Illustrating icing events complexity using the IEA Task54 **public** database

IEA Wind TCP

IEA Wind TCP Task 54

Cold Climate Wind Power

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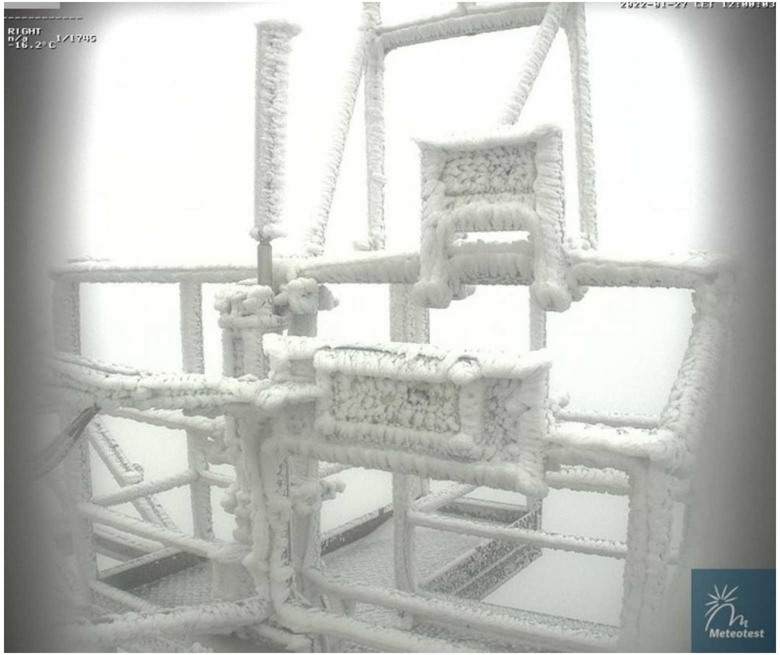

Winterwind 2025

04.02.2025

Plan

- **Quick reminder** on the database (3 slides)

- **Icing events** (20+ pictures):
  - Glaze ice in Eastern Canada
  - Rime ice + shedding in Eastern Canada
  - Ice growth + shedding in Germany

Reminder: why a public icing events database?

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- The **large majority** of icing observations is **confidential** (at least in wind energy)
- Especially, direct and concrete examples of icing events are often kept hidden (cautious communication about risks).
- The lack of publicly-available data is **limiting general public awareness** about:
  - ➢ The general impacts of icing events and the need to manage them
  - ➢ The large diversity of icing events (ice type, duration, intensity, etc.)
  - ➢ The large diversity of direct and indirect monitoring systems of icing events
  - ➢ The regional specificities of icing events

Now available on Zenodo
https://zenodo.org/records/14447171

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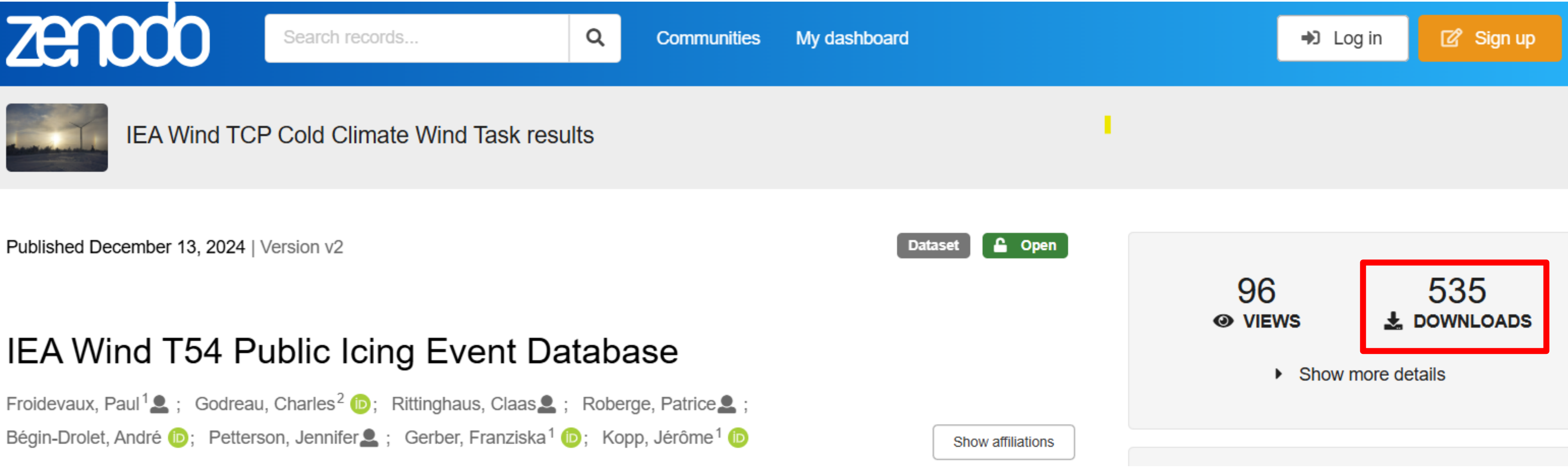
→ More than **500 downloads** since stored on Zenodo



Key points

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- Current content: **24 icing events** from Germany and Canada
- **Usage is free** and open for everyone: *Open Database License (ODbL) v1.0*

- **Easy to contribute**: “call for contributions.pdf” explains everything
- Reach out to task54 members if needed

- **Any contribution showing measurements of icing is welcomed!**
- If needed, **contributions can be anonym** with regard to contributor and location

Required data for contribution

- **Time series**, ideally 1- or 10-minutes resolution and in **csv** format.
- **Measured** (not modelled!) **meteorological parameters** relevant for ice growth and ice melt:
  - Wind speed
  - Temperature, Relative humidity
  - Liquid Water Content (LWC), Droplet size (e.g. MVD) → especially welcome because they are complex to measure!
  - Solar Radiation
- **Icing data**:
  - Ice load [kg], thickness [cm] and accretion rate [cm/hour] from dedicated icing sensors
  - Webcam pictures
  - Indirect icing measurements (such as e.g. a wind turbine's power curve deviation)
  - A differentiation should be made between **rotor icing** and **instrumental icing**
- Relevant additional data such as turbine status

Example 1: Glaze ice in Eastern Canada

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Contributor:
Laval University
Québec

Measuring devices:
Ice Conditions
Monitoring System
https://icetek.ca/
+
Webcam

Location:
turbine hub

Example 1: Glaze ice in Eastern Canada

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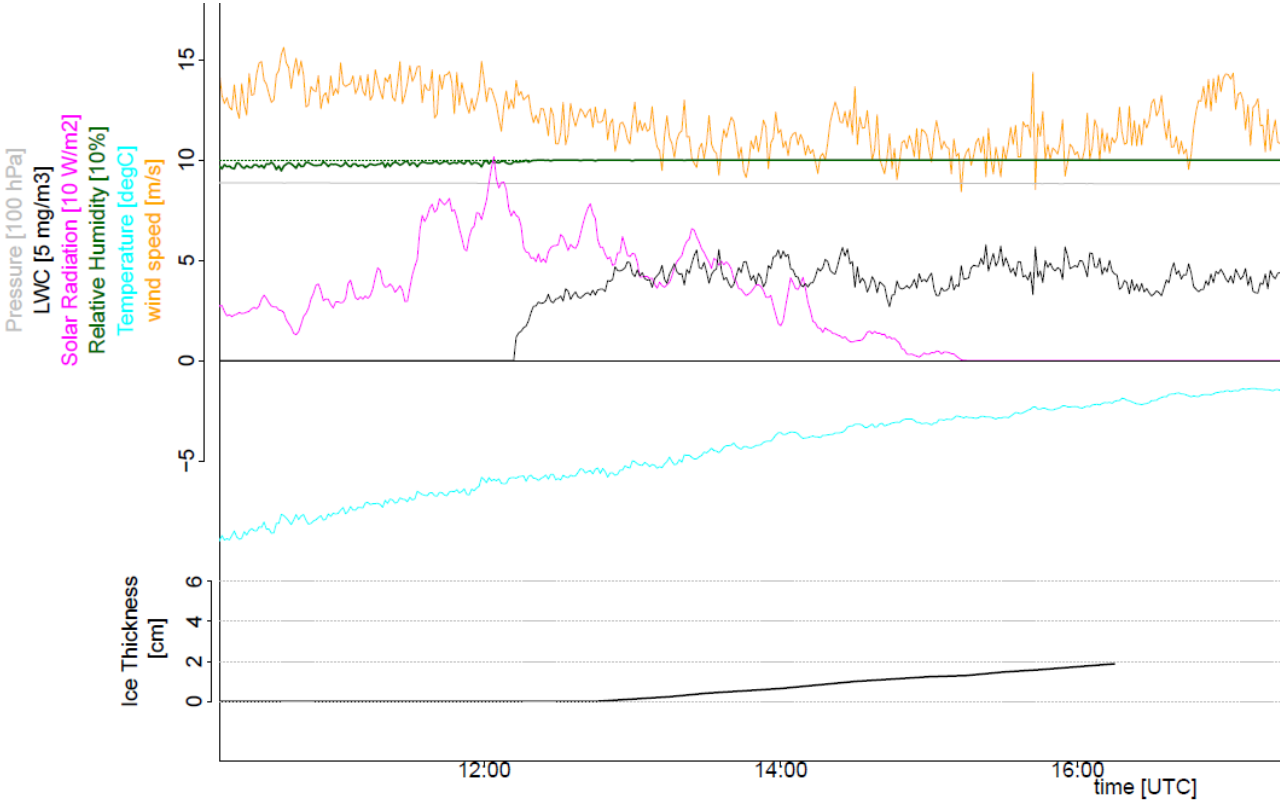

Example 2: Rime ice + shedding in Eastern Canada

IEA Wind TCP

Contributor:
Laval University
Québec

Measuring devices:
Ice Conditions
Monitoring System
https://icetek.ca/
+
Webcam

Location:
turbine hub

Example 2: Rime ice + shedding in Eastern Canada

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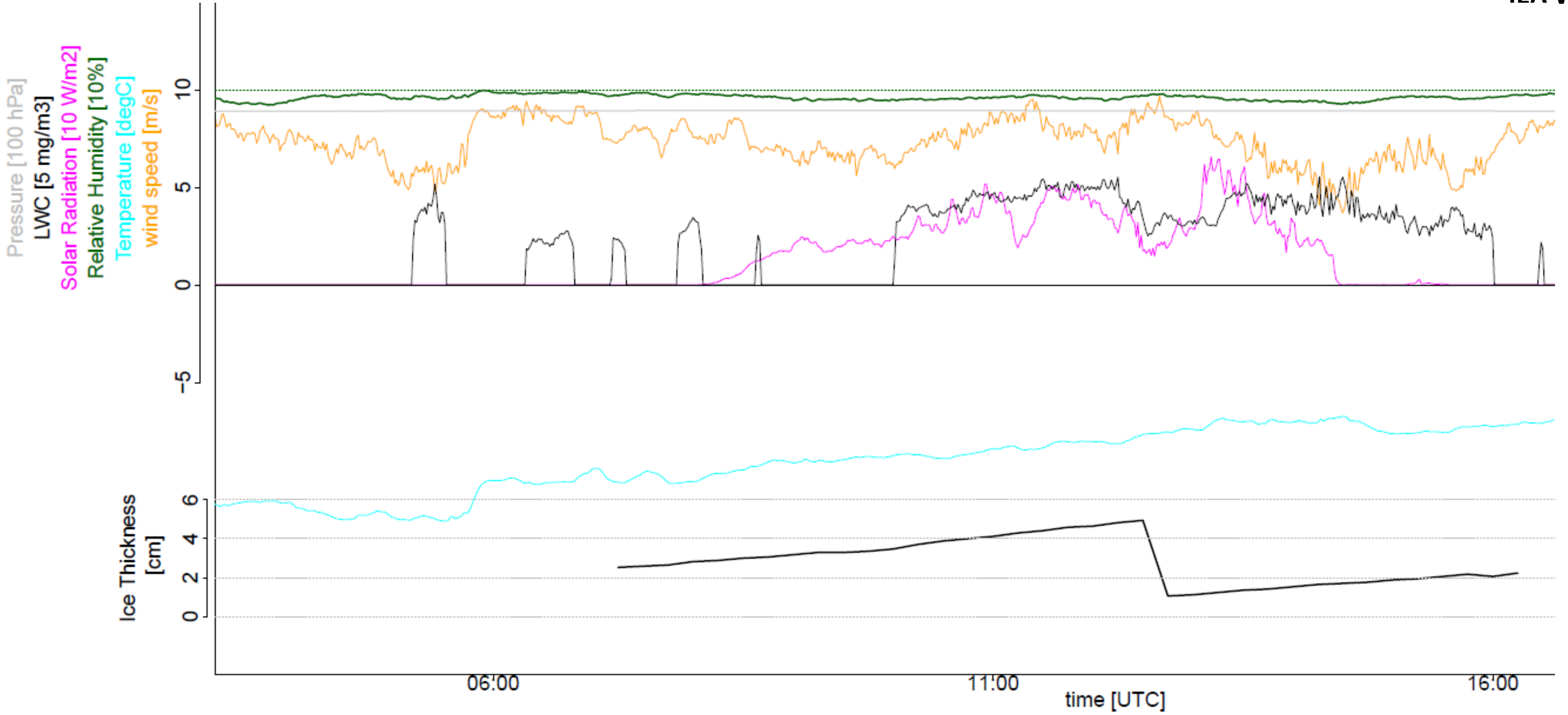

Example 3: Germany, ice growth + shedding in Germany

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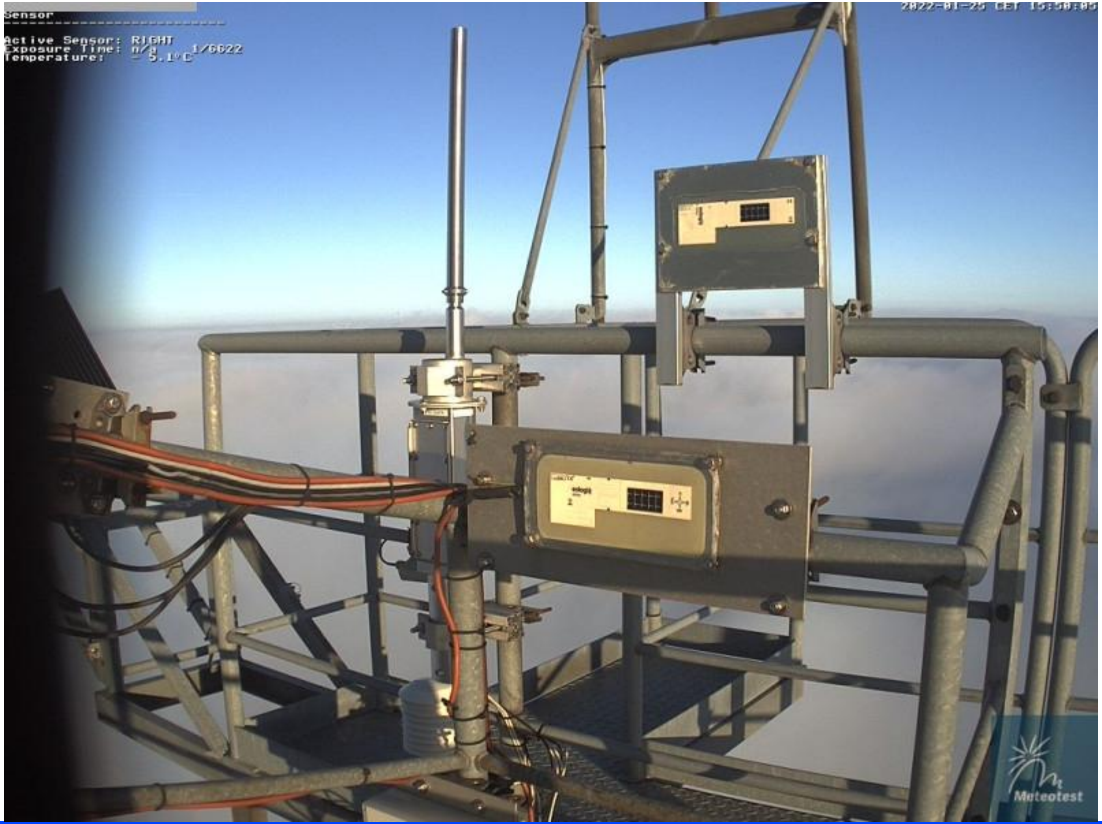
25 Jan
16:00 local



Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

26 Jan
06:00 local

IEA Wind TCP

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

IEA Wind TCP

26 Jan
12:00 local

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

IEA Wind TCP

26 Jan
17:00 local

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

27 Jan
07:00 local

IEA Wind TCP

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

IEA Wind TCP

27 Jan
08:00 local

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

IEA Wind TCP

27 Jan
17:00 local

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

IEA Wind TCP

27 Jan
19:00 local

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

IEA Wind TCP

27 Jan
20:00 local

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
(blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

27 Jan
21:00 local

IEA Wind TCP

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
  (blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding

27 Jan
22:00 local

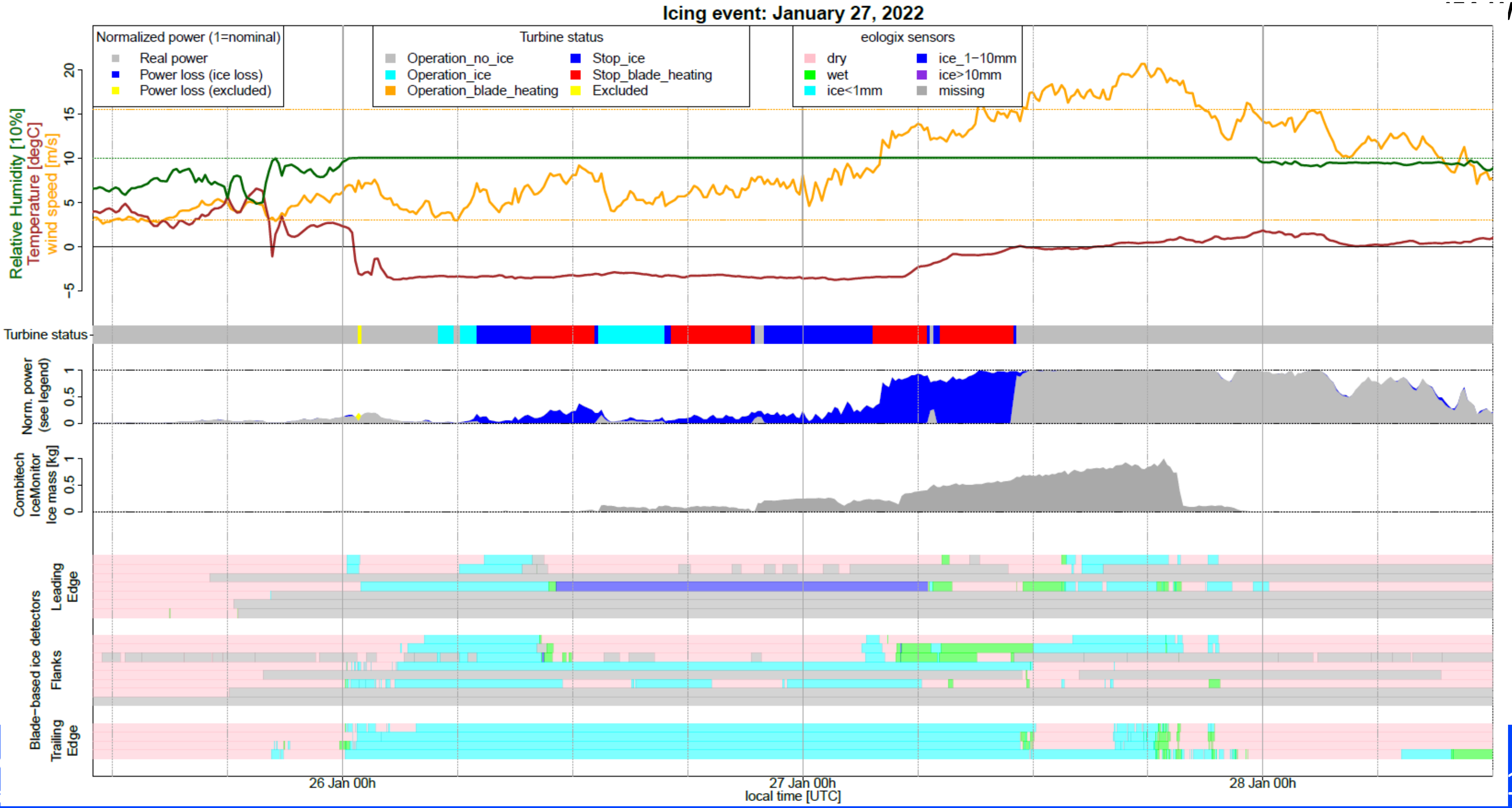
IEA Wind TCP

Contributor:
Meteotest Switzerland

Measuring devices:
- Met station
(TT, RH, wind speed)
- Webcam to sensors
- Webcam to blades
- Combitech IceMonitor
- eologix
  (blades+nacelle)

Location:
turbine hub

Example 3: Germany, ice growth + shedding



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How to contribute ?

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- 1) Go to **https://zenodo.org/communities/coldclimatewind/**
- 2) Make sure your data meet the requirements (see *call_for_contributions.pdf*)
- 3) Send us an e-mail to request authorisation (Timo.Karlsson@vtt.fi)

easy, isn't it?

Image source: https://www.facebook.com/Icancontribute/