

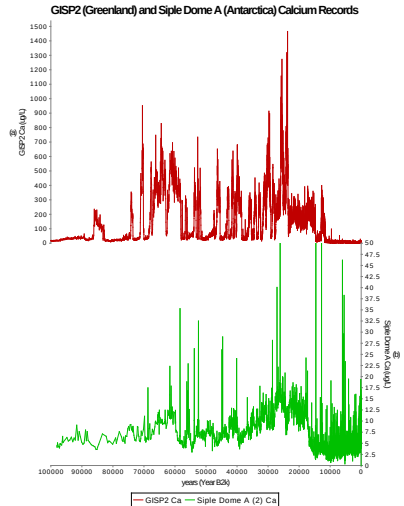
The P301 workbench for studying climate data

Mark Royer¹, Sudarshan S. Chawathe^{1,2},
Andrei V. Kurbatov^{2,3}, Paul A. Mayewski^{2,3}

1. School of Computing and Information Science, University of Maine
2. Climate Change Institute, University of Maine
3. School of Earth and Climate Sciences, University of Maine

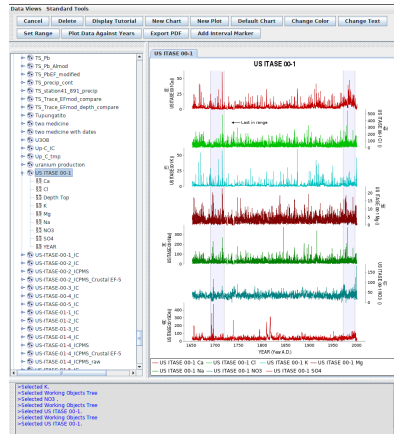
Motivation

- Studying past climate enables a better understanding of present and future climate conditions
- Data must be combined, transformed, and visualized
- Advances in the physical and chemical processing
 - Increase data sizes
 - Visual interpretation is difficult
- Ad hoc approaches:
 - No systematic record
 - Not easily reproducible
 - Difficult to modify input



The P301 Workbench

- Provides an interactive, graphical software workbench
- Facilitates common tasks
 - Storing and integrating
 - Sharing and analyzing
 - Visualizing climate-related data
- Notable features:
 - Analyze the largest datasets
 - Interactive times (a few seconds at most)
 - Use, define, and compose software tools
 - Transformations are automatically recorded
 - Used by several scientists

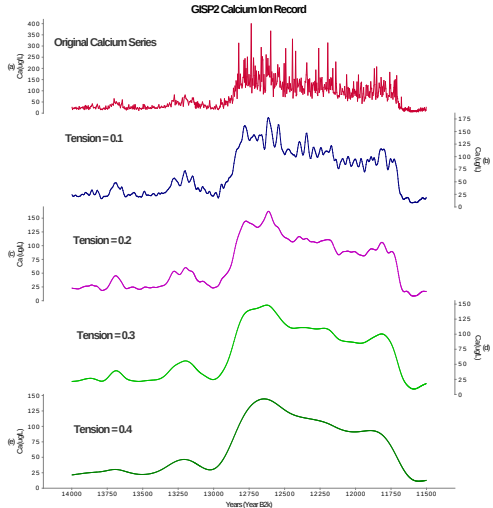


P301 Unique Features

- Datasets and functions are first-class objects
 - Interactively generate new data
 - Create new functions by composition
- Fine-grained audit of data maintained
- Scriptable history
 - Preserves object provenance
 - Provides a mechanism for reproducing results
 - Allows modification to input parameters
- Integrate additional tools
 - Statistical packages written for R or Matlab/Octave
 - Tools become native in the system
- Import formats: LibreOffice/Excel, netCDF, HDF5, CSV

Example Output

Robust spline smoothing of a portion of the calcium ion record from the GISP2 ice core. The time interval represented is that of the Younger Dryas Event (11,000 to 14,000 yBP). Different values of the "tension" parameter emphasize temporal behavior on different time scales.



- Interactive workbench for data analysis and visualization
 - very large ice-core datasets
 - interactive tool use, definition, composition, . . .
- Machine-readable audit trail
- Operational system in daily use
- Acknowledgments
 - Funding: US National Science Foundation
 - EAR-1027960, PLR-1142007, PLR-1848747
 - P301 project participants