Pacific Northwest
NATIONAL LABORATORY

Update: Global Coordination for Forecast Model Improvement & Energy Forecast Metrics in NWP Models

Will Shaw
Pacific Northwest National Laboratory
Richland, Washington

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Task 36 Objectives & Expected Results

Task Objective is to encourage improvements in:
1) weather prediction
2) power conversion
3) use of forecasts

Task Organisation is to encourage international collaboration between:
- Research organisations and projects
- Forecast providers
- Policy Makers
- End-users and stakeholders

Task Work is divided into 3 work packages:
WP1: Weather Prediction Improvements inclusive data assimilation
WP2: Development of a benchmarking platform & best practice guidelines
WP3: Communication of best practice in the use of wind power forecasts

Initial Phase: 2016-2018

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Task Work is divided into 3 work packages:
WP1: Global Coordination in Forecast Model Improvement
WP2: Power and Uncertainty Forecasting
WP3: Optimal Use of Forecasting Solutions

Second Phase: 2019-2021

Task 36 Phase I/II Objectives

- Establish active, open forum for sharing forecasting advances
- Establish standards and frameworks for operation and evaluation of forecast model performance
- Identify paths to increased use of forecast information by industry
- Identify most promising directions for new research
- To provide guidelines for implementation of forecast solutions*

*Green text indicates new item in Phase II

Task 36 Phase I/II Expected Results

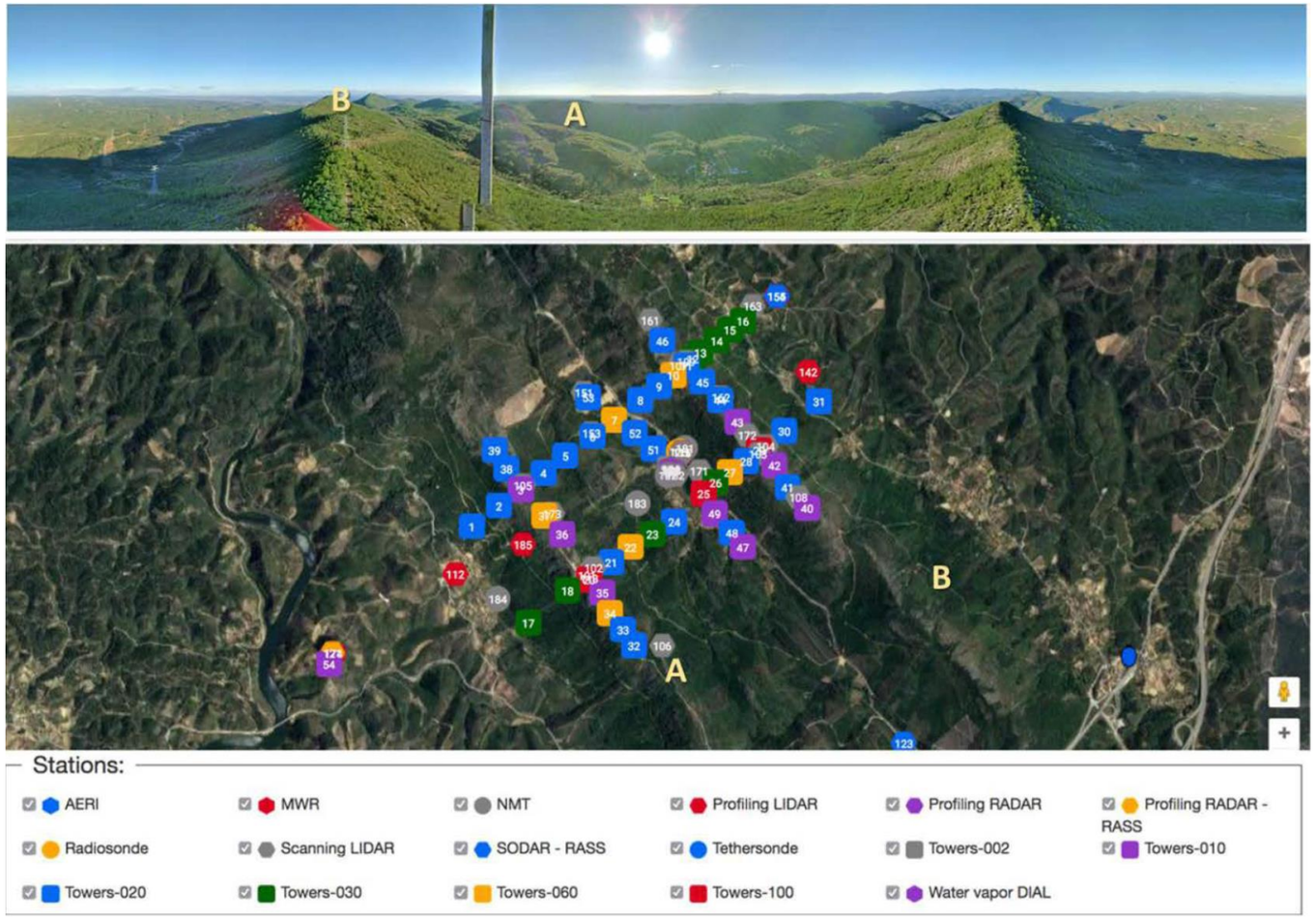
- Increased international collaboration and knowledge transfer
- Generally accepted framework for evaluation and use of forecast models and solutions
- Guidelines for calculation and evaluation of uncertainties
- Guidelines for observational requirements for forecasting
- Development of framework for use of forecast uncertainties
- Special sessions in conferences or dedicated workshops
- Development of framework for use of forecast uncertainties

Phase I/II WP1: Subtasks and Deliverables

- S1.1: Compile list of wind data sets, especially at hub height
  http://www.ieawindforecasting.dk/work-packages/work-package-1/task-1-1
- S1.2: Annual reports documenting available field data
- S1.3: Verify and validate improvements with common data
- S1.4: Work to include energy forecast metrics in NWP upgrades
- D1.1: Annual summary of field studies useful to forecasting
  http://www.ieawindforecasting.dk/work-packages/work-package-1/task-1-2
- D1.2: Common benchmark for V&V: release analysis as paper
- D1.3: Report on future issues in wind power prediction

Notable Data Available

- New European Wind Atlas
  - Supporting field studies
    - ✓ Northern Europe Mesoscale Experiment
    - ✓ Rödeser Berg
    - ✓ Perdigão
- Wind Forecast Improvement Projects
  - WFIP
    - ✓ U.S. Great Plains
  - WFIP2
    - ✓ U.S. Northwest (Columbia Basin)



Double hill environment of the Perdigão study (from Lundquist et al. 2019)

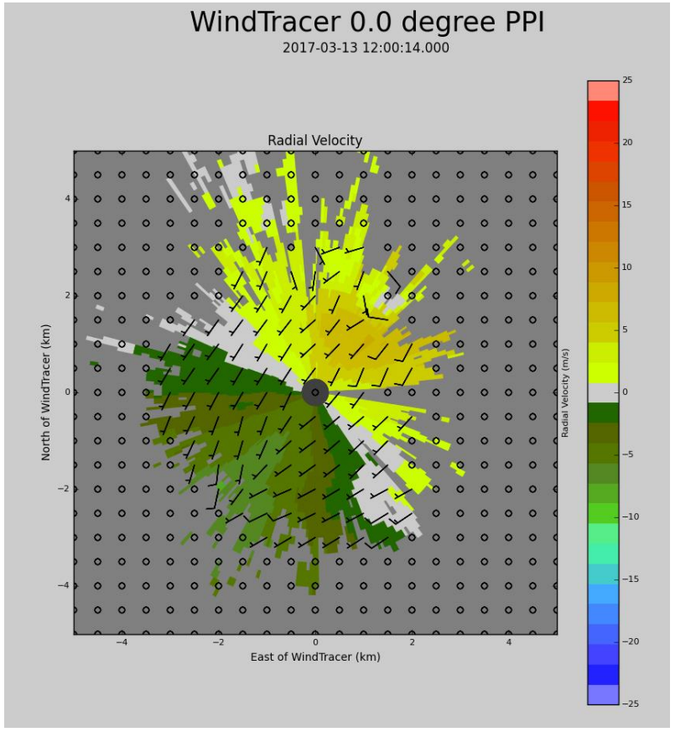
WFIP2 Key Outcomes

- Eighteen-month Comprehensive, Continuous Data Set
  - Relatively complete coverage from most instruments, 1 Oct 2015–31 Mar 2017
- Hierarchy of Model Development Experiments Completed
  - Changes to boundary layer, horizontal diffusion, gravity wave drag tested against case studies
    - Example: local formulation for mixing length significantly improved timing of cold-pool mix-out
  - Year-long reforecasts of twice-daily 24-hr forecasts with control and experimental physics
  - Retrospective tests
    - Hourly updated experiments with data assimilation to verify suitability for operational RAP and HRRR
- Formal Verification and Validation
  - Verification of code with single-column model to test code changes
  - Metrics-based validation using WFIP2 data
- Decision Support Tool Prototype Demonstrated
  - Initial focus on cold pool erosion
- Publications
  - Series of overview papers in process for BAMS
  - Numerous other papers are in preparation

Data Archive & Portal

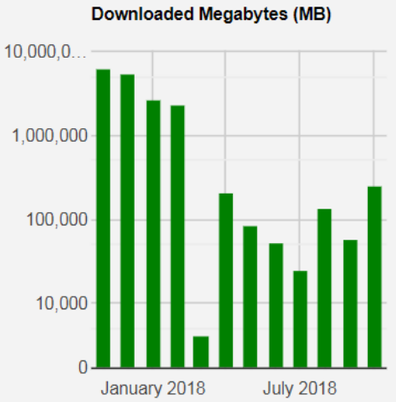
- Secure, Enduring Archive
  - For all data collected under DOE's Atmosphere to Electrons (A2e) program
  - Supports unrestricted access to public data and secure access to proprietary data
- Integral Component of WFIP2
  - Provided file-naming standards
  - Coordinated user access
  - Assisted users in preparing data for upload, including appropriate metadata
  - Provided visualization capabilities, including animation (essential for Event Log)
  - Acquired supporting data, such as satellite and analysis images
- WFIP2 data access: https://a2e.energy.gov/projects/wfip2

DAP Visualization of WindTracer Lidar Scan during WFIP2



276
Datasets

209.5 TB
Stored



DAP information for WFIP2 data as of 22 October 2018

WP1: Where Phase II is Headed

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  S1.2: Annual reports documenting available field data
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- U.S. funding now available to support V&V benchmark
- Better appreciation of scope of discussions around metrics
- Continuing development of data management and accessibility

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Thank you