all cases, the accessibility of the same specific region of the mRNA seems to be needed for initiation at the TisB RBS. IstR-1 binding does not induce any structural change in TisB region (data not shown).

Working model

During normal growth (no SOS) only IstR-1 is transcribed to inhibit any fortuitously expressed *tisAB*. When SOS is on, both IstR-1 and IstR-2 are expressed as well as *tisAB*. Since *tisAB* mRNA is present in excess over IstR- 1 (IstR-1 pool becomes depleted), TisB is translated and causes growth arrest. IstR-2 binds less efficiently (100x) to *tisAB* mRNA and cannot prevent the toxicity. IstR-2 probably regulates other target(s) in SOS conditions. We are currently searching for regulated targets.



Conclusions

Regulation

- Three *tisAB* mRNA species: only a processed (+41) RNA is active
- *tisAB* contains two ORFs, but only TisB is translated
- IstR-1 is the primary inhibitor of TisB toxicity
- IstR-1 binds 100 nt upstream to inhibit translation of TisB
- This does not involve translational coupling
- IstR-2 is believed to have another target
- The RNA chaperone Hfq (involved in many sRNAs/target RNA interactions), is not required for regulation

Toxicity

- The toxicity induced by TisB seems to be reversible
- TisB inhibits macromolecular synthesis and may affect membrane potential

Questions: Target for IstR-2?, how is the primary mRNA processed (+41)?, Indirect regulation of *tisAB*?

Biogenic VHOC Distributions in the Arctic Ocean During Spring: Preliminary Results From the AO-02 Cruise

Jacques Pravost[1], Mikael Theorin[2], Charlotte Eliasson[2], Peter S. Liss[1], Pauli Snoeijs[3] and Katarina Abrahamsson[2]

[1] ENVIC, School of Environmental Sciences, University of East Anglia, Norwich, NR4 7TJ, United Kingdom

[2] Analytical Chemistry, Chalmers University of Technology, Kemivagen 3, Gothenburg, SE-412 96, Sweden

[3] Evolutionary Biology Centre (EBC), Uppsala University, Norbyvagen 14, Uppsala, SE-752 36, Sweden

Introduction

Volatile Halogenated Organic Compounds (VHOC) are present in trace concentrations in the ocean and in the atmosphere. They are strong sources of halogens to the atmosphere and have a great catalytic potential for ozone depletion, as well as being involved in numerous other chemical reactions in the atmosphere. VHOC have therefore important implications for changes in atmospheric composition and global climate. Biogenic VHOC are produced in the surface ocean by phytoplankton and seaweeds and are transferred from surface ocean to lower atmosphere by exchange across the air-sea interface. Some biogenic VHOC measurements have already been performed in the Pacific, Southern and Atlantic Oceans, but they were often restricted to limited areas and depths of these oceans.

During the AO-02 cruise, measurements have been done in the Arctic Ocean and in the Greenland Sea in the spring period. Here, as preliminary results, we present a descriptive study of the vertical distributions of some brominated and iodinated VHOC at seven sections along the Greenland east coast.

Material and Methods

The AO-02 cruise lasted from 20th April to 7th June 2002. Seawater was sampled with a 24-bottles rosette at 45 stations from 82.4°N to 64.8°N. Samples were withdrawn from the Niskin bottles with a sampler (8 glass ampoules connected to a 16-positions Video valve) or with glass syringes. The extraction of VHOC from the seawater sample and their pre-concentration in a trap were performed with a Purge and Trap system. When the extraction was completed, the VHOC were injected in a Gas Chromatography-Mass Spectrometer for separation and quantification.

Brominated compounds

The distributions of the concentrations of CH_2Br_2 and $CHBr_2$ are presented for the seven sections. The concentrations are comprised between 0 and 47.7 pmol L^{-1} for CH_2Br_2 and between 0 and 17.3 pmol L^{-1} for $CHBr_2$. The highest concentrations are observed mainly in the upper layer, however relatively high levels can be observed at depth.

Section 1: Concentrations of both compounds are low in deep waters (<1.5 and <3.0 pmol L^{-1},respectively). They are high in the surface layer near the shores (15.6-19.8 and 14.0-16.5 pmol L^{-1}, respectively). However, relatively high levels (6.5 and 15.3 pmol L^{-1}, respectively) are observed as deep as 700db near the Spitzberg slope.

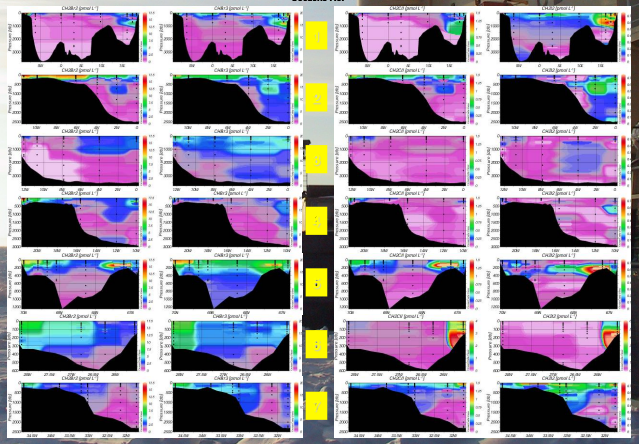
Section 2: Concentrations are high above 200 db depth on the continental shelf (12.0-16.6 and 8.0-17.3 pmol L^{-1}, respectively). They are lower in the open ocean surface waters and minimum in the deep waters (<1.5 and <4.0 pmol L^{-1}, respectively).

Section 3 and 4: Concentrations are low in the open ocean surface and deep waters (<3.0 and <5.0 pmol L^{-1}, respectively). High concentrations of CH_2Br_2 are observed near the shore on section 4 (11.1-17.0 pmol L^{-1}).

Section 5: Concentrations are high above layer by those the continental shelf of Greenland (10.0-11.6 and 11.6-16.4 pmol L^{-1}, respectively). Strong maximums are observed at 125db on the Icelandic shelf (4.7 and 15.4 pmol L^{-1}, respectively). Concentrations are lower in open ocean surface and deep waters (<3.0 and <5.0 pmol L^{-1}, respectively).

Section 6 and 7: Concentrations are relatively high in the surface waters over the Greenland continental shelf (7.1-8.8 and 6.9-13.9 pmol L^{-1}, respectively) and low in the open ocean surface and deep waters (<2.0 and <4.0 pmol L^{-1}, respectively).

Sections No.



→ The distributions of brominated and iodinated compounds can be completely different, probably due to specific sources for each group of compounds.

→ The maximum concentrations are observed mainly near the shores and above the continental shelves.

Iodinated compounds

The distributions of the concentrations of CH_2ClI and CH_2I_2 are presented for the seven sections. The concentrations are comprised between 0 and 4.0 pmol L^{-1} for CH_2ClI, and between 0 and 6.7 pmol L^{-1} for CH_2I_2. The highest concentrations are observed mainly in the upper layer, however relatively high levels of CH_2I_2 can be observed at depth.

Section 1: Concentrations of both compounds are low in deep waters (<0.2-0.5 pmol L^{-1}). They are high in the surface water, near the Greenland shore for CH_2ClI (1.0-3.6 pmol L^{-1}) and near the Spitzberg shore for CH_2I_2 (0.3-0.6 pmol L^{-1}). Relatively high levels (0.6 and 0.8 pmol L^{-1}, respectively) are observed as deep as 700db near the Spitzberg slope.

Section 2: Concentrations of CH_2ClI are high above 200 db depth on the continental shelf (0.8-1.2 pmol L^{-1}), whereas those of CH_2I_2 are quite low (<0.2 pmol L^{-1}). CH_2I_2 presents relatively high concentrations (0.3 pmol L^{-1}) at 2°W between 500 and 750db.

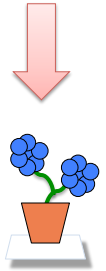
Section 3 and 4: Concentrations are low for both compounds (<0.3 and <0.2 pmol L^{-1}, respectively), except for CH_2ClI in the surface waters near the shore (0.6-0.9 pmol L^{-1}).

Section 5 and 6: The main feature of these 2 sections is the strong maximum respecially on the section 6: 5.7-4.0 and 5.7-6.7 pmol L^{-1}) between 100 and 200 db depth at the edge of the Icelandic slope. Relatively high concentrations of CH_2ClI are observed in the surface waters on the Greenland shelf (1.5-6.7 pmol L^{-1}).

Section 7: Both compounds present high concentrations (1.0-1.15 and 1.0-1.7 pmol L^{-1}) in the surface waters at 31.7°W. CH_2I_2 also presents high concentrations (1.4 pmol L^{-1}) at 31.4°W.

UPPSALA UNIVERSITET

Don't call me Lobelia



UPPSALA UNIVERSITET

Posters from your course

UPPSALA UNIVERSITET

Project in Computational Science Fall Term 2015

Project members:
Alexander Bilock
Carl Jidling
Ylva Rydin

Supervisor:
David Marquez

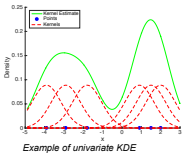
Course Coordinator:
Maya Neytcheva

Modelling Bivariate Distributions Using Kernel Density Estimation

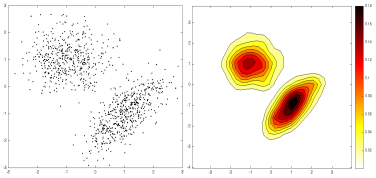
Kernel density estimation, KDE, is a topic covering methods of making nonparametric continuous estimates of the underlying density of a data set. In this project different methods to perform KDE have been tested and compared.

The idea behind KDE is to approximate the underlying density *f* of a data set by representing each point by a kernel *K*.

$$\tilde{f}(x,h) = \frac{1}{n}\sum_{i=1}^{n} K_h(x - x_i)$$



Example of univariate KDE



Example of bivariate KDE

To make the calculations more efficient binning can be used to assign the data points to fixed grid points and calculate the estimate on the grid.

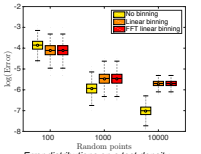
This allows usage of the fast fourier transform, FFT, yielding a significant speed-up. However the binning introduce errors to the estimate which are related to the sample size and coarseness of the grid.

The most important factor for an accurate KDE is the choice of the **kernel bandwidth**. This can be done automatically by minimizing an approximation of the error.

Two different bandwidth selection methods have been investigated in this project, plug in bandwidth selection (PI) and smooth cross validation (SCV). Our results showed that PI is the faster method, especially for small data sets.

Regarding accuracy it was found that an important factor is pre-transformation. Two **transformation** methods were compared, scaling and sphering (*). The scaling should be adjusted depending on the properties of the data set.

In **conclusion** kernel density estimation is a potent way to explore the properties of multivariate data. For a fast and accurate kernel density estimate the recommendation is to bin the data on a dense grid and use FFT for the estimation.



Error distributions on a test density comparing the impact of different computational methods and sample sizes.

UPPSALA UNIVERSITET

Joakim Borgh
jobo9638@student.uu.se

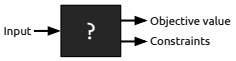
Erasmus Cedernaes
erce4185@student.uu.se

Kateryna Mishchenko
Supervisor
ABB Corporate Research

Maya Neytcheva
Course coordinator
Department of Information Technology, Uppsala University

Project in Scientific Computing, 2015

Analysis of different optimization algorithms for a black box problem



NLopt

NLopt is an open-source library for non-linear optimization. It contains several single-objective optimization routines.

Our task

Analyze the algorithms of the NLopt library with respect to (listed in order of importance)

1. Feasibility
2. Optimal objective value
3. CPU time

Based on these measures, nominate the best algorithm for a specific set of problems.

Methods

In order to assure a feasible solution different methods were applied

Standard runs
The sum of the objective function value and the constraint violations is minimized. The idea is that this should give a solution with a low objective value and a constraint violation of zero. However, it may fail when the algorithm finds a low objective value which is slightly infeasible.

Penalty multiplier method (PMM)
A scalar is multiplied to the constraint violation to penalize it more, such that feasibility is prioritized. PMM is identical to the standard run if the penalty multiplier is set to one.

Feasible initial guess method (FIGM)
A fully feasible initial guess is first generated by only minimizing the constraints and neglecting the objective function. This solution is then used as an initial guess when minimizing the objective function with a barrier-like method to remain feasible.

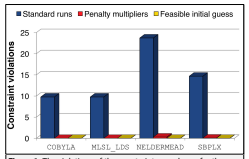


Figure 1: The violations of the constraints are shown for the different algorithms.

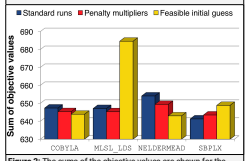


Figure 2: The sums of the objective values are shown for the different algorithms.

Results

In Figure 1 and 2 the feasibility and minimum objective value are displayed. It is clear that standard runs are not sufficient to achieve a feasible solution. Both PMM and FIGM yield completely feasible solutions, but FIGM has a greater number of successful algorithms. Also, FIGM gives a slightly better objective value than PMM. The best feasible objective value is achieved by `NELDERMEAD` with FIGM.

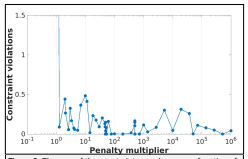


Figure 3: The sum of the constraints are shown as a function of the penalty multiplier for the `COBYLA` algorithm. Penalty multipliers less or equal to one give constraint violations greater than 1.5.

Figure 3 shows that there is no clear correlation between penalty multiplier and feasibility, making the choice of a penalty multiplier difficult. This lack of generality is the main drawback of PMM.

A drawback of using FIGM is that one has to first generate the feasible guess by minimizing the constraints only. It is likely that two different algorithms will be used, one for generating the feasible guess and another one for minimizing the objective function.

Conclusions

- Standard runs are not sufficient to achieve a feasible solution
- Both PMM and FIGM yield feasible solutions
- PMM lack generality therefore FIGM is the recommended method
- A feasible initial guess is best generated by `SBPLX`
- Given a feasible initial guess the preferred algorithm is `NELDERMEAD`

UPPSALA UNIVERSITET

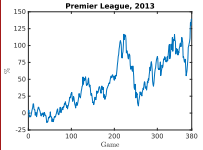
A project by:
Niklas Fejes
fejes@betamatics.com
Jonas Mirza
mirza@betamatics.com

Supervisor:
David Sumpter
david.sumpter@math.uu.se

Please visit *www.betamatics.com* to enhance your betting performance.

Odds Bias Based Football Betting Strategy for Premier League

A Study of Football Betting and Implementation of Statistical Algorithms to Enhance One's Betting Performance



Introduction

The aim of this project was to create a football betting model that gives a net gain in the long run. This was done by analyzing data from Premier League over the last 10 years. The model that was developed utilize that there exist a difference between the odds and the actual outcomes and has made a net gain between 30-300% per season in the last five years. The plot above shows how well the model performed during the 2013 season.

Method

We have evaluated three different methods that can be used to model the outcomes of the games.

The first two approaches we have been studying are commonly used in the football community and are called the Elo-ranking model and the Expected Goals model. Both of these methods use data from previous matches to predict the outcome of future games.

The Elo model, first developed in 1960 for chess players, is used to create a ranking for the playing teams and will change depending only on the outcome of the games. The more recent Expected Goals model is similar to Elo-ranking, but instead of the match results, the number of shots on goal is used to estimate the performance of a team. The advantage of using this variable is that the expected number of goals should be less random compared to the outcome, and thus a model using this variable could potentially achieve higher accuracy predictions.

The Odds Bias Model

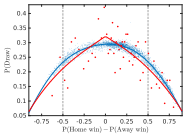
The bookmakers will attempt to set the odds such that the average game will make them earn money. Let the "true" probability of one outcome (home win, draw, or away win) be p. If the odds are b, and you bet a total of M on the outcome, your expected net gain will be

$$G = M(-1 + pb)$$

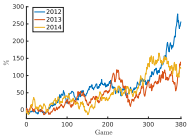
which comes from that you always pay M for the bet, but with probability p you win Mb. The bet will be "fair" if

$$p = \frac{1}{b}$$

since this makes G=0. The bookmakers will also add a margin on the odds (usually 4-8%) to prevent "sure bets". We can thus get the bookmakers probability by the equation and normalize p such that they sum to 1 for the three outcomes.

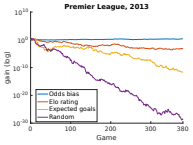


But what if there is a bias in the bookmaker probabilities compared to the actual match results? In the figure above we have plotted the home team advantage P(Home) - P(Away) versus the probability for draw, over the last 10 years. The blue dots represent the odds-probabilities, and the blue line is the corresponding trend line. The red line is a trend line for a multinomial logistic regression of the game outcomes. Even though these lines are close to each other they are not identical which implies that the odds are not perfect estimations of p. By utilizing this difference we have created a model that in the long run will earn money.



Result

Our research has resulted in three betting algorithms of which the Odds bias model, to our knowledge, is profitable in the long run as can be seen in the graph above. A comparison of all the three models for 2013 can be seen in the log scale graph below. As a part of this project a web application was built that shows live recommendations, and contain a lot more information about the project. Please go to www.betamatics.com (QR-code on your left) to see it and get the best bets of the week.



Solving the Linear Poroelastic Equations Using The SBP-SAT Method

Students
Kim Torberntsson
Vidar Stiernström

Project in Scientific Computing
2016-01-09
Uppsala

Supervisors
Eric Dunham
Ken Mattsson

Summary

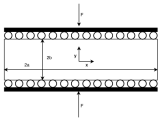
The linear poroelastic equations with spatially variable material parameters have been solved in 2D using the SBP-SAT method. Using the energy method, well-posed physical boundary conditions were derived and stability was proven. Simulations of Mandel's problem were conducted in order to verify the accuracy of the numerical scheme. The results show that the numerical solutions converge to the analytic solutions.

The SBP-SAT Method

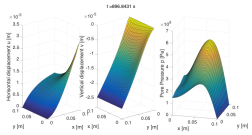
The SBP-SAT method is a finite difference method that allows for the implementation of physical boundary conditions. In the SBP-SAT method, derivatives are approximated using central finite differences and boundary conditions are imposed weakly. One of the main strength of the SBP-SAT method is that it allows for convergence proofs for linear or linearized problems.

Poroelasticity

The linear poroelastic equations describe the fluid flow in a porous material and the deformation of the material simultaneously. It is a system of coupled PDE:s that governs pore pressure p and displacements u of the medium. The theory of poroelasticity is used in civil engineering and geosciences to study for example stability of earthen dams, landslides and reservoir compaction.



The setup of Mandel's problem



Simulation of horizontal displacement u, vertical displacement v and pore pressure p in Mandel's problem with variable material parameters

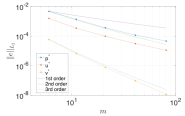
Governing Equations

$$\frac{\partial}{\partial x_j}\left[\left(K+\frac{G}{3}\right)\frac{\partial u_j}{\partial x_i}\right]+\frac{\partial}{\partial x_j}\left(G\frac{\partial u_i}{\partial x_j}\right)=\frac{\partial(\alpha p)}{\partial x_i}$$

$$\frac{1}{M}\frac{\partial p}{\partial t}-\frac{\partial}{\partial x_i}\left(\kappa\frac{\partial p}{\partial x_i}\right)=-\alpha\frac{\partial^2 u_k}{\partial x_k \partial t}$$

Mandel's Problem

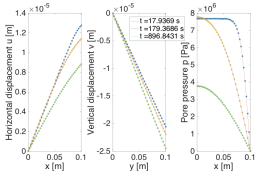
In Mandel's problem an infinitely long, rectangular plate of a poroelastic material is located between two rigid plates. At time zero an compressive force is applied at the top and bottom plates. The shear traction is zero at the north and south boundaries and the left and right boundaries are drained and stress free.



Convergence rate of horizontal displacement u, vertical displacement v and pore pressure p in Mandel's problem.

Results and Discussion

- Stability was proven for the linear poroelastic equations with physical boundary conditions discretized using the SBP-SAT method.
- It was shown that the numerical solutions converge toward the analytical solutions with expected convergence rates of the SBP operators used.
- For early times the solution has large spatial gradients giving rise to the π-mode. Operators that add artificial viscosity could damped the π-mode.
- With higher order SBP operators the temporal error quickly becomes dominant. A higher order time integrator than Euler Backward could therefore improve performance.



Simulation of horizontal displacement u, vertical displacement v and pore pressure p in Mandel's problem.

Future Work

- Use a higher order time integrator than Euler Backward.
- Use SBP operators with artificial viscosity to damped the π-mode.
- Analyze and simulate other problems, such as the finite length crack problem, the internal line source problem and fault slips.

Towards moving Scientific applications in the cloud

UPPSALA UNIVERSITET

Project in Computational Science 2016

Oscar Möller
oscar.moller.7848@student.uu.se

Saim Mehmood
saim.mehmood.7275@student.uu.se

Supervisors:

Salman Toor
Salman.Toor@it.uu.se

Behrang Mahjani
Behrang.Mahjani@it.uu.se

Ali Dorostkar
Ali.Dorostkar@it.uu.se

Maya Neytcheva
Maya.Neytcheva@it.uu.se
Department of Information Technology
Uppsala University

Aims:
Our aims are threefold:
1. Make this architecture viable for other scientific applications as well.
2. Make it ready & useable from scratch on any Cloud i.e. Amazon, HP Helion etc. with minimal effort.
3. Study the performance of a computationally intensive scientific application when executed in a cloud environment.

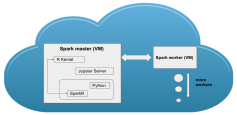
Directions:
1. Application as a service
2. Performance analysis of scientific applications

QTL as a service (QTLaaS):
Using already existing technologies i.e. **R** language, Apache **Spark**, SparkR, Jupyter notebook and **OpenStack** cloud infrastructure, we have designed a framework that help biologists run their **QTL** (Quantitative traits loci) code on cloud.

User Interface

Problem:
Cloud computing provides **usability**, **scalability** and **on demand** availability of resources, remotely. That's why we are using it for scientific applications. We have designed an architecture in cloud that help scientists run their applications **elastically**. In addition we are also quantifying the performance overhead when using cloud to solve a numerical experiment. To evaluate performance, we ran already existing **MPI code** on the cloud.

Cloud based infrastructure developed using Spark



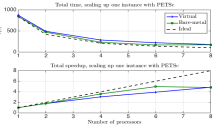
Features:
1. System Scalability
2. Interactivity
3. Automation
4. Portability
5. User familiar environment settings

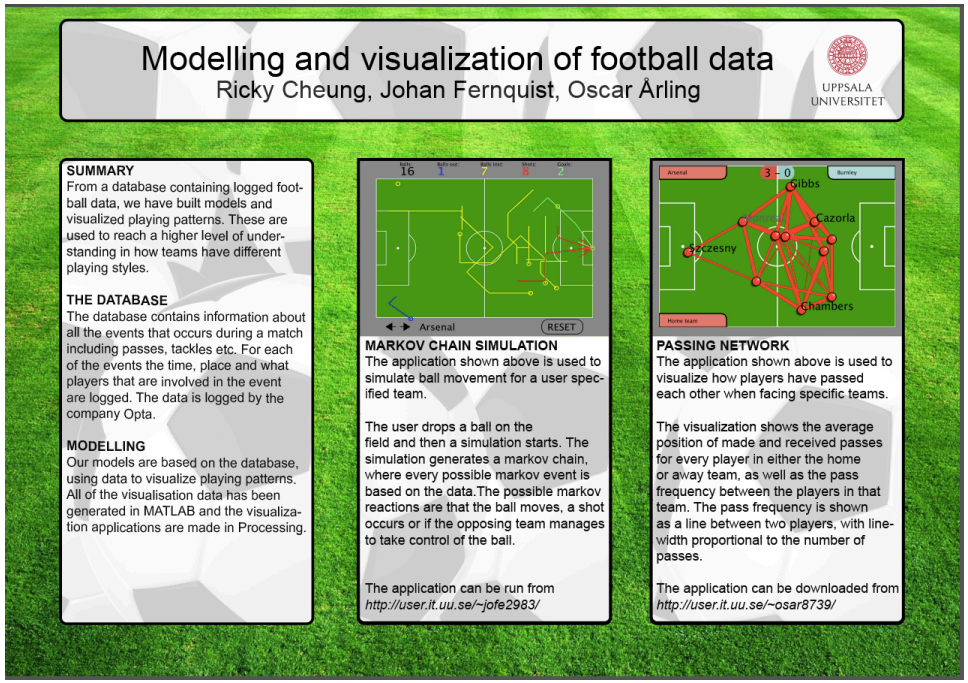
Performance on the cloud:
In the scientific world, number of applications are well aligned with computing model. However, there are applications that require profound understanding to gain maximum performance together with the services, offered by the cloud concept.

Performance Analysis:
When performing numerical experiments using cloud, there are two potential causes for performance degradation. The causes are **consolidation and virtualization**. Consolidation occurs when more and more applications run on a single physical server, and virtualization is the layer between an application tier and the physical hardware in addition to the operating system.

Method:
When trying to evaluate the performance using the cloud, Laplace's equation was solved, discretized using finite elements and solved by the **Algebraic Multigrid method** (AMG) and simulated using the open source scientific libraries – **deal.ii** and **PETSc**. Deal.ii handles the mesh generation and the discretization. The arising large linear system of equations is solved by the AMG implementation, provided by PETSc. The code is parallelized using MPI.

Results:
From the results we see that, the run time while solving the problem on the cloud scales as well as when solving it on the bare metal machine. The increase **usability** and **simplicity** that comes with our framework can be seen as a tradeoff with performance degradation that appears when using the cloud.





UPPSALA UNIVERSITET

Printing the poster

- Find out where.
- When: Normally you should have at least a week extra in case something goes wrong.
- Spell check and read through carefully before print. Send it in as a pdf and check that the pdf looks the same as your original file.
- Avoid strange fonts and symbols if you can. They might cause problems…

This is how it may look in a science conference

The poster exhibition

- Think through how you want to present your poster to your audience and practice. You will have ca 3–5 minutes – several times if you are lucky ☺

15 January
14.45–15.30