

# Scientific Workspaces of the Future (SWOF)

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Ag Retreat, June 2004



# SWOF Mission

- Deploy advanced collaborative workspaces to support teams of scientists
  - AG systems
  - Advanced visualization services
  - Large scale displays
  - New collaborative tools



# SWOF Goals

- Use advanced computer mediated communications techniques to enhance work environments to enable increased productivity for collaborative work.
- Exploit the use of high-performance computing technologies (digital media, advanced networking, visualization, VR, etc.) to improve the effectiveness of large-scale collaborative work environments.
- Show that network based advanced collaboration technology can create enhanced groupwork productivity benefits



# SWOF Users

## – Computational Biology

- Argonne
- NCSA
- ORNL

## – Atmospheric Modeling

- NCSA
- NCAR
- SSL



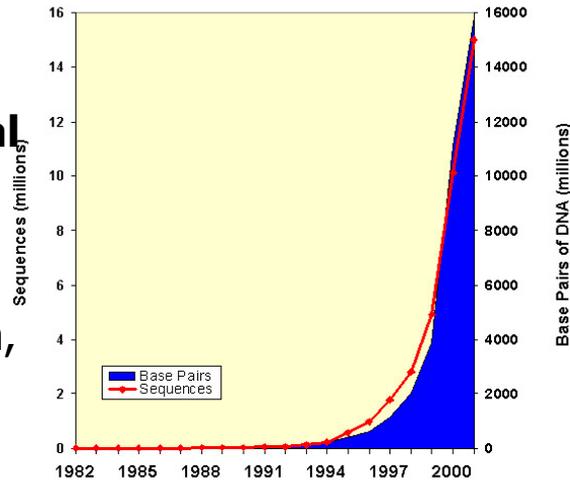
# Why Biotechnological Revolution?

- **High-throughput technologies provide huge amounts of biological data:**

- Sequence data
- Data describing functional Networks (Metabolism, Regulation, Gene Expression)
- Dynamic data

- **Progress of Computer Science and Computer Technologies and Bioinformatics allows to analyze this data**

Growth of GenBank



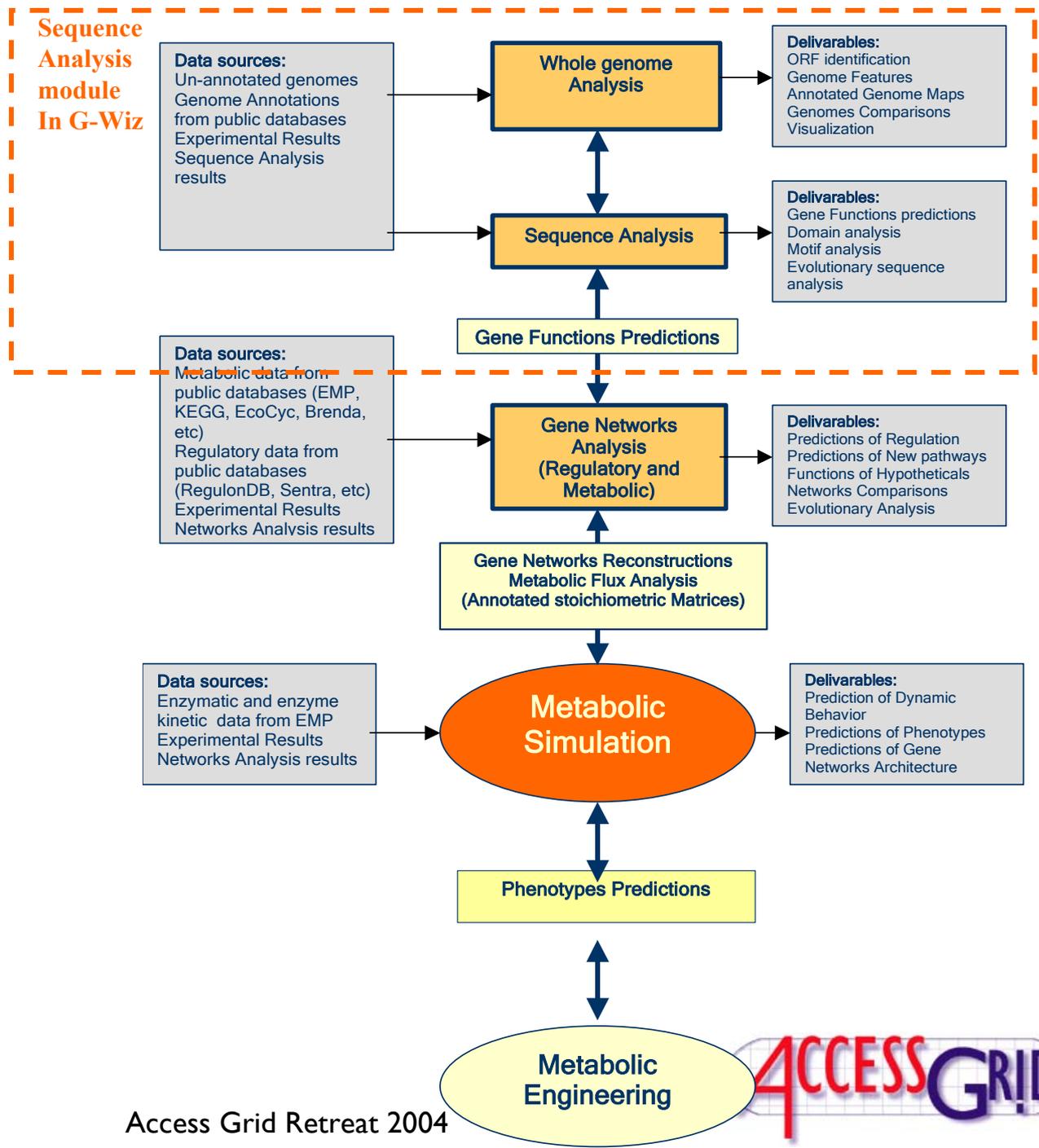
Hmmm...

- 98 published genomes
- 652 on-going genomes

## Stages of analysis:

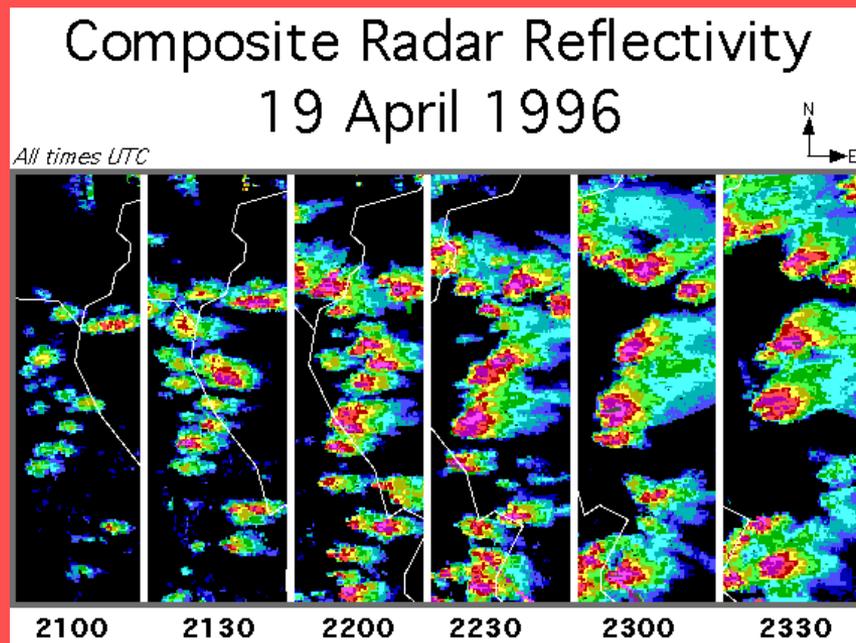
- Determine components of the system (assign functions to the genes)
- Establish relationships between components (static model)
- Develop dynamic model of the system

## General Project Architecture



# Scientific Scenarios: Storm Interaction

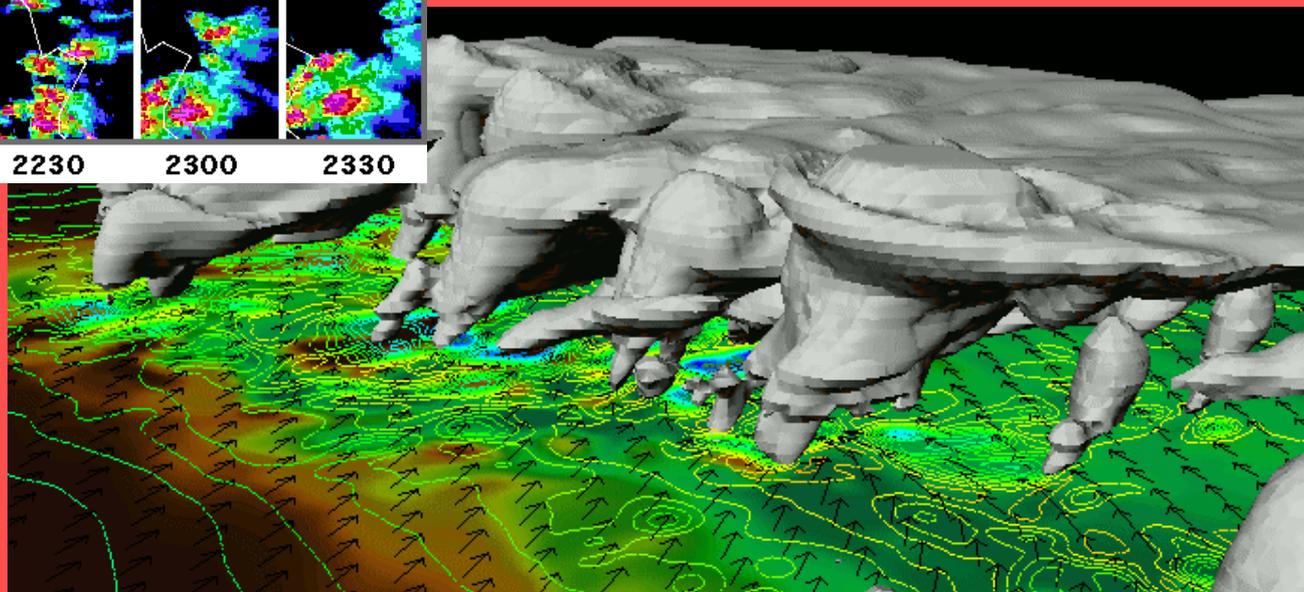
## April 1996 Tornado Outbreak



Real World

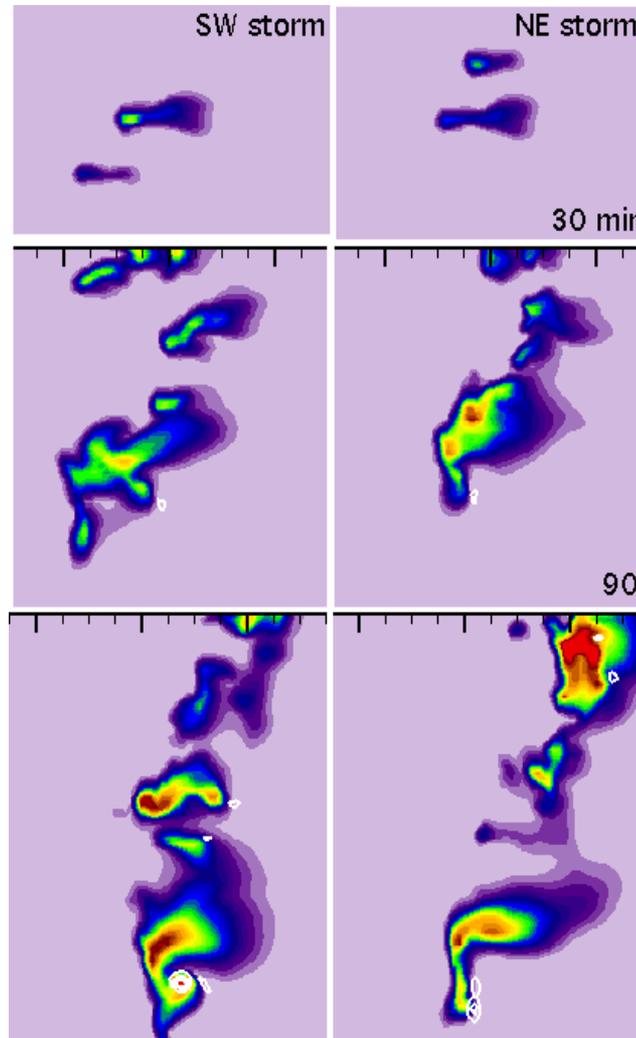
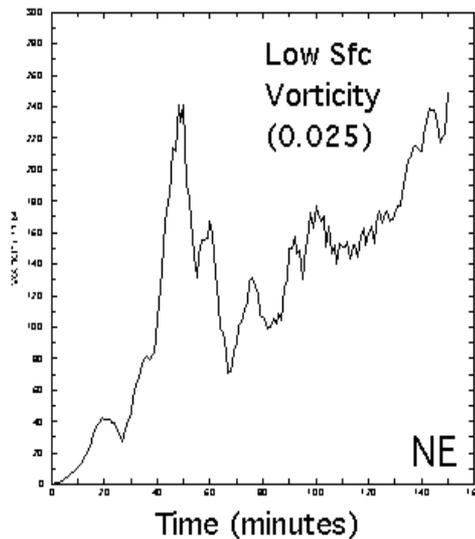
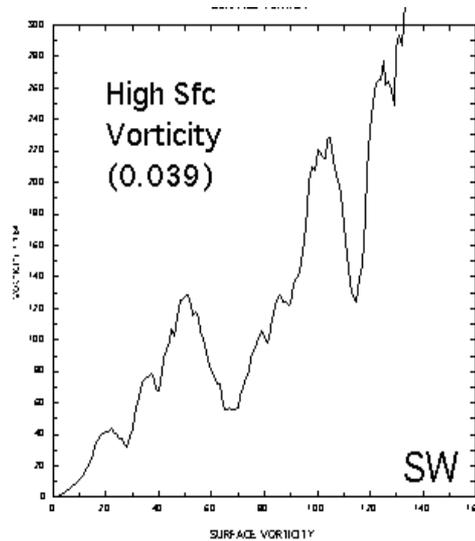
*1 km MM5, real data initialization*

Model →



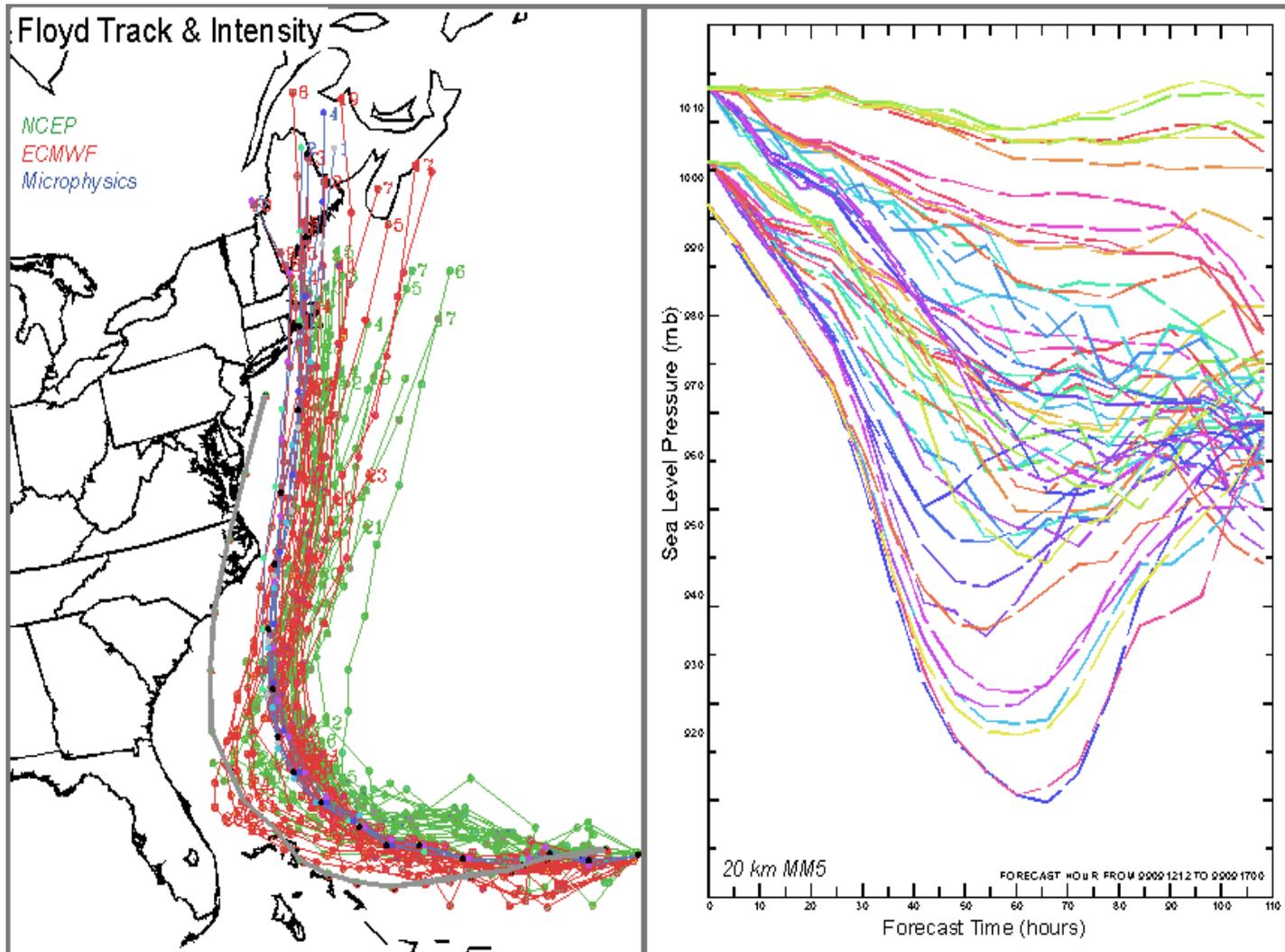
Jewett and Wilhelmson

# Visual Comparison of Pairs of Simulations



2 km rainwater (fill), vorticity (contour)

# Hurricane Ensemble (Suite) Visualization

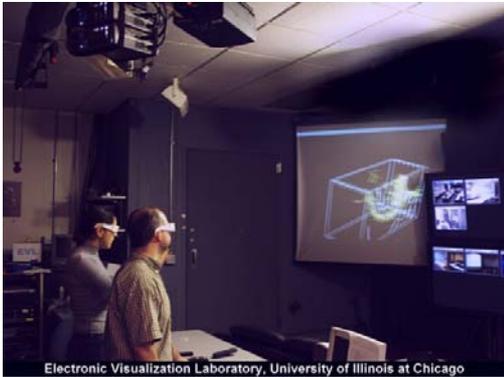


# User wish lists

- Applications as services
- Legacy App integration (i.e. BIOCORE)
- Viz interface for NAMD
- Group Annotation (EJ)
- Remote Viz Integration
- Database integration
- Collaborative Workflow
- Workflow construction
- Convenient, always on
- Easy display capability to show ideas
- Temporary group formation
- Provide tutorials
- Data Mgmt, mining
- Collab Viz
- Education
  - Animated presentations
- I on I interactive analysis
- group to group analysis
- Collab decision making – workflow
- AG - Hi res office display integration
- Tie into Earth Systems Grid with NCAR Graphics

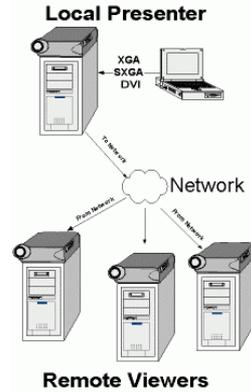


# SWOF Technology



Electronic Visualization Laboratory, University of Illinois at Chicago

## GeoWall



Remote Viewers

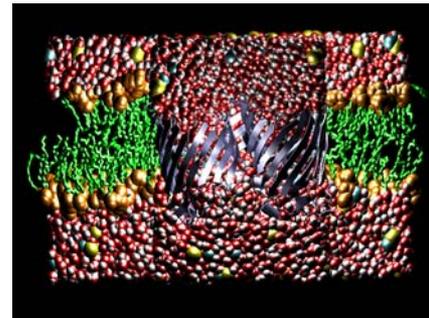
## TeraVision



## Tiled Displays



## Access Grid



High  
Performance  
Visualization  
Software



# SWOF Technology

- Challenges

- Independent devices – Independent Software
  - unique interfaces
  - Different functionality
- Different implementations
  - i.e. overlap vs edge butt displays or Linux vs NT clusters
  - Stereo or not
- Not designed to work together
- Need to know “secrets” of each one

- Solutions

- Overlay a common architecture
  - Standard interfaces
  - Hide Differences
  - Transcode as possible/necessary
- Provide discovery and use methods
- Enable transparent use, i.e. drag’n drop interfaces



# SWOF Strategy

## Deploy Collaborative Virtual Venues, Nodes

- Virtual Computational Molecular Biology Laboratory
  - Provide access to genomic and molecular biology databases and computational tools.
  - The computational biologists prioritize the specific selection of tools and databases.
  - SWOF Tech team integrating these tools into the AG infrastructure.
  - Enable one or more existing distributed collaborations to begin working together via the Virtual CMB Laboratory on a regular basis
  - Incorporate this into teaching and training environments. (ANL, NCSA, ORNL)
- Virtual Atmospheric Modeling and Simulation Laboratory
  - Provides group access to Grid based simulation and modeling tools
  - Focus on climate and weather modeling, sample datasets useful for education and training.
  - The Virtual AMS Laboratory provides a point of contact for collaborative analysis of large-scale output from climate simulations



# SWOF Computational Biology



Access Grid Retreat 2004



# SWOF BIO Node



# SWOF Strategy:

## Provide Enhanced Access Grid Virtual Venue services

- Persistent support for documents, locally hosted and remote applications, databases, and other tools
- Grid based access to domain-oriented problem solving environments.
- Virtual venues (VV) provide a mechanism to create associations of tools and data resources that are bound to virtual locations.
- The virtual venue server provides a point of contact for registering applications and services associated with a particular virtual location, which can be visited via an Access Grid node (e.g. group oriented node or the new personal interface node).
  - This capability can be used to build virtual project rooms that make available to a user community persistence access to datasets, computational and analysis tools, shared documents and notebooks, access to remote sites via video, audio and text services and access to recorded sessions of previous interactions.
- Virtual venues can also provide persistent access to group oriented Grid Portals (IU).



# SWOF Strategy:

## Develop and Deploy Visualization Services

- Virtual Venues support access to high-performance remote visualization services.
  - Grid based versions of ParaView (LANL),
  - ANL Volume Render (ANL),
  - VisBench (NCSA), etc.)
- Enable remote coupling of visualization servers
  - TeraGrid with network attached Tiled Displays
  - Specially configured AG nodes (nodes that have graphics accelerators installed on the display nodes, ANL, EVL).
  - Grid based version of Chromium (ANL, LANL) to support network-based visualization.



# SWOF Strategy:

## Integrate Advanced Displays

- Tiled Displays become active components of first class Access Grid nodes
  - NCSA Powerwall
  - ANL Active Mural
- GeoWall integration
  - Shared image viewing
  - RasMol
- BU Tiled passive stereo display



# SWOF Strategy: Develop and Deploy Tools

- AG 2.0 Shared APP framework
- Shared Movie Viewer
- Shared RASmol
- Shared Browser
- Shared PPT
- Shared Image viewer and Annotation (NCSA)
- Shared TD Image Viewer
- Integrated VNC app
- Condor Integration
- PARAvue (LANL)
- RDP Client Viewer on TD
- Speaker activated windowing (BU)
- Teravision (EVL)
- Desktop AG
- Closed Captioning (UW)



# SWOF Usage

- Atmospheric Research
  - UIUC, NCAR, SSL
  - Weekly meetings including ANL, LBNL, ORNL and Earth Systems Grid
  - Gentner audio bridging brings in individuals and those on travel
  - Monthly meetings – 15 20 people, ½ day
  - Cross campus use – 10 nodes
  - Use EBEAM whiteboard, shared app tools



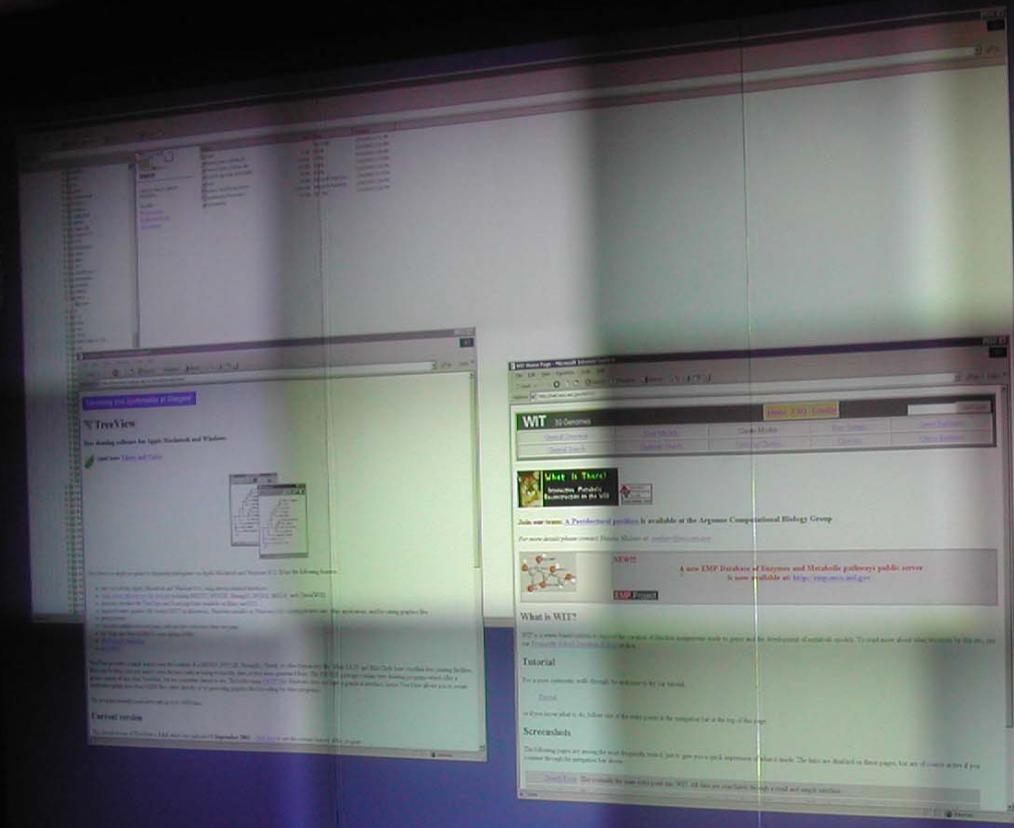
# SWOF Usage

- **Biology**
  - NCSA, ANL, ORNL
  - Regular meetings, tutorials
  - Shared RASmol
  - Tiled Display
  - Involving structural biology
  - Need Portal integration



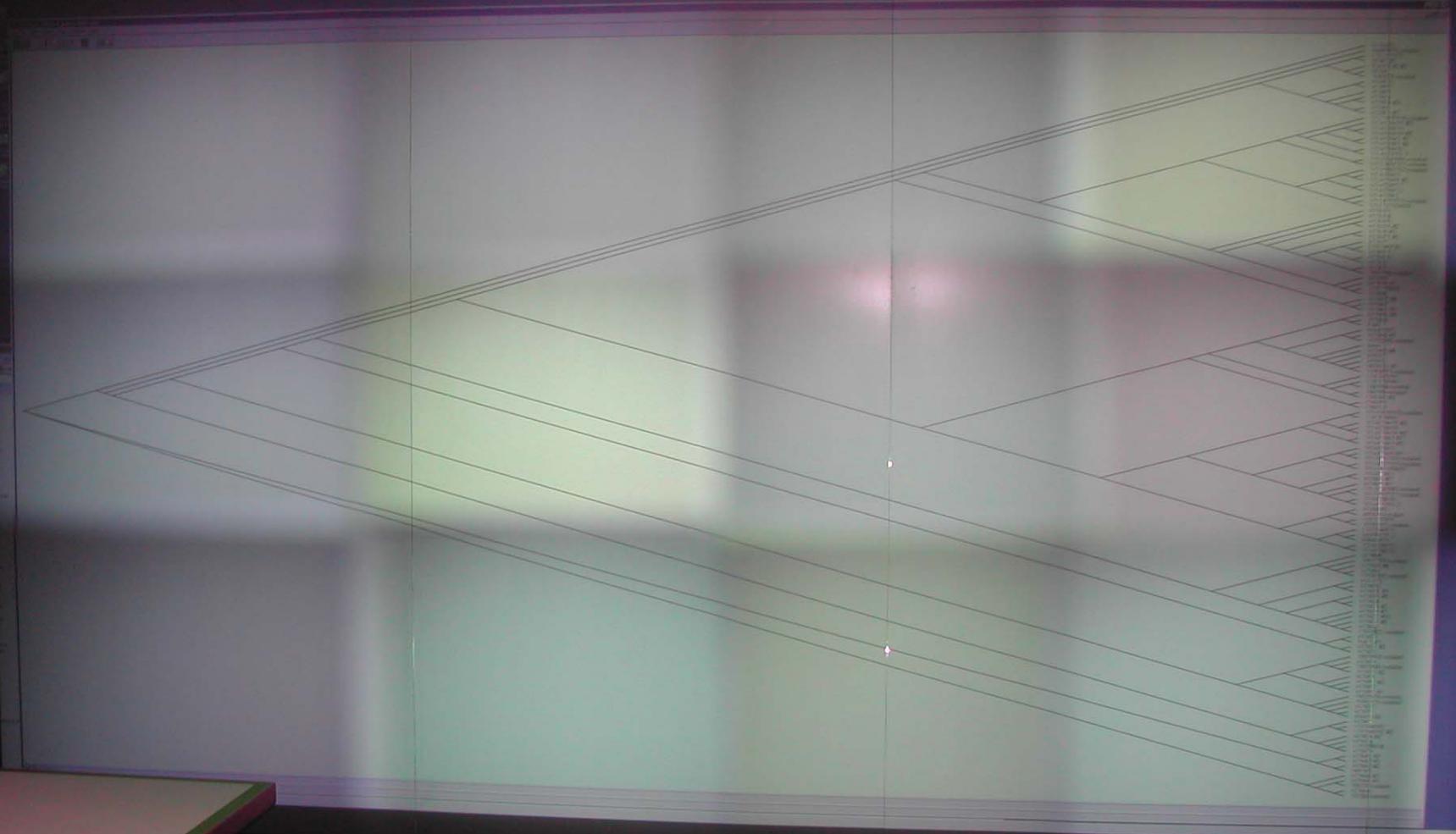


ActiveMural



ActiveMural



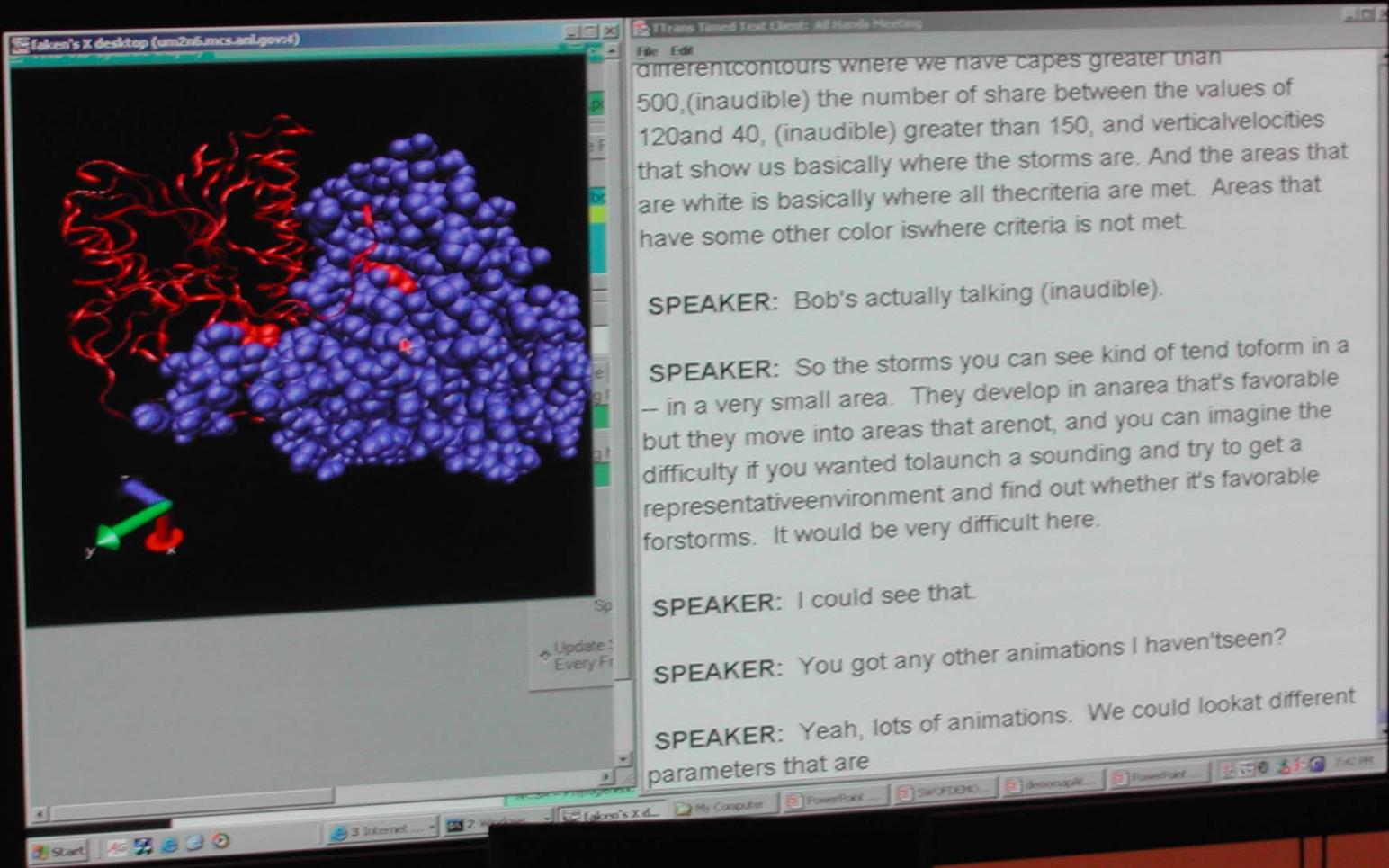


A small table in the foreground with a laptop and a mobile phone on it.

ActiveMural







Falken's X desktop (um2n6.mcs.anl.gov:4)

File Edit

different contours where we have capes greater than 500, (inaudible) the number of share between the values of 120 and 40, (inaudible) greater than 150, and vertical velocities that show us basically where the storms are. And the areas that are white is basically where all the criteria are met. Areas that have some other color is where criteria is not met.

SPEAKER: Bob's actually talking (inaudible).

SPEAKER: So the storms you can see kind of tend to form in a – in a very small area. They develop in an area that's favorable but they move into areas that are not, and you can imagine the difficulty if you wanted to launch a sounding and try to get a representative environment and find out whether it's favorable for storms. It would be very difficult here.

SPEAKER: I could see that.

SPEAKER: You got any other animations I haven't seen?

SPEAKER: Yeah, lots of animations. We could look at different parameters that are

Start | Internet | My Computer | PowerPoint | SWOFFO... | dencompil... | PowerPoint | 7:42 PM

# Thanks

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