IEA WIND TASK 57

JAM

JOINT ASSESSMENT OF MODELS

March 12, 2024

VIRTUAL KICKOFF

1

Moon setting over King Plains Wind Farm (B. Bechtold, NREL)

APPROVED PROPOSAL

Feb 2024 – Jan 2027

o **Increase and accelerate research yield** through coordination and collaboration of validation programs;

o **Produce, disseminate, and execute benchmarks** that are long-lived, democratic, and standardized;

o **Maximize benchmark value with stakeholder input** pre- and post-execution;

o **Reduce uncertainty in model assessment** through emphasis on inflow and uncertainty quantification;

o **Recommend best practices** on model use across application spaces;

o **Promote the adoption of improved models** while protecting model diversity and innovation.
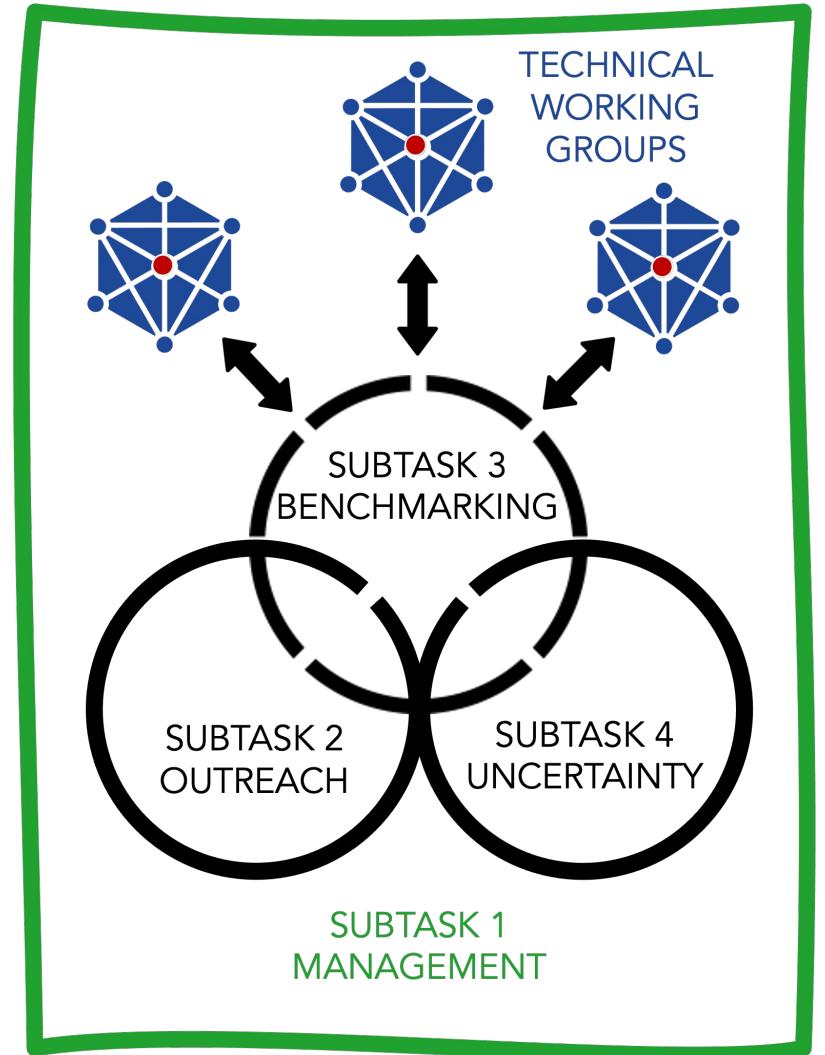
TASKS & MANAGERS

Paula Doubrawa
NREL

Operating Agent
Management & Outreach

Pat Moriarty
NREL

Task Manager
Management

Regis Thedin
NREL

Subtask Manager
Benchmarking

Lukas Vollmer
IWES Fraunhofer

Subtask Manager
Uncertainty

+ Benchmark Leads for each benchmark

TASK 2 : OUTREACH

- JAM places strong emphasis on collaboration and outreach
  - Model users drive choice of dataset and standardization (via surveys)
  - Model developers support deep-dive discussions (via workshops)
  - Diverse contributors (industry, academia, laboratories)
  - Diverse contribution (model fidelity spectrum)
  - Facilitate internationally aligned strategy on future field campaigns
  - Inter-task collaboration
    - 44 – Controls : uncertainty quantification
    - 52 – Lidar : lidar measurements in model assessment
    - 43 – Digitalization : stakeholder input, data/code frameworks
    - 47 – Turbinia : aerodynamic model validation
    - 56 – OC7: validation practices, potential joint benchmark

TASK 3 : BENCHMARKING

- The total number of benchmarks will depend on participants
- We will choose benchmarks based on community input (survey coming later today)
- Each benchmark triggers a working group and a 15-month cycle

3 months	2 months	5 months	5 months
Preparation	◆ Setup	Three-Phase Execution	Deep Dive & Iteration ◆

Release   Completion

Codes of multiple fidelities

Low-fidelity wind turbine simulation   High-fidelity wind turbine simulation

Low-fidelity wind farm simulation[1]   High-fidelity wind farm simulation[2]

Full-scale experimental datasets, e.g.:

Land-based wind plants — AWAKEN, U.S. DEPARTMENT OF ENERGY

Offshore wind plants — X-WAKES

- ▲ Lidar position
- ■ FINO1 met. mast
  WRF model grid
- ● alpha-ventus
- ● Borkum Riffgrund 1
- ● Borkum Riffgrund 2
- ● Gode Wind 2
- ● Gode Wind 1
- ● Nordsee One
- ● Trianel Borkum
- ● Merkur
- ▲ Lidar measurement

R5 R1 R3 R2 R4
cluster N-3
cluster N-2

- ☆ Remote sensing+surface instrumentation
- ★ X-band radar
- • Turbine
- ○ Instrumented turbine

Land-based wind turbine — RAAW

Near-shore wind turbines — DLR, Forschungspark Windenergie Krummendeich WiValdi

TASK 4 : UNCERTAINTY

- Its own task because it needs purposeful attention

- Despite being its own task, it acts in support of Task 3 : Benchmarking

- Main goals of Task 4:
  - Provide guidance on uncertainty quantification to benchmark managers
  - Ensure that uncertainty is being adequately handled in benchmarks
  - Collaborate with other IEA Wind Tasks on the topic

IEA Wind Multi-Task Workshop on Uncertainty
May 28, 8:00-10:00, Florence, Italy (NOT CONFIRMED)

- Planned by Tasks #57 (JAM) #47 (Turbinia) #56 (OC7) #52 (lidar) #43 (Digitalization) #44 (Controls), open to all experts
- Objectives
  - Understand how different tasks are incorporating UQ into their workflow
  - Understand how UQ is being incorporated into standards
  - Identify and prioritize knowledge gaps and guidance gaps in UQ practices
  - Identify and resolve lack of clarity in terminology used for UQ in wind energy
  - Form working groups to tackle the identified challenges and facilitate inter-task collaboration

MEMBERSHIP

Committed countries

Likely countries

MEMBERS

- Can propose benchmarks
- Can submit simulation results for benchmarks
- Can shape methodologies and framework
- Can join benchmark working groups
- Can access simulation data of others
- Can join in-person meetings 1-2x yearly

PUBLIC

- Can join virtual and in-person kickoffs
- Can see benchmark releases
- Can attend benchmark conclusion deep dives
- Performs model assessment independently

COMMUNITY

JAM COMMUNITY

Legend:
- BE
- BR
- CA
- CN
- DE
- DK
- ES
- FR
- IN
- IT
- JP
- NL
- NO
- SE
- US

Pie chart values: 4%, 2%, 3%, 3%, 18%, 8%, 10%, 10%, 2%, 1%, 4%, 3%, 1%, 28%

Legend:
- ACADEMIA
- INDUSTRY
- LABORATORY

Pie chart values: 28%, 41%, 31%
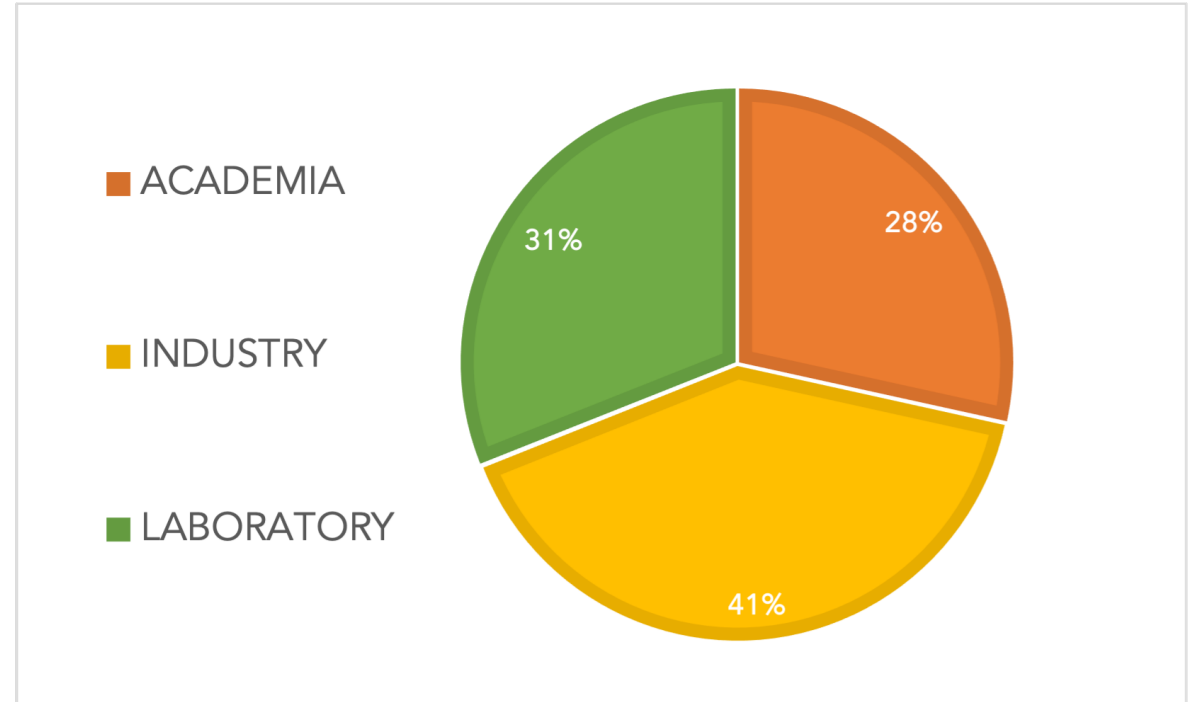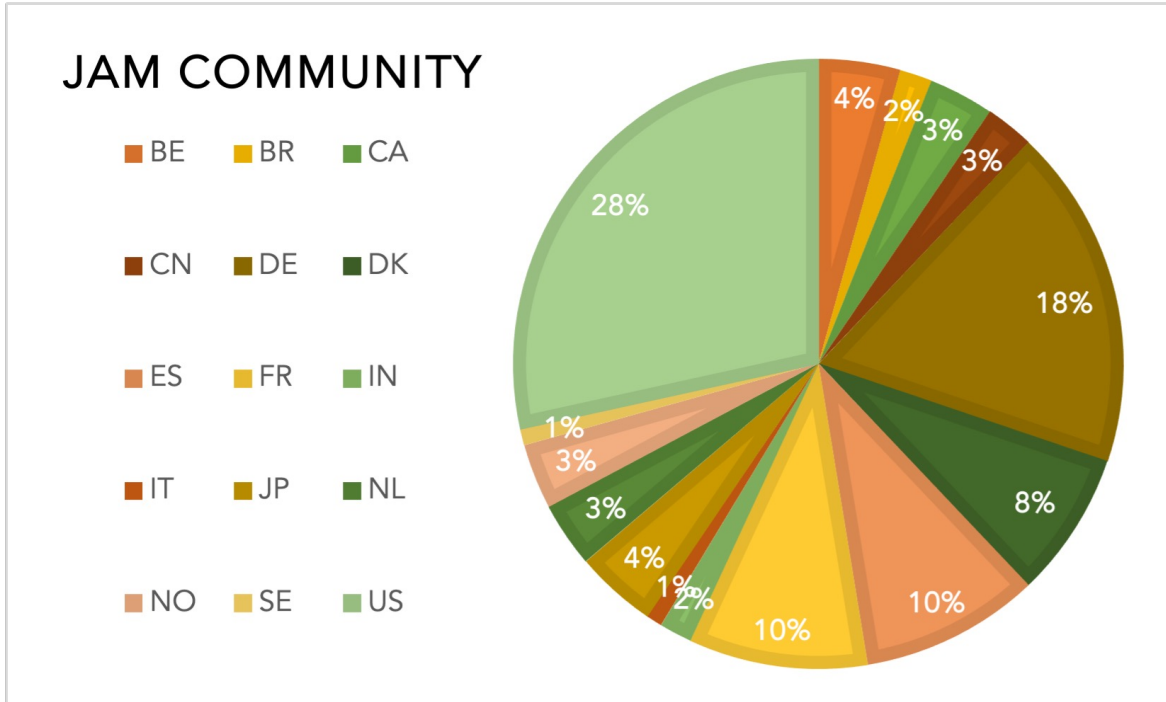
Based on those signed up to mailing list (116). We are currently using a GOOGLE FORM for sign ups:
https://forms.gle/XGyR1Xg7ojSTBtHe7

WHAT TO EXPECT

- Meetings
  - In-person JAM meeting: 2x yearly, co-located with conferences (1 in USA, 1 in Europe)
  - Benchmark launch: 1x per benchmark
  - Benchmark working groups: regular (e.g. bi-weekly or monthly) as needed during benchmark execution
  - Benchmark deep dive: 1x per benchmark

- Participation categories

  - Benchmark lead
    - Ensure the experimental data is ready
    - Select period(s) of interest and determine model audience
    - Manage data release needs
    - Lead working groups, launch meeting, deep-dive meeting
    - Receive simulation data from participants and analyze
    - Lead final journal article with validation results

  - Technical contributor
    - Run simulations according to benchmark schedule
    - Format simulation output according to benchmark requirements
  - Member audience
    - JAM member who does not propose nor participate in benchmarks
    - Knowledge exchange, no data exchange
  - General audience
    - Not a JAM member, access to public content only

BENCHMARK
AWAKEN WIND PLANT W

- Teaser! Full benchmark release at in-person kickoff

- Data collected in Oklahoma, USA on August 24 2023

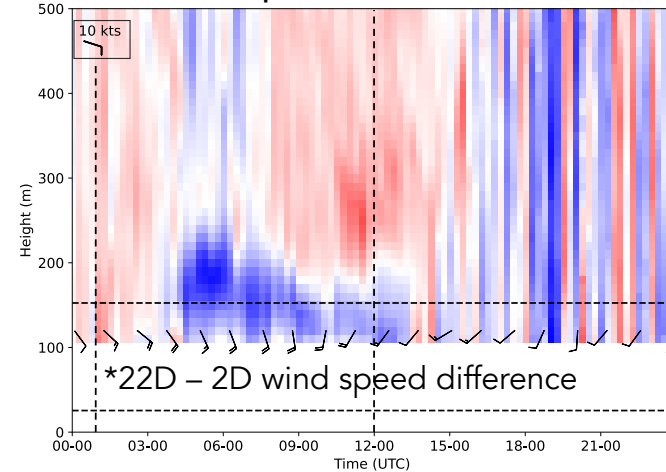- Open to all models, submissions expected in September 2024
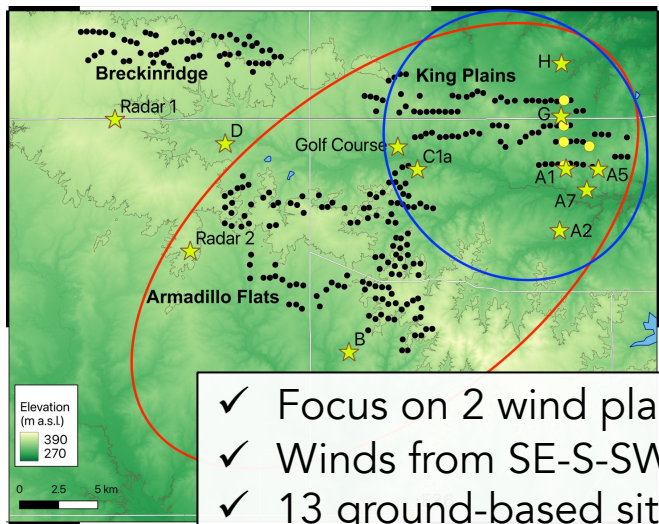
✓ Focus on 2 wind plants
✓ Winds from SE-S-SW
✓ 13 ground-based sites
✓ 5 instrumented turbines
✓ 14 scanning lidars
✓ 8 profiling lidars
✓ 2 X-band radars
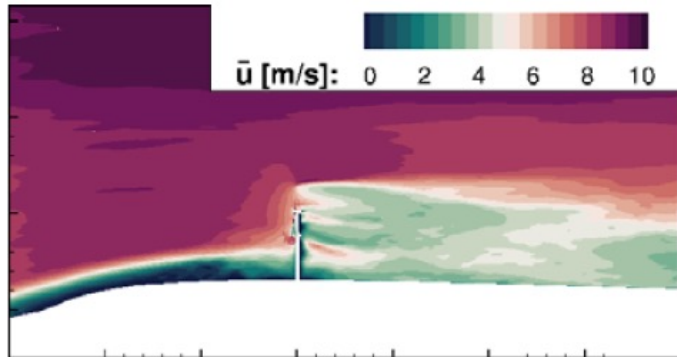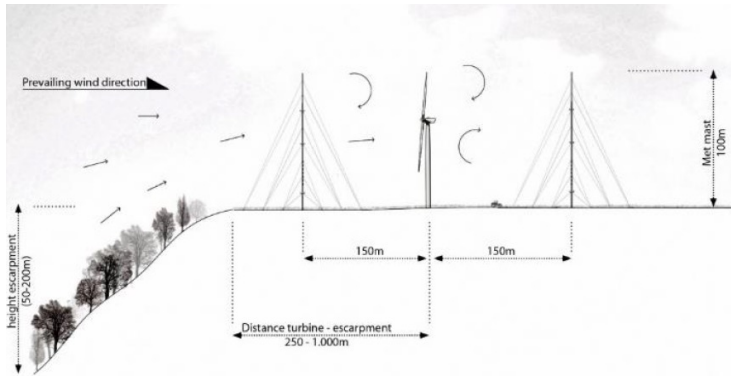
The atmospheric conditions:
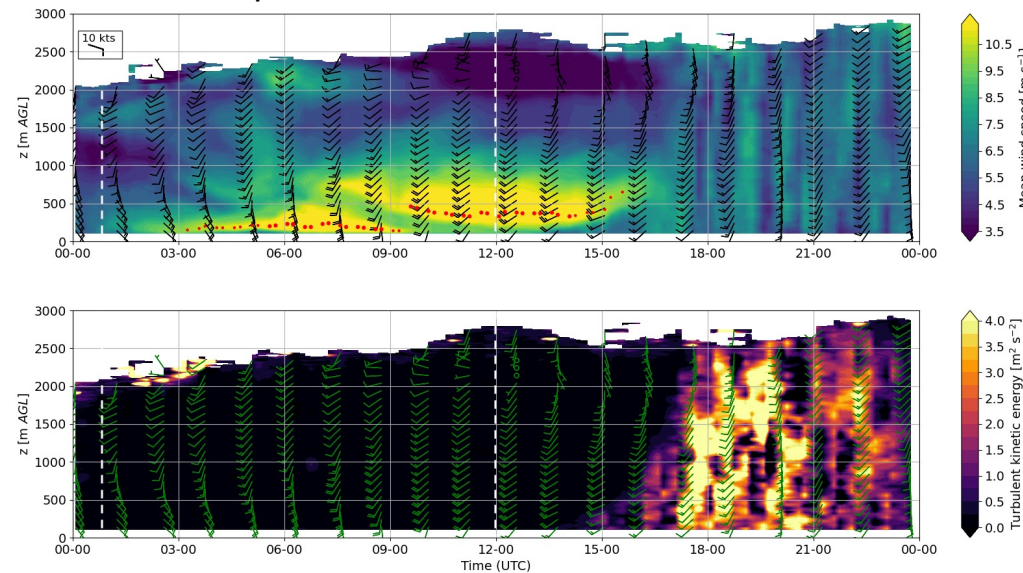
The wind plant wake*:

*22D – 2D wind speed difference

VIRTUAL KICKOFF

OTHER POTENTIAL BENCHMARKS

Dataset: WINSENT
Uniqueness: complex terrain
Benchmark lead: Hermann Knaus

Dataset: X-WAKES
Uniqueness: offshore wakes
Benchmark lead: Lukas Vollmer
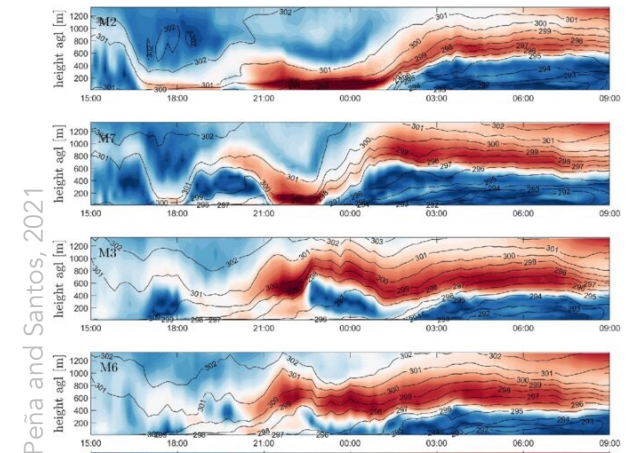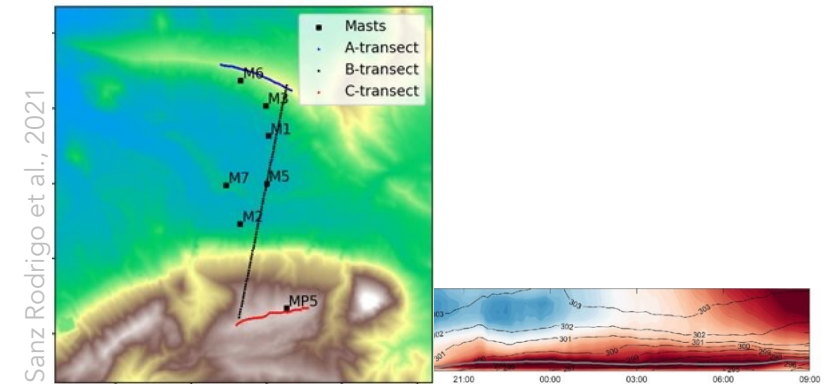
Dataset: Alaiz
Uniqueness: complex terrain, long-term dataset
Benchmark lead: Javier Sanz-Rodrigo

[pause for WINSENT presentation]

survey on benchmarks needs

https://forms.gle/o4QuAmRwgjYm78NA8

IN-PERSON KICKOFF

- May 28 (day before Torque) afternoon (13:00 – 17:00 CEST)

In-Person Kickoff Sign-Up Link

https://forms.gle/w8oFhZ1LcVRh5TkZ7

- Coordinated agenda with other IEA Wind Tasks
    - #41 #44 #47 #49 #50 #55 #57 (hop as needed!)
- Type in the chat or email what you would like to see in the agenda
- Type in the chat or email if you can attend the uncertainty workshop (same day, 8:00-10:00)