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Basin Resilience to Extreme Events
in the Lake Champlain Basin

Cyberinfrastructure Update

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Your Cyber Team

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- Manager, Cyberinfrastructure and Partnerships
  - Patrick Clemins
- Software Developers
  - Scott Turnbull
- Technologist
  - Steve Exler
- Collaborators
  - UVM Enterprise Technology Services (ETS)
  - CISL @ NCAR

Our Support Roles

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- **Data Collection:** Support the collection and management of data from the soil, stream, and lake sensor networks and social systems surveys
- **BREE Domain Scientists:** Provide software development and data management expertise for building and calibrating the component models of the IAM
- **The IAM Effort:** Build the connectivity between the component models and the necessary cyberinfrastructure to effectively run the IAM
- **Collaboration:** Develop and maintain video conferencing capabilities, data management and sharing policies, and our Macroinvertebrates mobile app

Core CI Resources - Hardware

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- Compute
  - Babbage – Dell PowerEdge R820 compute server
    - 32/64 CPU cores, 256 GB RAM
  - Pascal – NVIDIA DXG-1 GPU compute server
    - 40/80 CPU cores, 512 GB RAM, 28672 NVIDIA CUDA cores (8x Telsa GP100)
  - Cheyenne / XSEDE (i.e. Xstream)
    - National high performance computing (HPC) resources
- Data Management
  - Aquarius – Aqaurius hydrology database server
  - Leopold – LoggerNet Admin and Aquarius workstation
- Data Storage
  - epscorfs – 100TB network storage

Past Year's Progress

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- Data Collection
  - Soil sensor network and lake profiler data available in Aquarius
  - Researchers can now directly import Aquarius data into R for analysis
- IAM Advancements
  - Improved support in IAM for Daymet climate data (Jory's climate perturbation runs)
  - CSV output includes more RHESSys and Lake Model outputs
  - New NCAR allocation received for climate modeling and IAM runs
- Component Models
  - Jory's RHESSys post-processing script to improve extreme event modeling
  - New version of RHESSys (Linyuan's) partially integrated
  - New lake model is configured on Babbage, along with GUI to analyze data
- Collaboration
  - ownCloud containerized and upgraded to 10.x from 7.x

Integrating New RHESSys

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- Not just new version of RHESSys…
  - Updated soil and vegetation definitions
  - Updated patch layout
  - More climate station locations
  - Tracks carbon, nitrogen, and phosphorus through the watershed
  - New framework for implementing nutrient loading events
- Currently, 2001 landuse and discharge integrated
- Soon…
  - IAM Linkage with ALL ABM landuse changes
  - Nutrient tracking and triggering of nutrient-related events

New Lake Model: AEM3D / HydroHub

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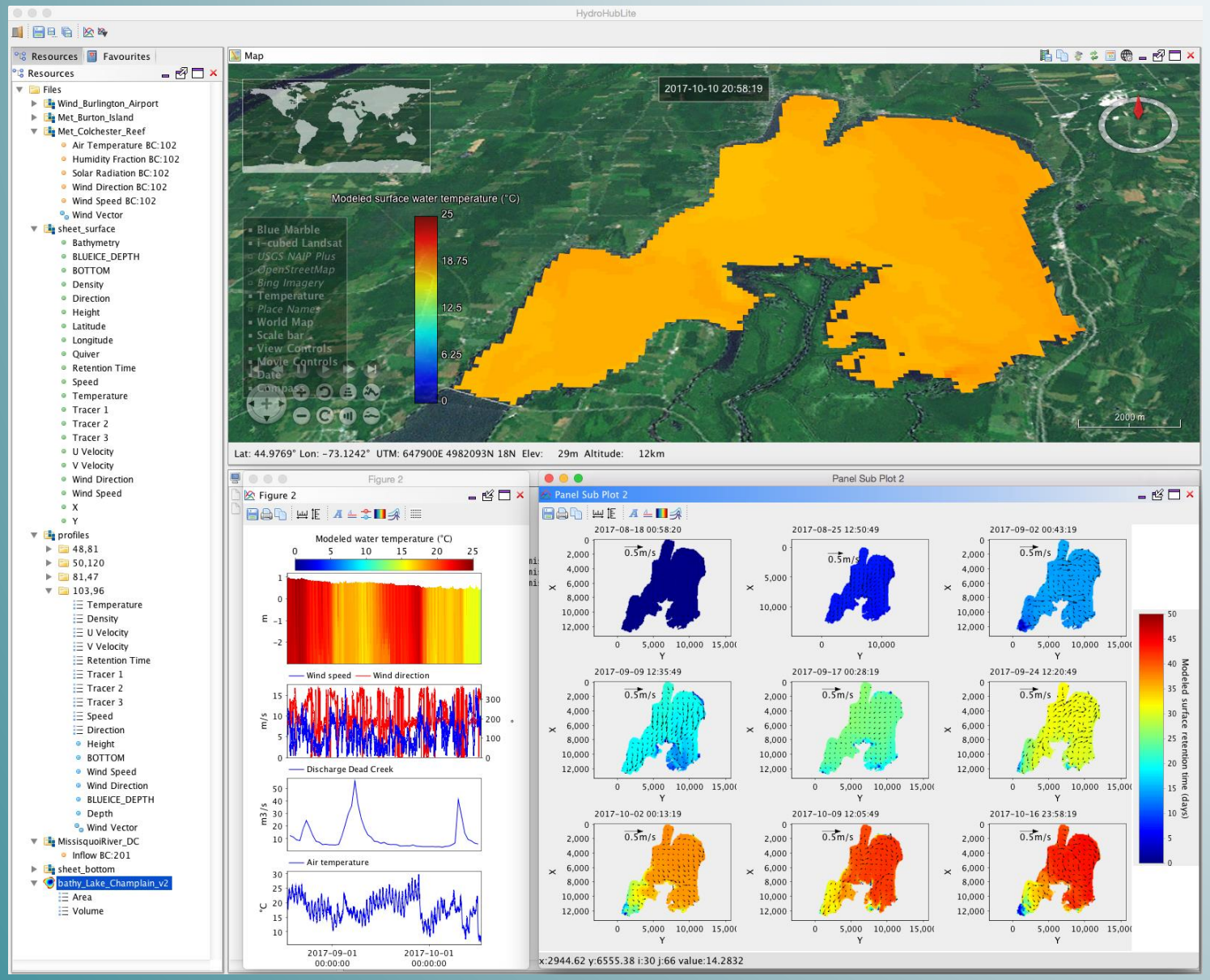

Screen Shot Credit:
Clelia Marti De Ocampo

IAM Run Status

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- 50 Year / Climate Change and Legacy Phosphorus
  - Paper submission in June
- Phosphorus Load Estimation
  - 52 Scenarios finished and being analyzed
- Climate Variability Perturbations
  - 144 Scenarios finished and being analyzed
- 100/60 Year / Lags and Inertia
  - Time-variable P loading runs about to start
- BMP Implementation and Efficacy
  - Details being finalized, IAM code modifications underway

On the Horizon

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- Data Collection
  - Next generation Aquarius software?
- Hardware Maintenance
  - Upgrade Babbage's OS to newer version of RHEL (7 or 8)
- IAM
  - Make ucar_client_worker and ucar_server more robust to unexpected conditions and allow dynamic packaging of jobs
  - Add scenario types for Liz's runs (BMP Implementation and BMP Effectiveness)
  - Implement finer control over dates and feedback timeframe of IAM execution
- IAM Component Models
  - Finish Linyuan RHESSys integration (ALL ABM link)
  - Version 0.0 of bias-corrected dynamically-downscaled climate data
  - Integrate new lake model
  - Transition LULCC ABM model to GPU-enabled FLAME framework

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Discussion

IAM / Cyberinfrastructure