Responding to environmental emergencies in real time at the Canadian Meteorological Center using SPI

(as a management and visualisation tool for global to local scale emergencies)
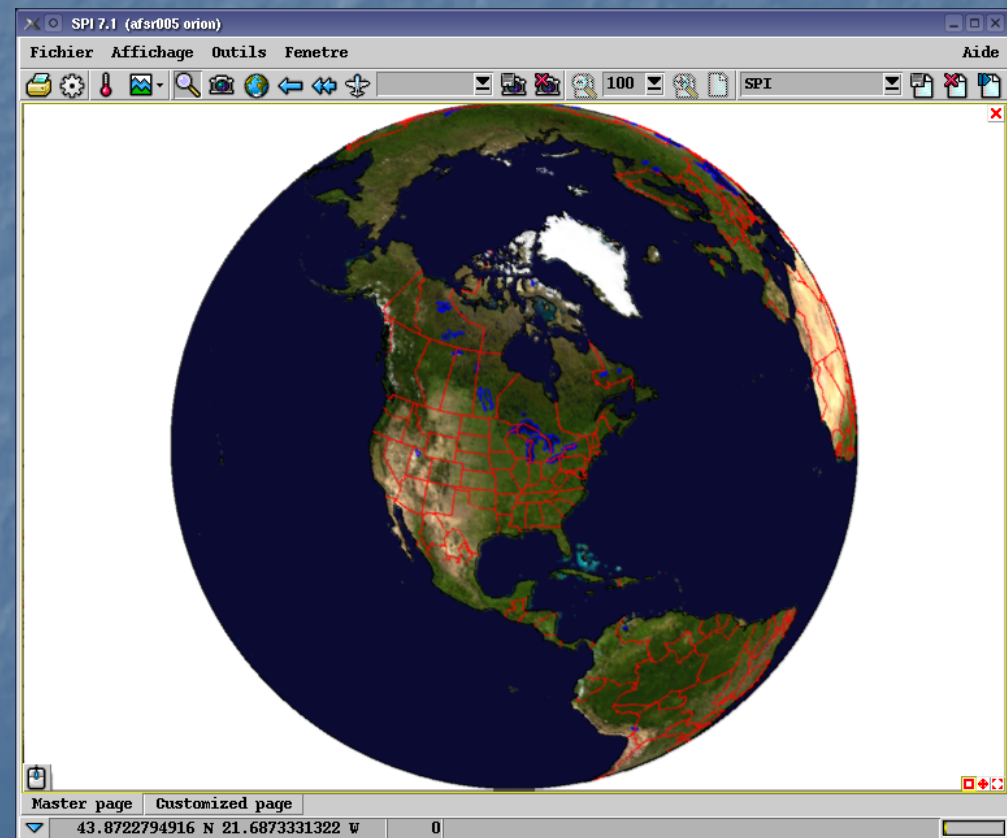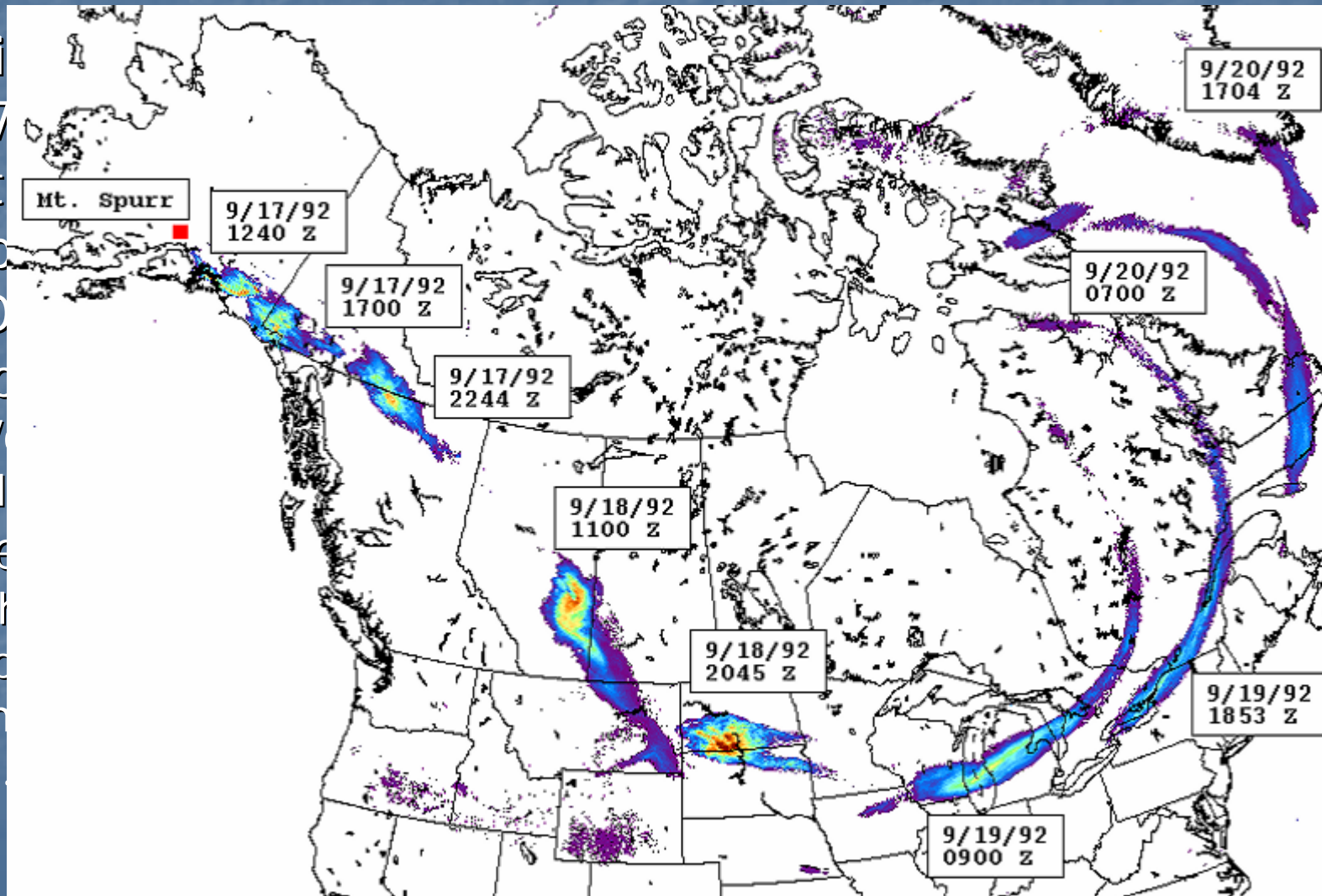
Jean-Philippe Gauthier Bilodeau

Outline

- Who are we
- Context of development
- Requirements
- Key features
- Architecture
- Functionalities
- Tools
- Scripting
- Upcoming
- Conclusion

Who are we (within CMC)

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Centre météorologique canadien   Canadian meteorological center

Official 24/7 EER mandates

RSMC Response process

- Nuclear
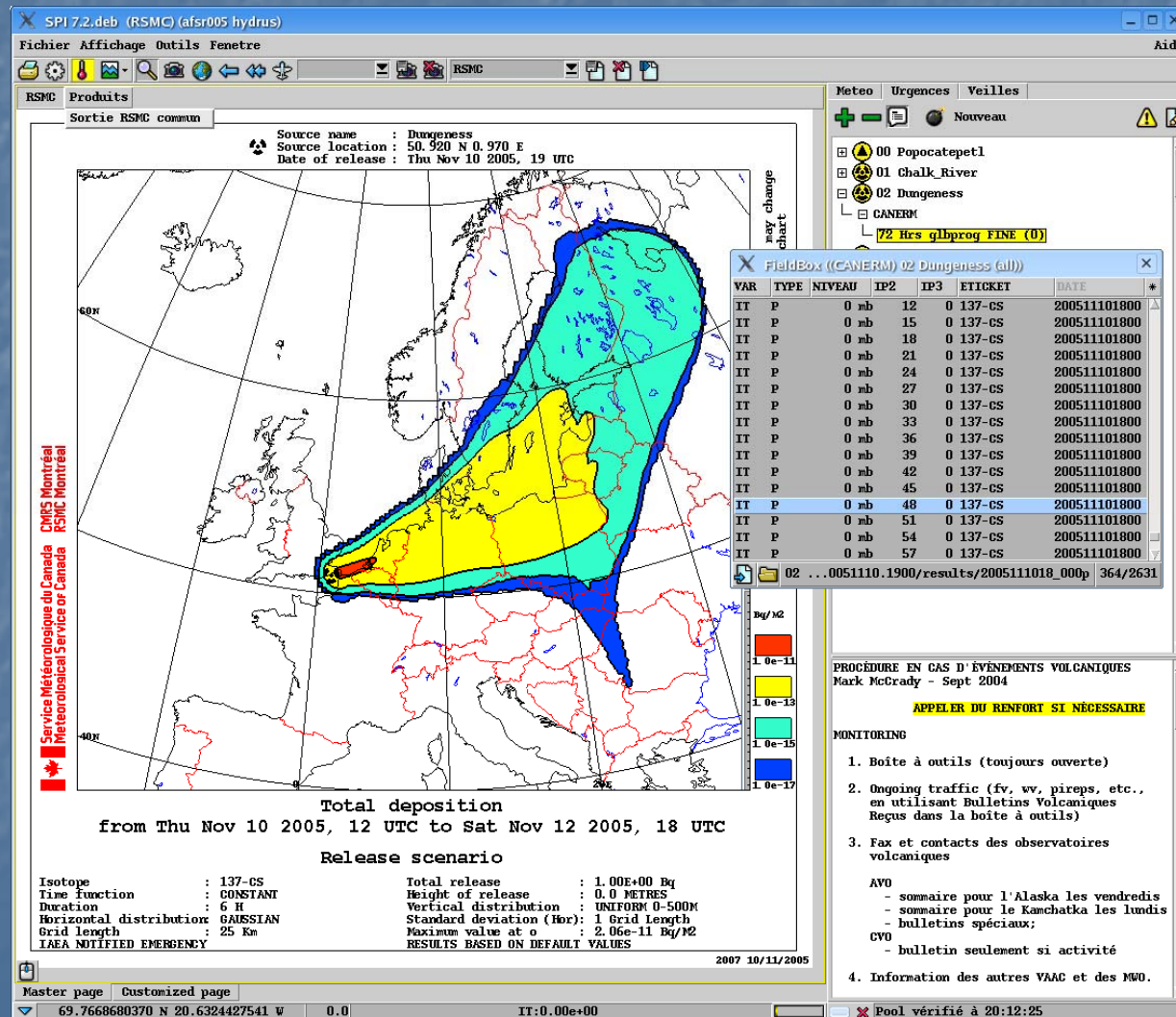
Context of development

- What we had
  - Non interactive script processes
  - Limited and fixed capabilities

- Emerging needs
  - New higher resolution scales
  - New dispersion models
  - New data types
- Quick response suitability
- Flexible functionalities
- Development and analysis
- Single do-it-all tool
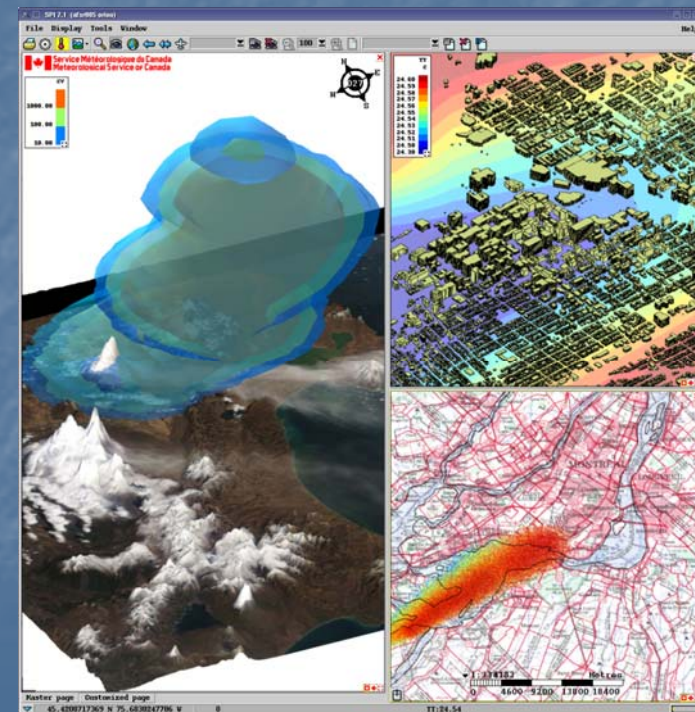
Requirements

- Stability / Robustness
- Efficiency
- Extensibility / Flexibility
- Simplicity / Support workload
- Ease of use
- Scripting / Automatisation
- Portability (Software – Hardware)

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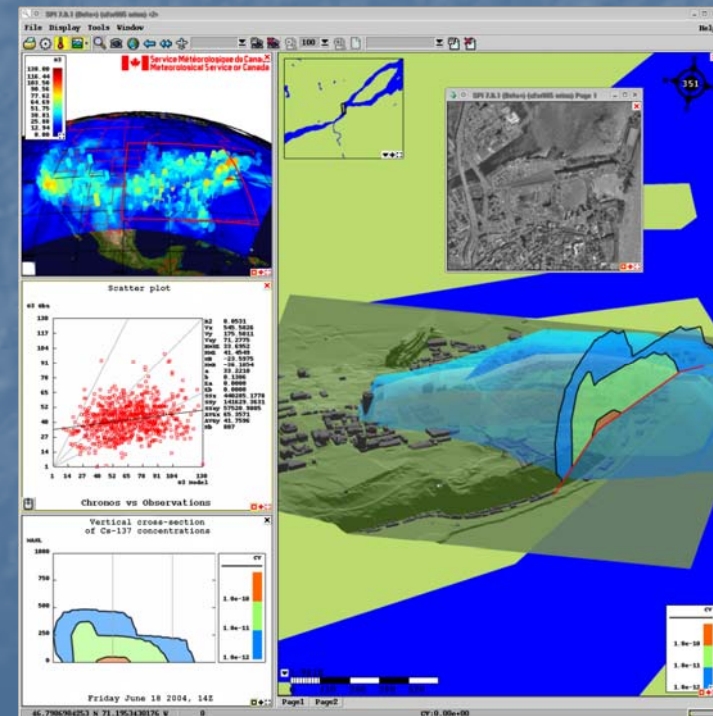
Highly specialized needs

- EER models integration

- Databases integration for EER needs

- Resolution scope (Global – Local)

- 3D – 4D

- Interactivity

- Performance (>20 fps)

- Response / Development
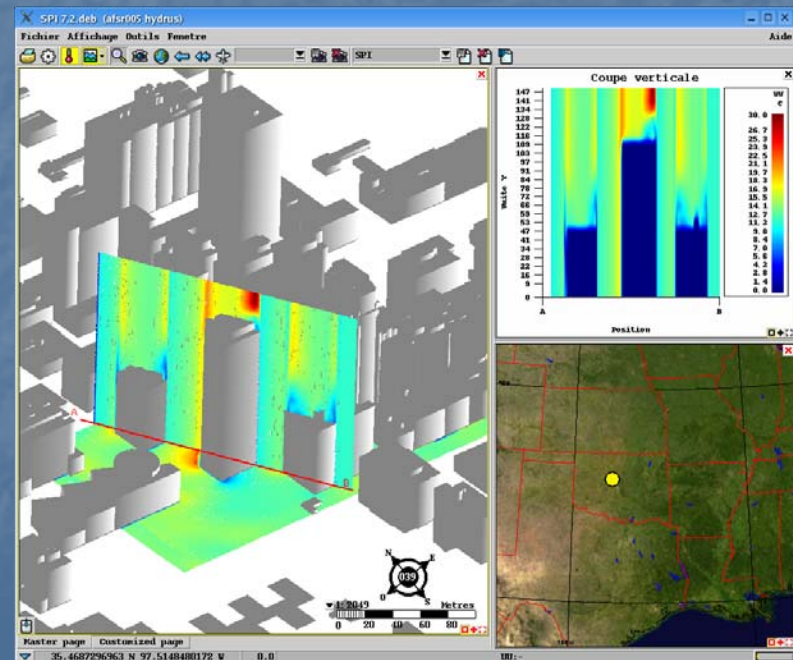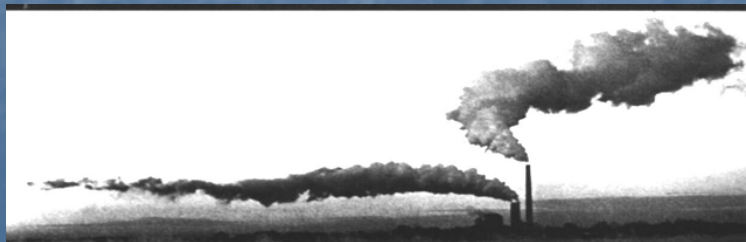
In house development (Why is it such a good idea for us)

- By in house we mean within the division
- Complete knowledge of the application
- Bug fixing within minutes, not months
- New needs answered within hours or days
- Handling of specific situations on the fly
- Development process simple
- Project management simplified

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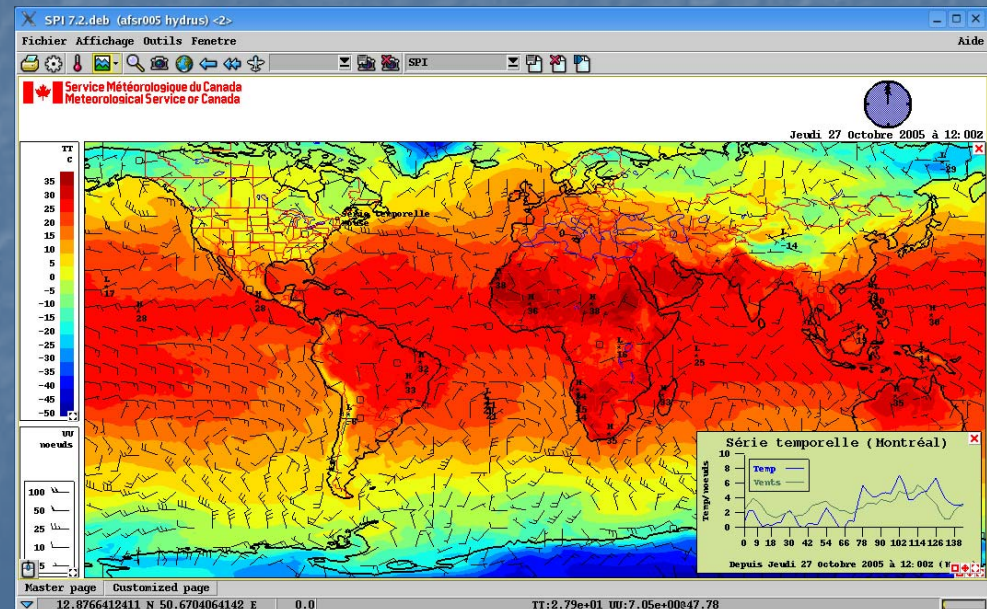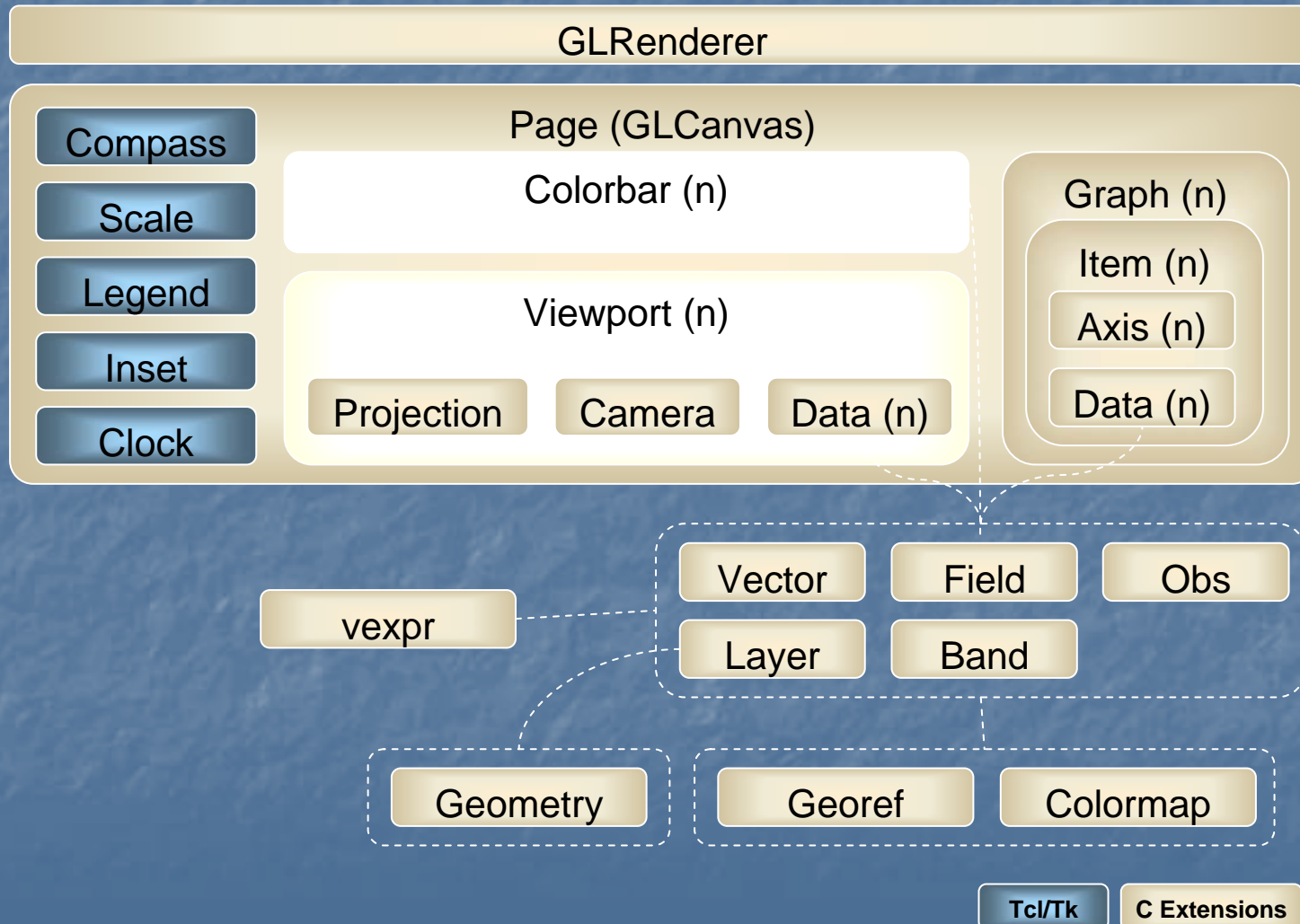
Key features

- Page concept
- Visualisation and Data objects
- Viewport / Projection / Camera
- Layering vs Real world
- Always 3D
- Interactivity
- Layouts
- Scripting
- WYSIWYG

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Architecture (Objet)

GLRenderer

Page (GLCanvas)

- Compass
- Scale
- Legend
- Inset
- Clock

Colorbar (n)

Viewport (n)

Projection | Camera | Data (n)

Graph (n)

Item (n)

Axis (n)

Data (n)

Vector | Field | Obs

Layer | Band

vexpr

Geometry

Georef | Colormap

Tcl/Tk | C Extensions

Functionalities

- Visualisation, modeling and analysis
- Multiple pages
- Page layout design/management
- Interactive objects
- Interactive product
- Meteorological, Dispersion and Geographical data
- Automatisation (Macro/Script)
- Batch product (>500 maps a day)
- Export static and geo-referenced
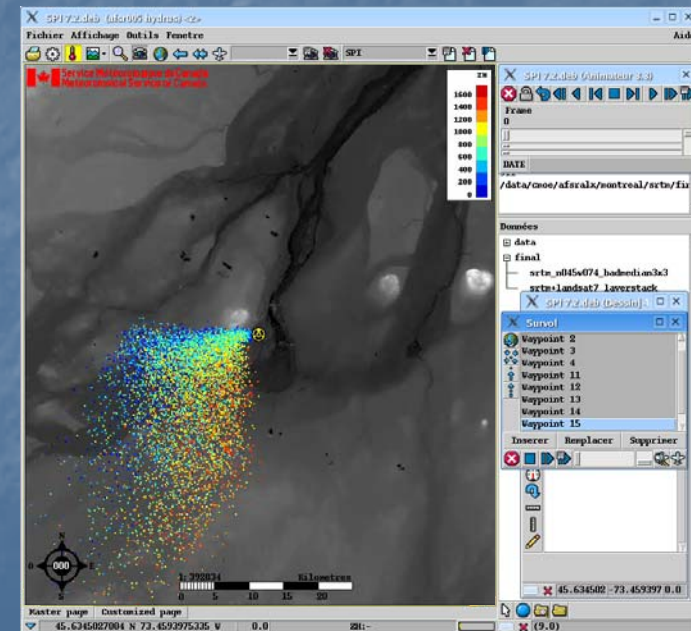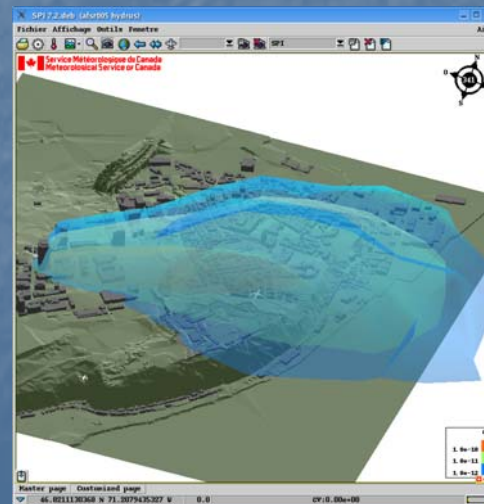
Functionalities (Modeling)

- Trajectories, Eulerian, Lagrangian
- Interface Plug-in structure
- Interactive input parameter selection
- Remote or local model execution
- Output management
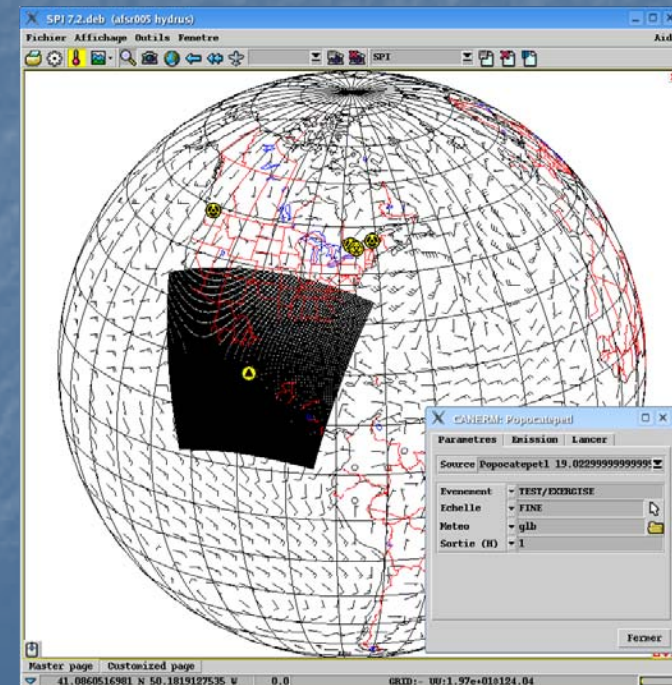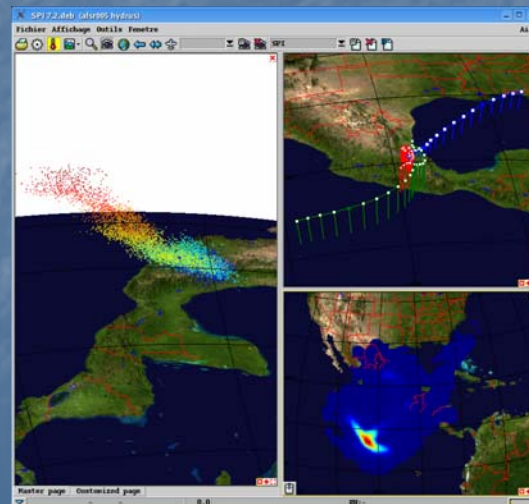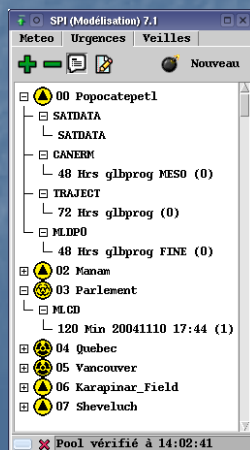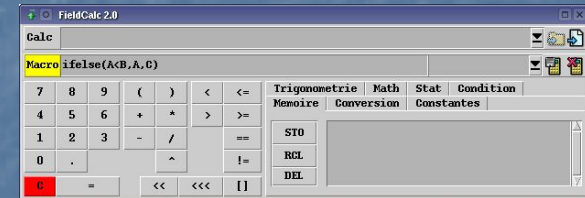
Functionalities (Visualisation)

- Model Data (Meteorological and dispersion)
- Observation Data
- Geographical Data (Vector, Raster)
  - 1:50000 and 1:250000 topographic maps Canadian coverage
- Multiple viewport
- Always 3D
- 3D Objects
- Volume
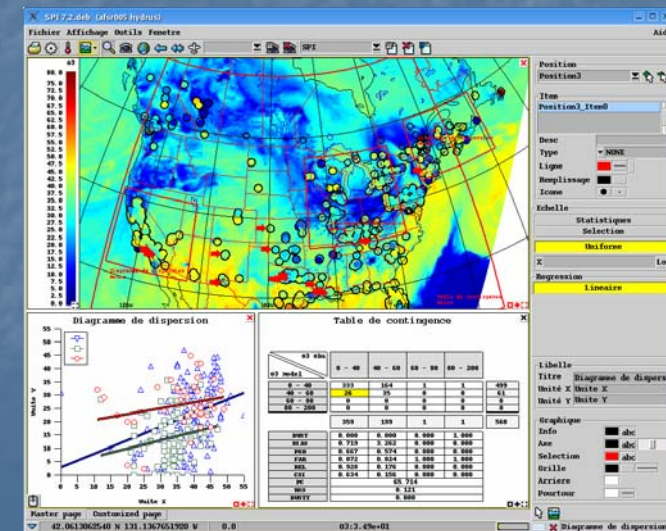- Fly-bys

Functionalities (Analysis)

- Vectorial expression parser
  - Arithmetic, statistic, logical,...

- Graphs
  - Cross-Section, Vertical profile, Time profile, Time Series, Scatter plot, Contingency diagram, ...
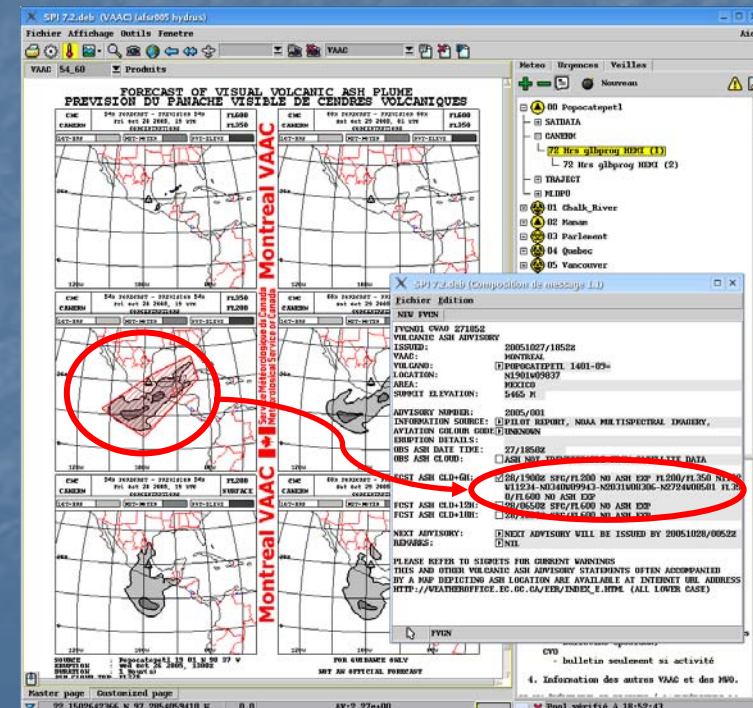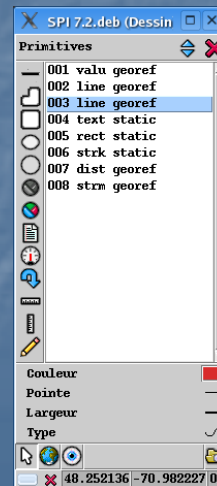
- Easy observation data integration
- Data manipulation functionalities

Tools

- Extension architecture
- Animator
- Drawing
- Geographical Data Manager
- Macro Manager
- Console
- Message Writer
- Your tool

Scripting

- Same language than application itself (TCL)
- Extended for our needs
- Maximum versatility
- Access to all of application functions
- Simple self contained data objects
- Powerful, simple and efficient
- Not only mapping but processing
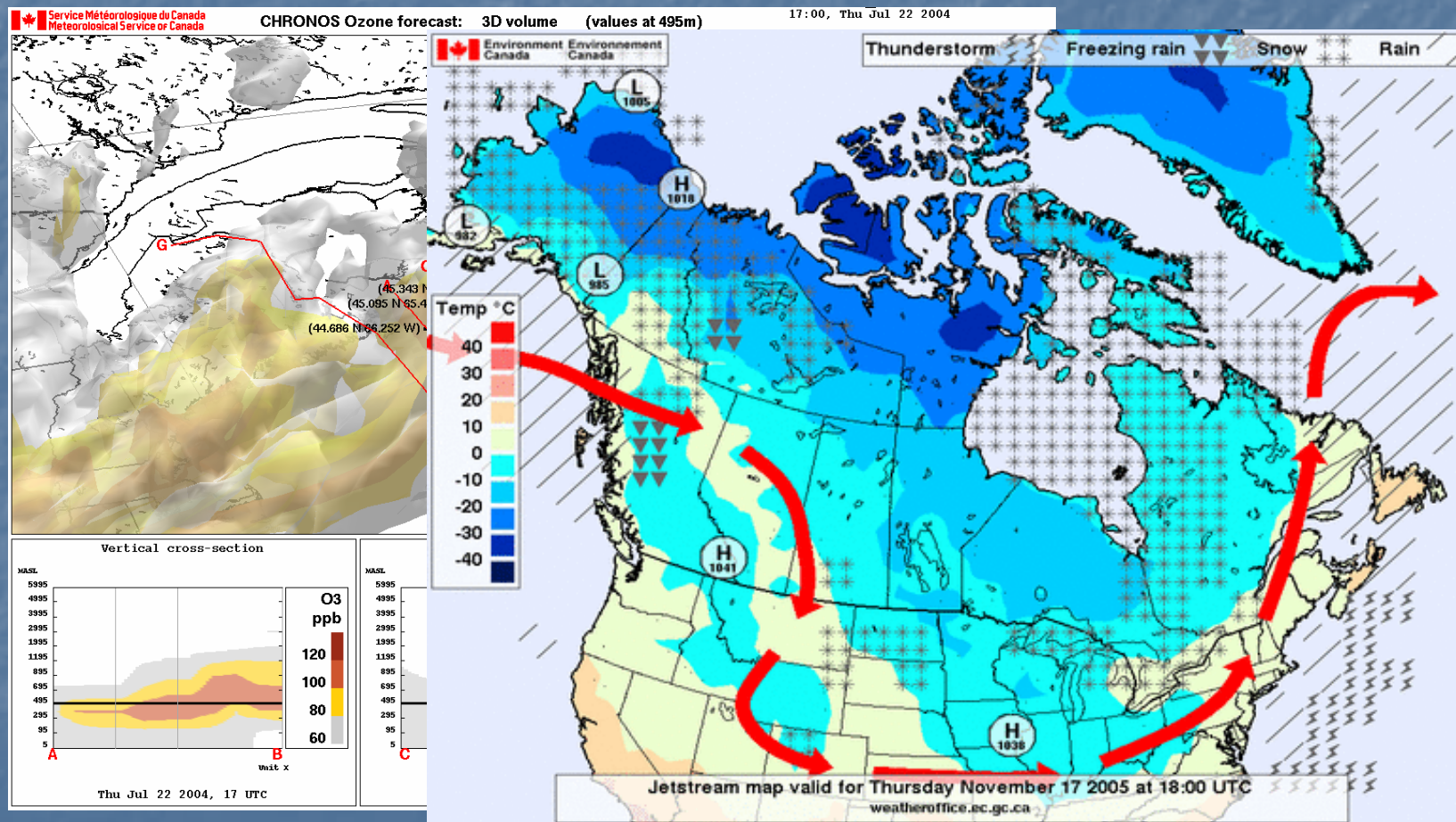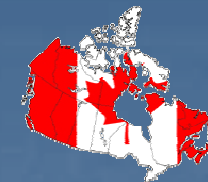- Replace binaries with unified scripts

Upcoming

- Pixel/vertex shaders

- Thread

- More GIS Capabilities

- Add Cache/Performance on raster

- New graph types (box plot, 3D graphs, ...)

- Performance, ... yet again

- Distribution setup (LGPL)

- Demo

If (Time left >2Min) then

Conclusion

- Operational EER response tool developed at CMC over the past 6 years

- Used in a 24/7 highly specialized environment

- Flexible design for easy expansion to meet emerging needs in high resolution modeling

- User-friendliness and performance to meet strict operational requirements

- Integration of global to local meteorological, dispersion and GIS data

- Advanced functionalities and flexibility for R&D purposes