Using EmisView to Quality Assure and Visualize Emission Modeling Data

Alison Eyth

Rajasooriyar Partheepan
Carolina Environmental Program
University of North Carolina at Chapel Hill

Marc Houyoux

Emission Inventory Group

U.S. EPA OAQPS

September 27, 2005

Outline

- Introduction
- EmisView Setup
- Importing Data
- Subsets
- Performing Analyses
- Analysis Results
- Customizing Products
- Availability
- Future Plans

Introduction to EmisView

- Open source tool for quality assurance and visualization of emissions data

- Goal: Create plots and tables of emission summaries at various spatial and temporal resolutions

- Supports emissions inventory and modeling staff at states, RPOs, EPA, and industry

- Supports SMOKE and CONCEPT

- Funded by the Emission Inventory Improvement Program (EIIP) and EPA's Emission Inventory Group (EIG)

EmisView Setup

- Prerequisites:
  - Java 1.4 (to run the software)
  - R (for plots)
  - MySQL or PostgreSQL (to store data)
- Download and run EmisView Installer
  - Downloads software and documentation
  - Configures for user's system
  - Sets up to use MySQL or PostgreSQL
  - Can be run again to download updates

Performing an Analysis in EmisView

1. Load an Inventory to create a Dataset
2. Create a Subset to specify how the data should be subselected and aggregated
3. Select a Product that specifies how to present the data (e.g., in particular tables and / or plots)
4. Run the Analysis to view the results

EmisView Main GUI

Importing Data

- Click New on Datasets tab to show Importer
- Choose Dataset Type (e.g. NIF3 Nonpoint Inventory)
- Select file(s)
- Modify table names if desired

Using EmisView to Quality Assure and Visualize Emission Modeling Data

Supported Data Types

Data Type	Formats
Point inventory	NIF3, IDA, ORL
Nonroad mobile inv.	NIF3, IDA, ORL
Nonpoint (area) inv.	NIF3, IDA, ORL
Onroad mobile inv.	NIF3, IDA, ORL

- **NIF3 is used by CONCEPT for most source types**
- **NIF3 support is currently for ASCII fixed format files and can be read directly from CONCEPT database**
- **IDA and ORL formats are used as inputs to SMOKE**

Using EmisView to Quality Assure and Visualize Emission Modeling Data

Specify Dataset Properties

- **Give a Name and Description**
- **Confirm start date, end date, resolution**
- **Specify Region and Sector**
- **Note Pollutants**
- **Confirm Units**
- **Other Metadata tab shows database tables and metadata**

Imported Dataset Now in Table

- **Buttons on toolbar control view of table and selection (Sort, filter, show/hide columns, format, select all, clear all)**
- **Buttons at bottom operate on selected items**

Using EmisView to Quality Assure and Visualize Emission Modeling Data

Subset Editor Overview

- **Specifies how to subset and aggregate data**
- **Subsets can be defined by region (i.e., country, state, county characteristics), SCC, Columns, Filter**

Using EmisView to Quality Assure and Visualize Emission Modeling Data
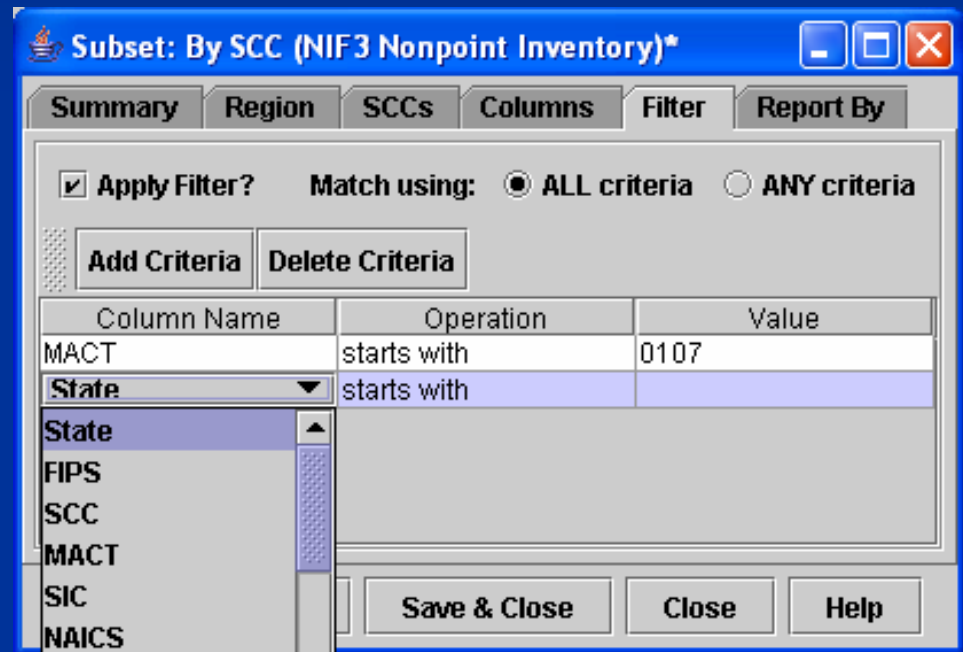
Subset Editor – Report By

- **You may aggregate by state, FIPS, SCC, MACT, SIC, NAICS, ...**
- **Function applied can be Sum, Mean, Min, or Max**
- **Subsets can be reused on different datasets**
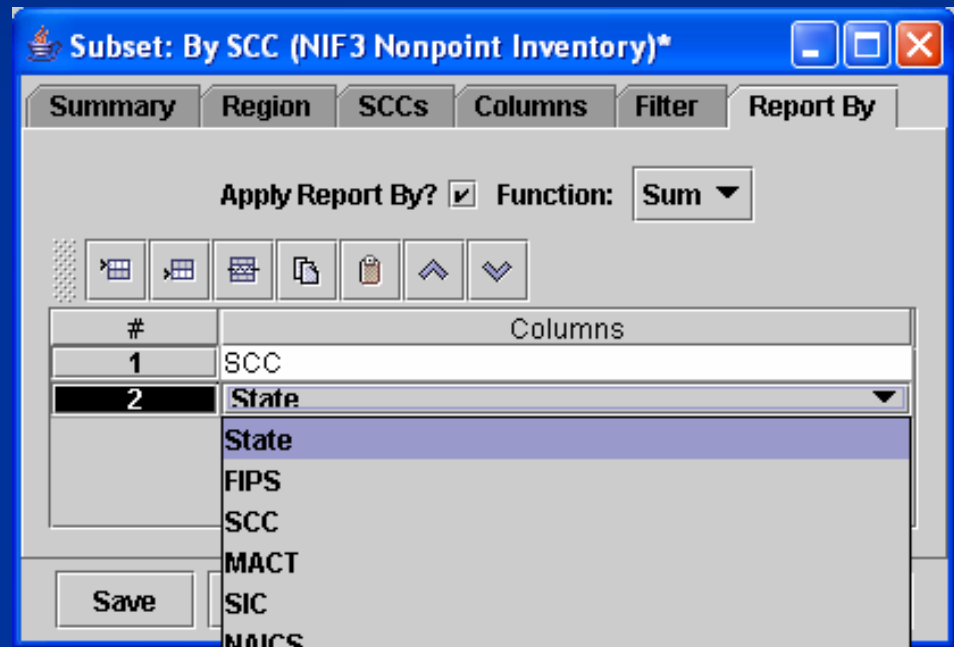
Analysis Editor

- **Name:** KY nonpoint 2002 by SCC
- **Subset:** By SCC
- **Dataset:** KY nonpoint 2002
- **Product:** Table and Plots
- **Run** to see results
- **Alternative:** enter own custom query

Analysis Results

Analysis Results: KY nonpoint 2002 by SCC

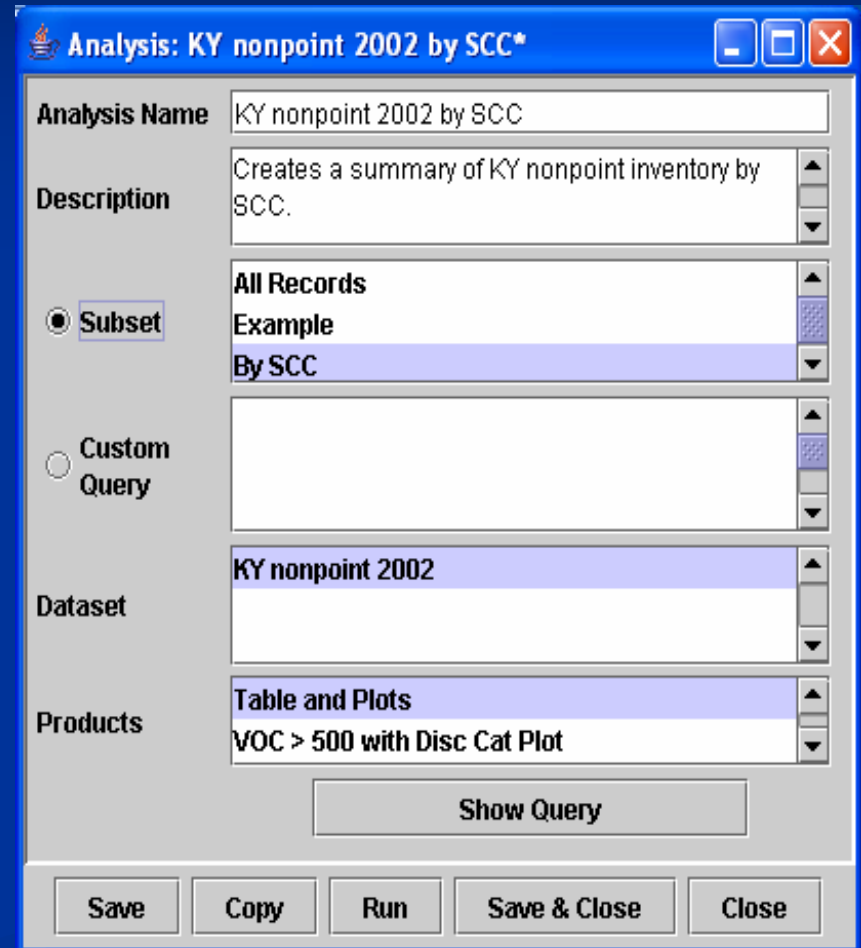|	SCC	VOC	NOX	CO	SO2	NH3
1	2102006000	5.548E02	4.63E04	6.89E03	3.59E01	1.41E02
2	2102004000	1.747E02	2.79E03	6.79E02	1.16E04	7.18E01
3	2102002000	1.363E02	1.31E04	2.93E03	3.10E04	2.90E-01
4	2103006000	6.450E01	2.39E03	4.78E02	1.88E02	1.18E01
5	2103002000	3.603E01	8.20E02	4.95E02	2.51E03	1.00E-02
6	2102006001	1.582E01	7.94E02	1.90E02	1.02E03	
7	2103004000	5.000E00	2.06E02	5.10E01	1.42E03	8.34E00
8	2102007000	1.620E00	8.05E01	2.01E01	1.03E02	
9	2103001000	6.400E-01	1.88E02	1.00E01	7.50E02	
10	2103007000	2.700E-01	5.67E00	1.14E00	7.28E00	
11	2102005000	1.600E-01	2.90E01	2.64E00	8.38E01	
12	2103005000		1.90E-01		5.50E-01	

12 rows : 6 columns

| Description | Load Configuration | Export | Close | Help |

- **From the results table you can sort, filter, show/hide cols, format, create plots, show a description, load/save configuration, export**

Using EmisView to Quality Assure and Visualize Emission Modeling Data
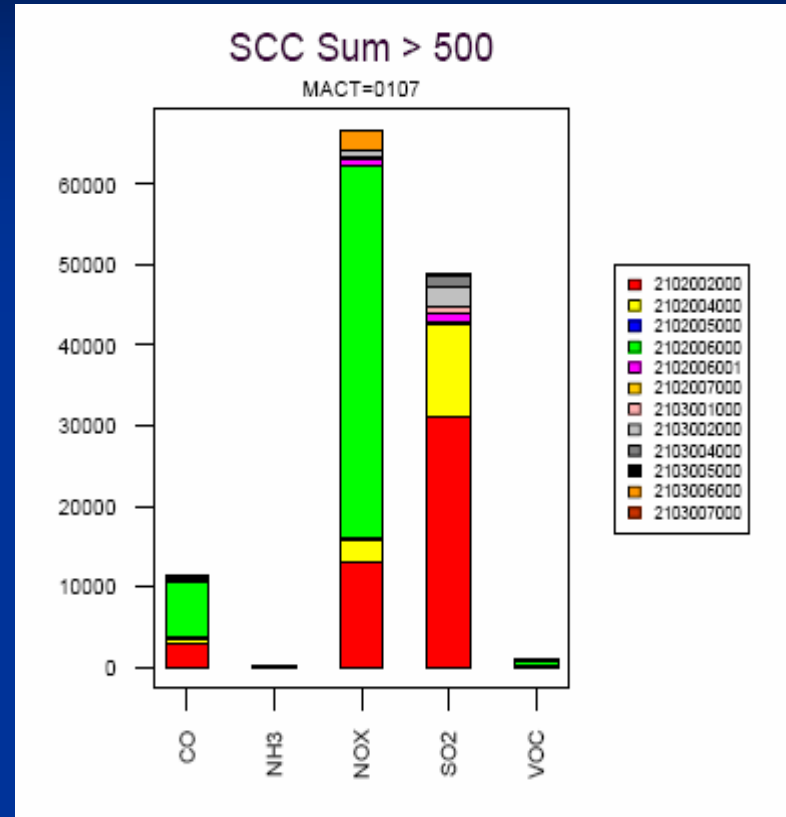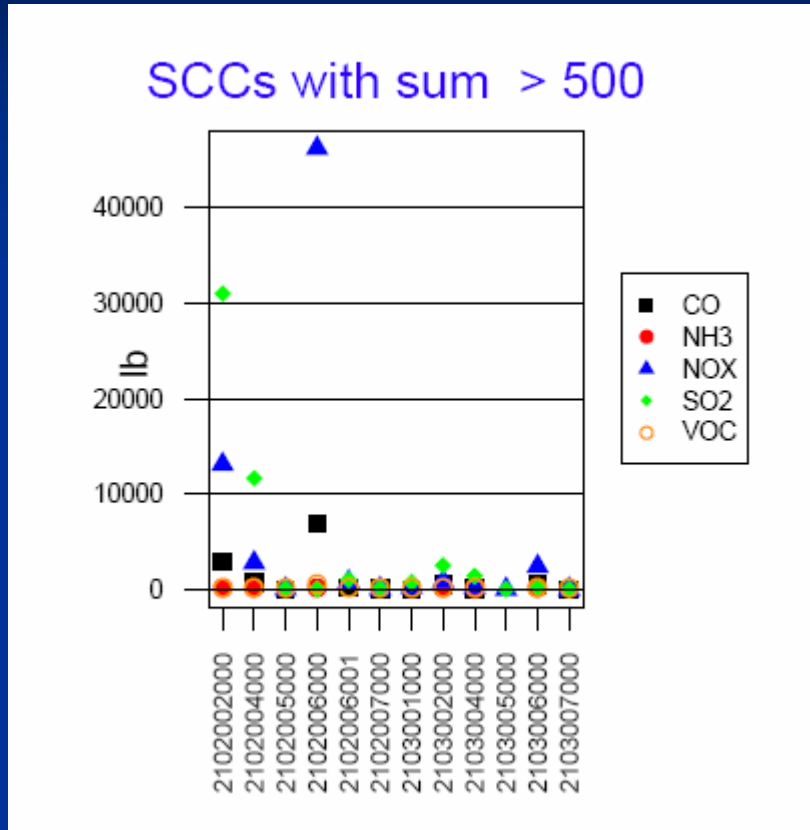
Examples of Plots

Available Plot types: Bar Plot, Box Plot, CDF Plot, Histogram, Discrete Category Plot, Rank Order Plot, Tornado Plot, XY

Using EmisView to Quality Assure and Visualize Emission Modeling Data

Analysis Configuration

- You can save the configuration of your table and the plots you created for later use. For example:
  - Sort by VOC
  - Format columns
  - Show VOC > 500
  - Create two plots
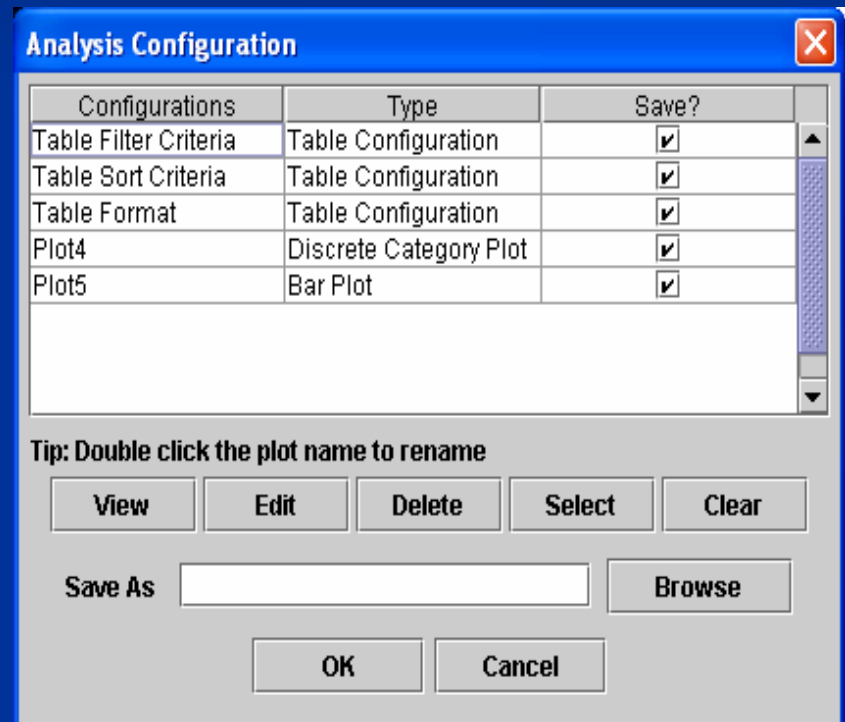
Products

- **Table and Plots is the default product**
- **Custom products can be defined by specifying an analysis configuration**

Product: VOC > 500 with Disc Cat Plot

Product Name	VOC > 500 with Disc Cat Plot
Description	Filters out entries with VOC > 500. Shows a discrete category plot of remaining labeled by SCC.
Configuration File	D:\My Documents\voc_gt_500.cfg	Browse

Save | Copy | Save & Close | Close | Help
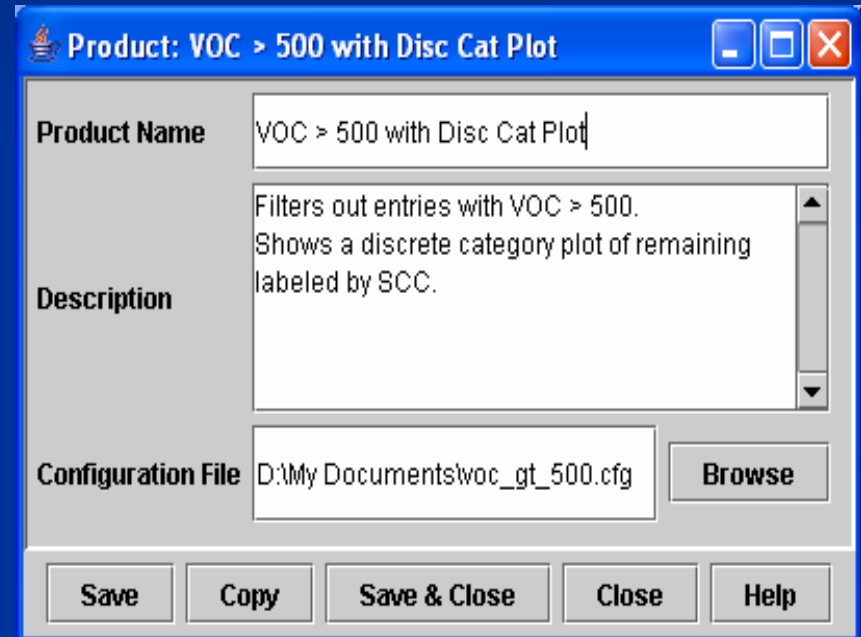
Flexible, Reusable Analyses

- Definition of the Analyses is saved in the database
- Components of analyses are reusable
  - The same subsets can be applied to different datasets
  - Applying different subsets to the same dataset produces different results
  - Results can be shown in different ways using custom products
  - Configuration of products can be saved

Availability

- Version 0.9 available now from http://emisview.sourceforge.net

- Bug reports and feature requests can be submitted to SourceForge

- Runs on Windows and Linux using MySQL or PostgreSQL

- Source code available under GNU Public License

Goals thru December 2005

- Support for Java 1.5
- Streamline process of creating plots
- Add statistics to Results window (e.g., min, max, sum, percentiles, histogram)
- Support "Show Top N" as Product
- Better support for mobile emissions and activity data
- Make analysis configurations more robust and flexible

Using EmisView to Quality Assure and Visualize Emission Modeling Data

Goals through September '06

- Export Shapefiles and create basic geographic plots (e.g. via JUMP)
- Enhanced batch interface
- Comparison of two Datasets (e.g., inventories)
- Importers for intermediate data (e.g. Smkreports), and air quality model-ready data
- Support grouping analyses into Projects
- Track a source through the modeling process

Links

- EmisView: emisview.sourceforge.net
- MIMS: mimsfw.sourceforge.net
- R: www.r-project.org
- MySQL: www.mysql.com
- PostgreSQL: www.postgresql.org
- JUMP: www.vividsolutions.com/jump
- NEI Extended QC Tool: www.epa.gov/ttn/chief/nif