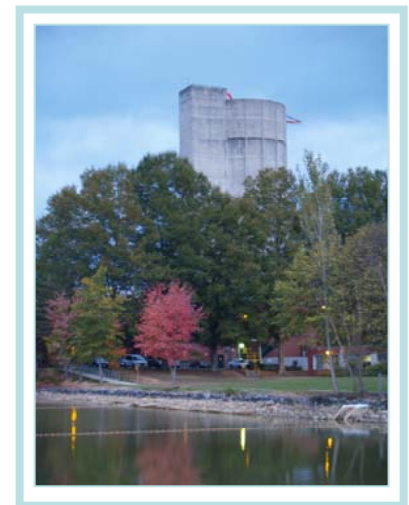
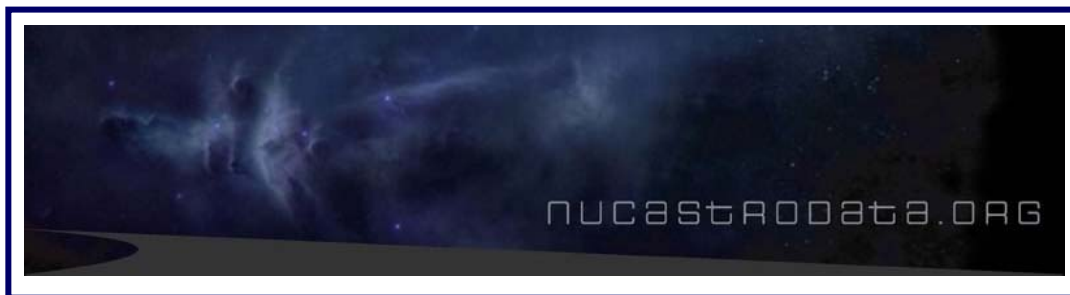




# Nuclear Data Dissemination Efforts for Nuclear Astrophysics & Nuclear Physics at ORNL

Caroline Nesaraja, Eric Lingerfelt,  
Jason Scott, Michael Smith  
ORNL





# Overview

- We have created a number of **specialized, innovative tools** for disseminating nuclear data for astrophysics
- Interface & suite performance have been very well received
- These tools for data manipulation and visualization also work well for **nuclear physics studies**
- Current and future efforts are
  - **Complementary** to work at the NNDC & other USNDP labs
  - can **improve utilization** of data generated by USNDP labs



# Outline

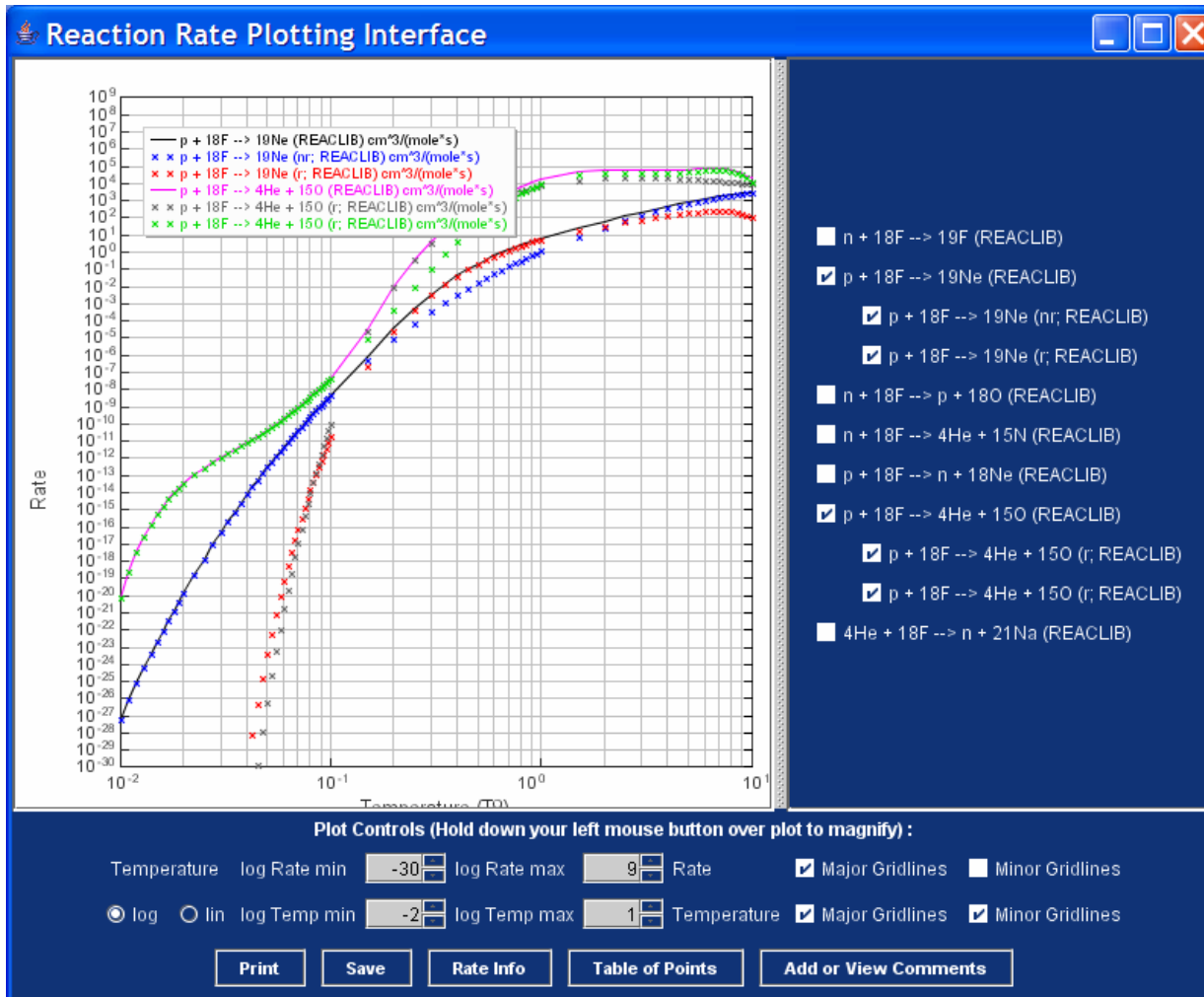
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- • Multipurpose Data Visualization Tools
- • User-Friendly Interface
- • Data Sharing
- • Dataset Commenting
  - Custom Data Set Creation (supplemental)
  - Performance Improvement (supplemental)
  - Future Plans (supplemental)
- • Summary



# Multipurpose Data Visualization Tools

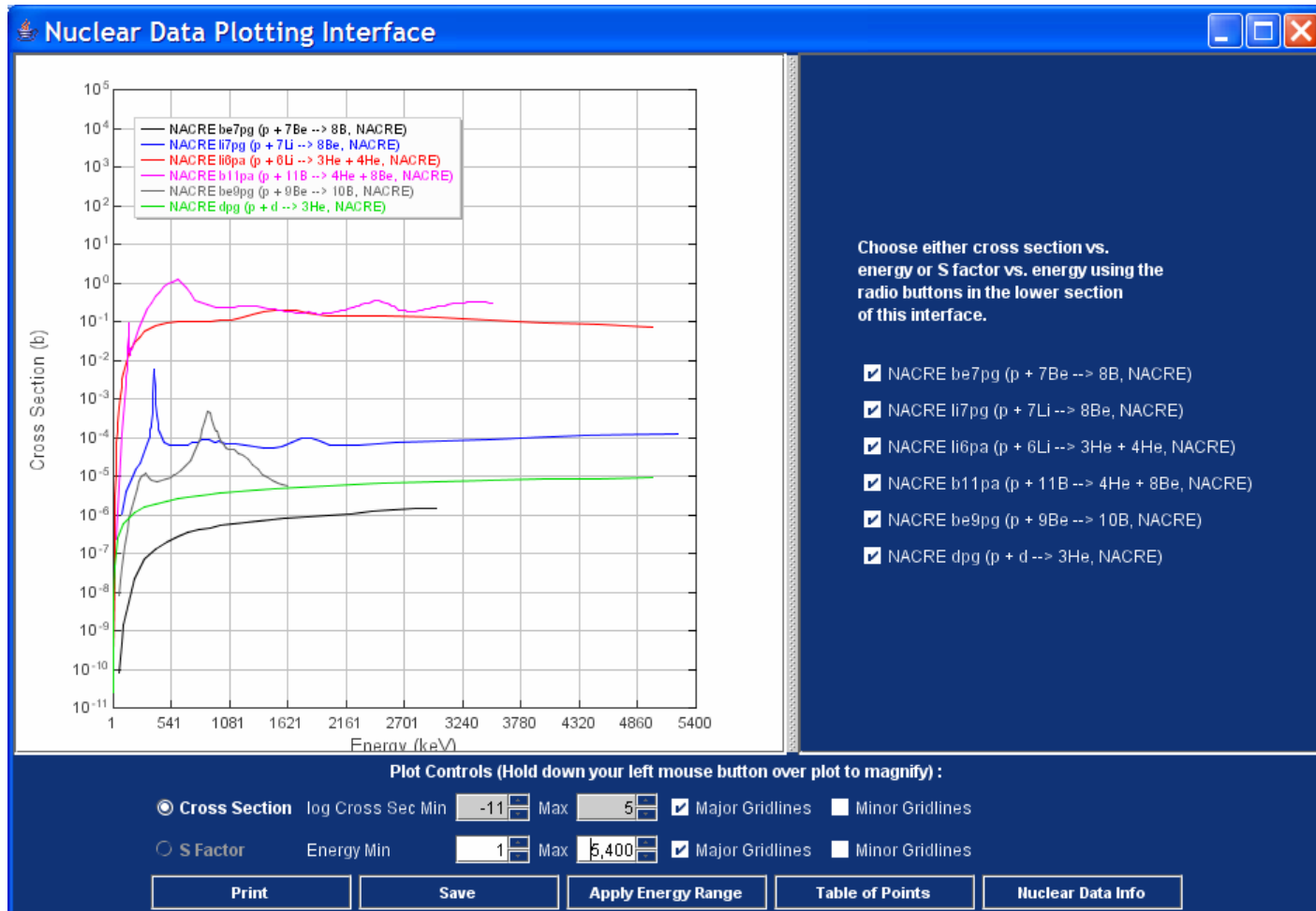
- Example: 1-d plots for reaction rates





# Multipurpose Data Visualization Tools

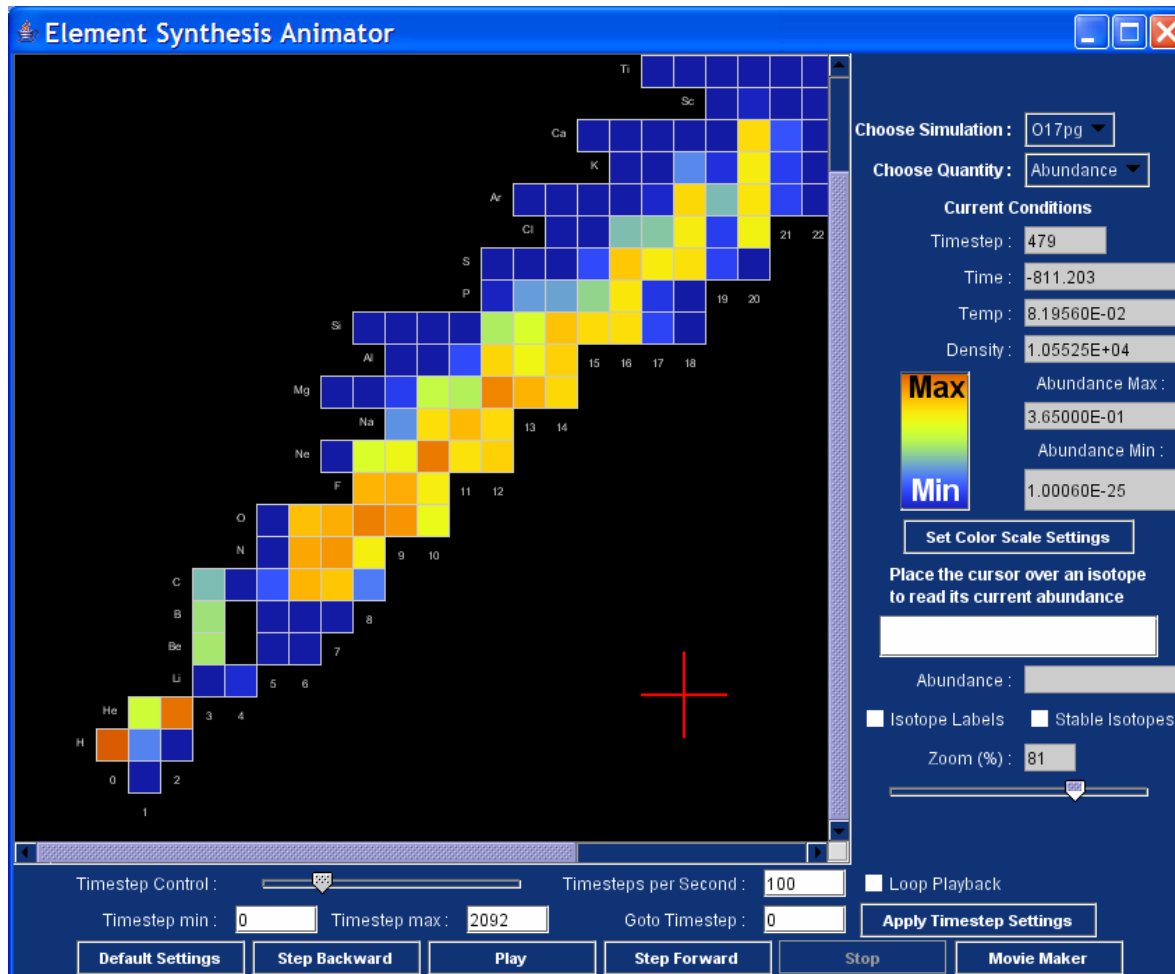
- Example: Similar 1-d plots for cross sections





# Multipurpose Data Visualization Tools

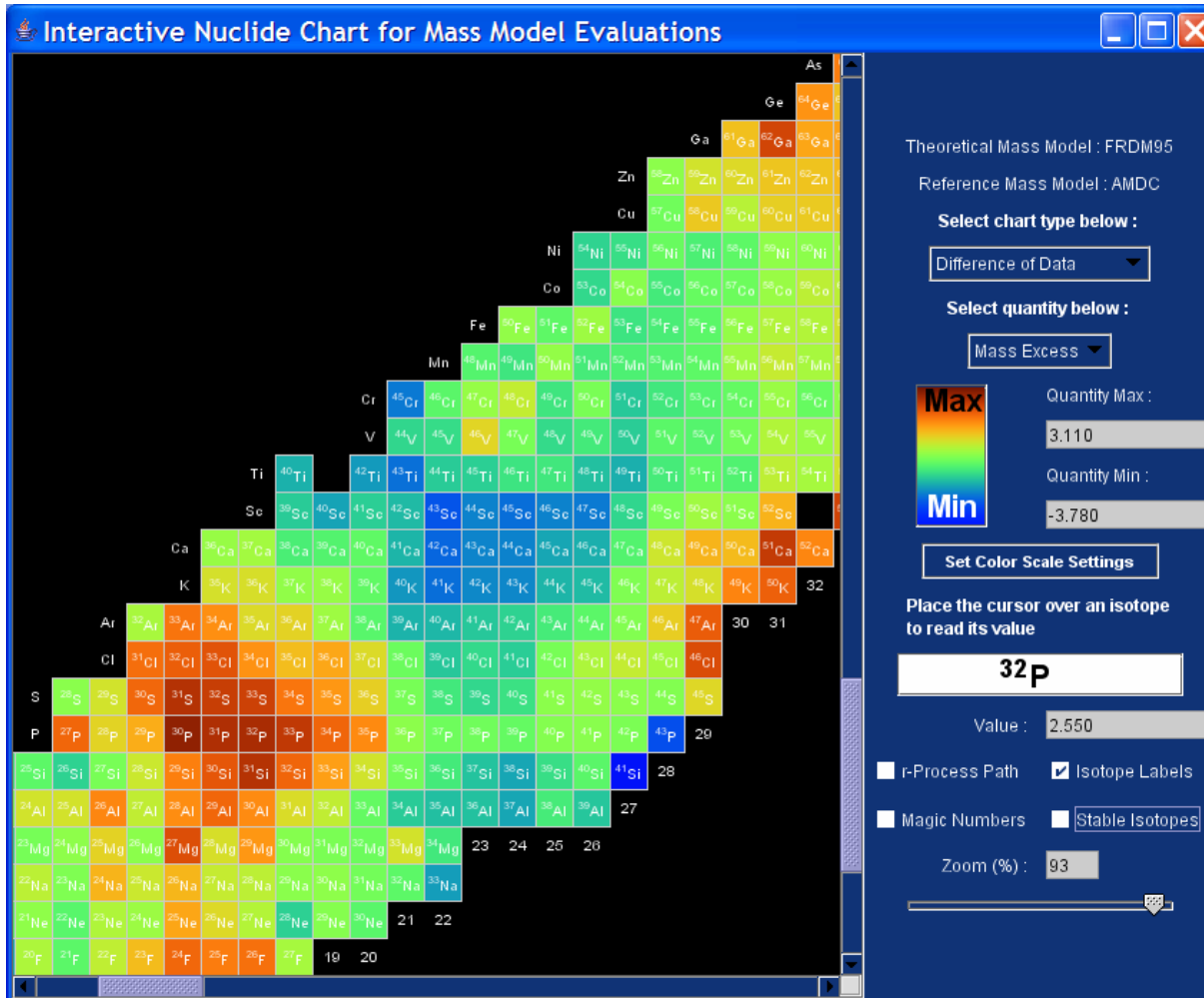
- Example: 2-d nuclide charts for abundances



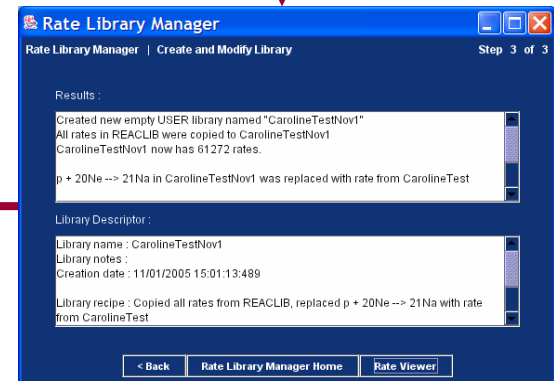
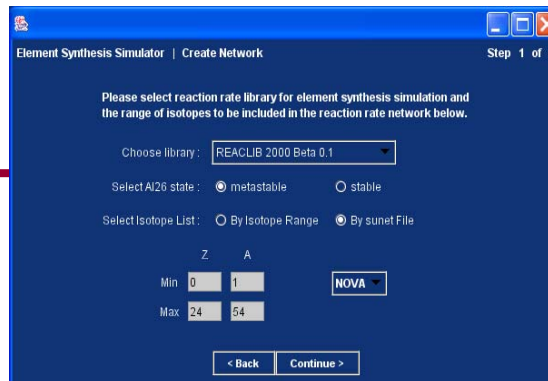
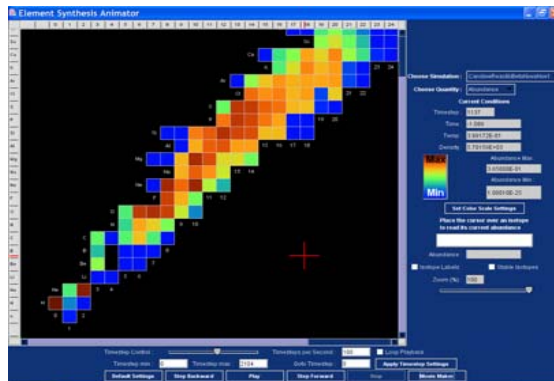
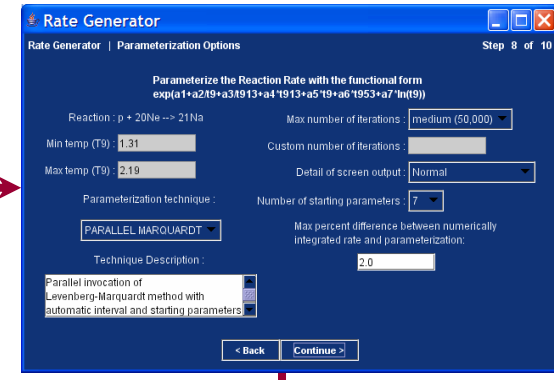
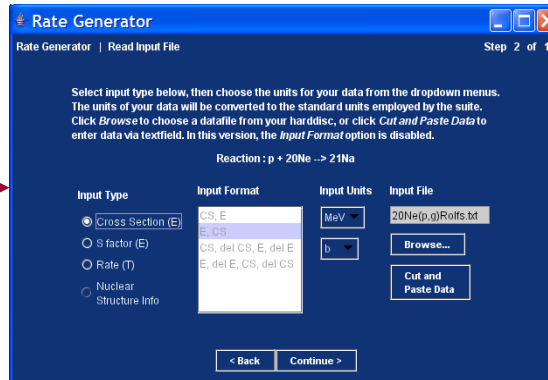
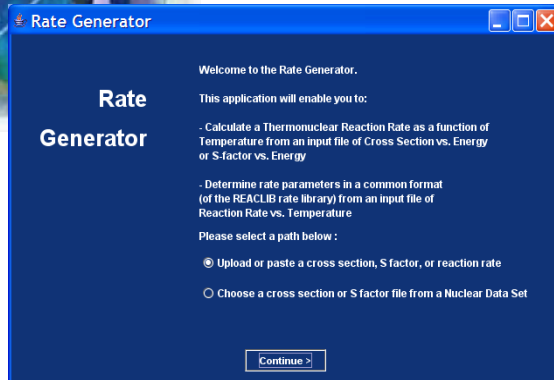


# Multipurpose Data Visualization Tools

- Example: Similar 2-d nuclide charts for masses



# User-Friendly Interface



- “Windows Wizard” approach
  - Step-by-step interface where complex tasks are broken down into simple steps with just a few choices
- Multiple views of accessing data are used
  - Chart of nuclides, file “tree”, text entry ...





# Data Sharing

Rate Library Manager | Create and Modify Library Step 2 of 3

Select reactions from the tree below.

- Libraries
  - User
  - mergerlman
  - newlib
  - p20ne
  - p20nenum
  - JF001
  - CarolineTestLibrary
  - 2test
  - Shared
  - nucastrodata.org Best
  - ORNL Best
  - Sample\_Lib\_1
  - REACLIB 2000 Beta 0.1
  - REACLIB 2000 Beta 0.1 Nova
  - ORNL Canonical-2000-Beta-0
  - ORNL Canonical w Coc F18
  - fixed\_XRB
  - 17fap\_mods\_7
  - 17fap\_mods\_1
  - 17fap\_mods\_2
  - Public
    - REACLIB
    - NACRE
    - Ne
      - 20Ne
      - 21Ne
      - 22Ne
    - Na
    - Mg
      - 24Mg
      - 26Mg
    - Al

Rate list for modified base library CarolineTest

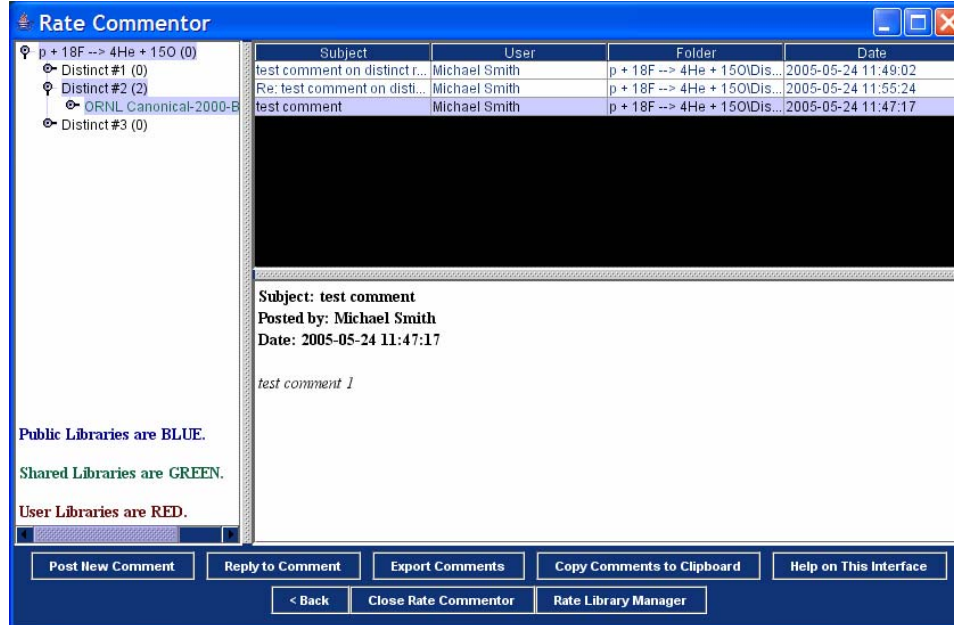
liadis

- Help build an online community where users can share information with a few mouse clicks
- Three classes of datasets
  - User** - the private data sets, can be accessed and modified only by the user
  - Shared** - shared with all users, can be accessed by all, modified by suite coordinator only
  - Public** - “official” data sets that can be accessed by all, modified by none

Remove Selected Rate    Add Selected Rate

< Back    Continue >

# Dataset Commenting



The screenshot shows the 'Rate Commentor' web interface. On the left, a tree view shows a hierarchy of folders: 'p + 18F --> 4He + 15O (0)', 'Distinct #1 (0)', 'Distinct #2 (2)', 'ORNL Canonical-2000-B', and 'Distinct #3 (0)'. The main area displays a table of comments:

Subject	User	Folder	Date
test comment on distinct r...	Michael Smith	p + 18F --> 4He + 15ODis...	2005-05-24 11:49:02
Re: test comment on disti...	Michael Smith	p + 18F --> 4He + 15ODis...	2005-05-24 11:55:24
test comment	Michael Smith	p + 18F --> 4He + 15ODis...	2005-05-24 11:47:17

Below the table, a detailed view of a comment is shown:

Subject: test comment  
Posted by: Michael Smith  
Date: 2005-05-24 11:47:17

*test comment 1*

Public Libraries are BLUE.  
Shared Libraries are GREEN.  
User Libraries are RED.

At the bottom, there are several buttons: 'Post New Comment', 'Reply to Comment', 'Export Comments', 'Copy Comments to Clipboard', 'Help on This Interface', '< Back', 'Close Rate Commentor', and 'Rate Library Manager'.

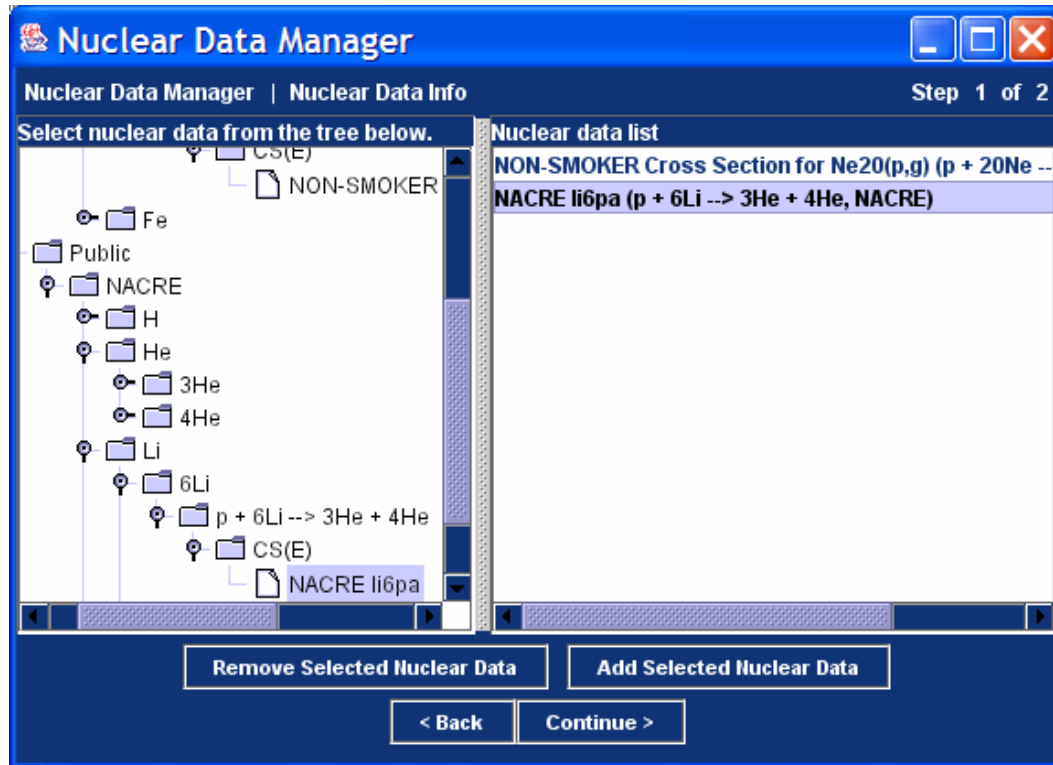
- Email - type interface where users comment on datasets
- Browsing allowed on comments on shared & public datasets
- Has a tutorial-like function - novices can read comments by experts
- Serves for **consensus-building**: enables decisions on “best” datasets to be more quickly determined



# Summary

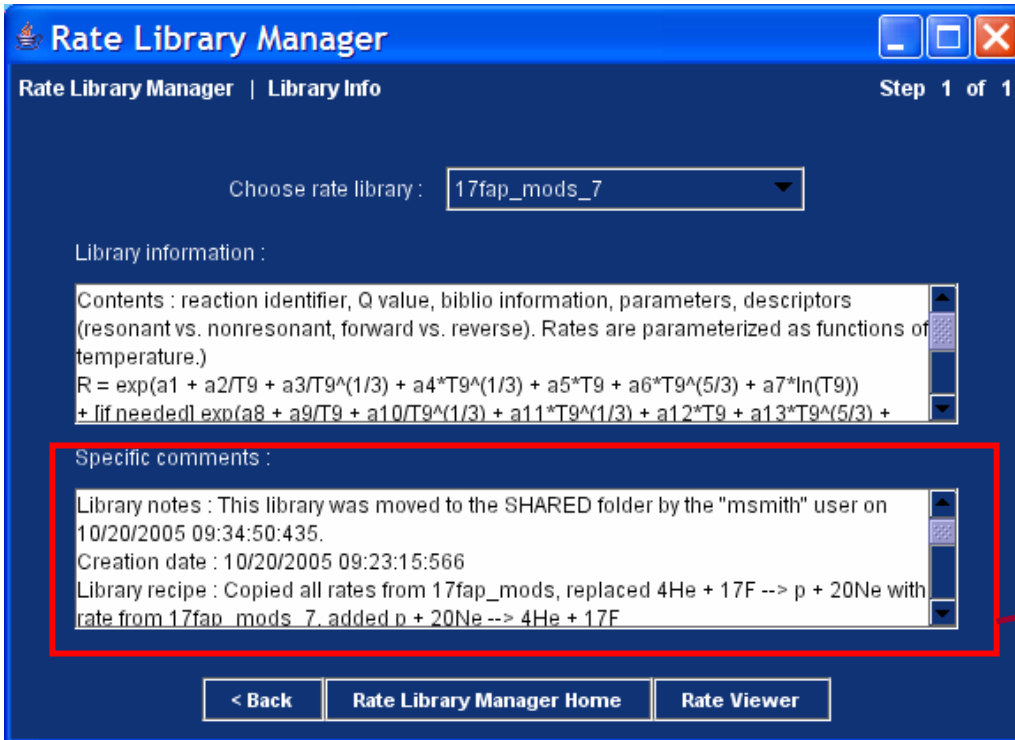
- We have created a number of specialized, innovative tools for **disseminating nuclear data** for astrophysics studies
- Interface & performance have been very well received
- These tools for data manipulation and visualization can be utilized for nuclear physics studies as well
- Our efforts are
  - **Complementary** to work at the **NNDC** & other **USNDP** labs
  - **Can improve utilization** of data generated by **USNDP** labs

# Custom Data Set Creation



- Graphical user interfaces enabling datasets to be **combined** into libraries
- Set of **file management tools** working on both libraries and their components

# Custom Data Set Creation



Rate Library Manager | Library Info Step 1 of 1

Choose rate library :

Library information :

Contents : reaction identifier, Q value, biblio information, parameters, descriptors (resonant vs. nonresonant, forward vs. reverse). Rates are parameterized as functions of temperature.)

$$R = \exp(a1 + a2/T9 + a3/T9^{(1/3)} + a4*T9^{(1/3)} + a5*T9 + a6*T9^{(5/3)} + a7*\ln(T9))$$

+ if needed  $\exp(a8 + a9/T9 + a10/T9^{(1/3)} + a11*T9^{(1/3)} + a12*T9 + a13*T9^{(5/3)} +$

Specific comments :

Library notes : This library was moved to the SHARED folder by the "msmith" user on 10/20/2005 09:34:50:435.  
 Creation date : 10/20/2005 09:23:15:566  
 Library recipe : Copied all rates from 17fap\_mods, replaced 4He + 17F --> p + 20Ne with rate from 17fap\_mods\_7. added p + 20Ne --> 4He + 17F

< Back    Rate Library Manager Home    Rate Viewer

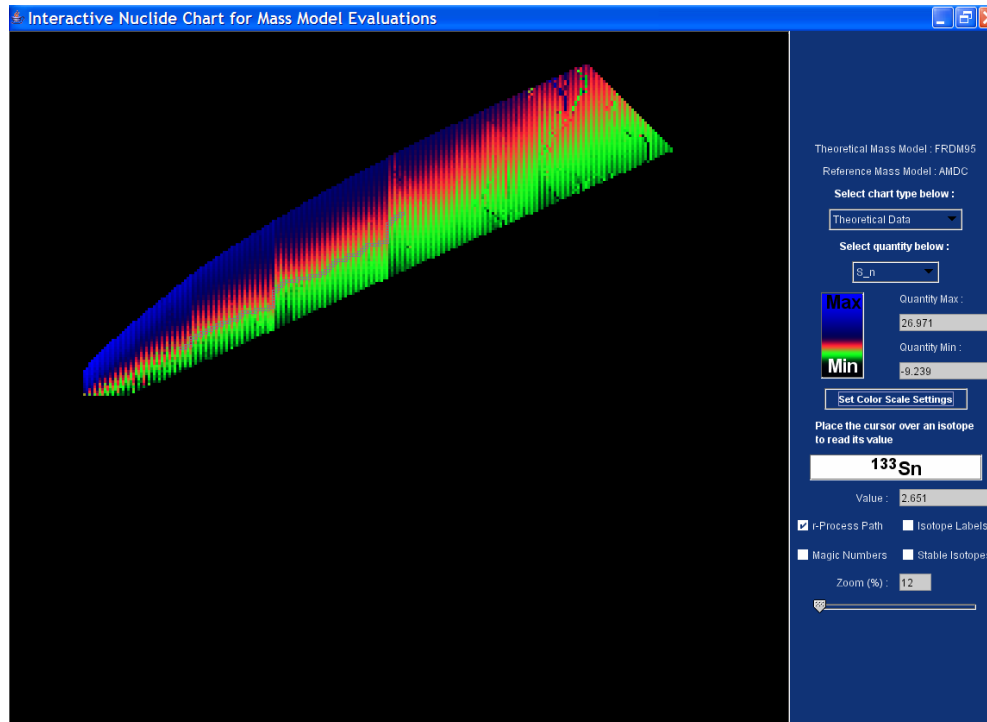
Library recipe

- Efficient algorithms make combining libraries easy
- Robust “recipes” are automatically generated to enable others to recreate these libraries
- Recipes & archive system enable datasets to be referenced in publications

# Performance Improvement

- **Compression** used to speed transfer of large data files from our server to the client
  - exported rate libraries, abundance & reaction flux data for astrophysical simulations
- Use of **efficient graphics algorithms**
  - Smooth rendering when zooming in/out
  - Graphics update in near real time during animation playback
- Use of **indexing** in data structures for fast retrievals & searches
  - Retrieval of reaction rate information

# Future Plans



- Expand functionality of mass model evaluator
- Add theoretical cross section calculation tool to enable generation of large sets of reaction rates
- Additional features suggested by our international community of users