

# Wind Resource Assessment in Remote and Harsh Climates (i.e., Alaska)



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# Alaska/Arctic Environment Met Tower Challenges

- Remoteness - expensive and time-consuming travel
- Temperamental weather – fall thru spring
- Access difficulties at the site
- Permafrost
- Rime ice
- Cold temperatures
- No cell phones (modems)
- Remote servicing management

Villages are remote, not road  
accessible and see long winters

Gambell, St. Lawrence Island





Point Hope, Chukchi Sea  
Coast, mid-April

# Expensive Travel

- Airfare \$500 to Bethel, \$800 to Barrow (from Anchorage)
- Additional airfare to villages
- Ship met tower to hub village via NAC
- Charter Caravan or similar aircraft to transport tower to village
- Must do everything in reverse when finished



# Transporting met towers to the sites



# Weather – the ideal installation



- Sunshine
- Shorts and sneakers
- “Picnic weather”



Arctic climates – long winters often require cold weather work to support project needs



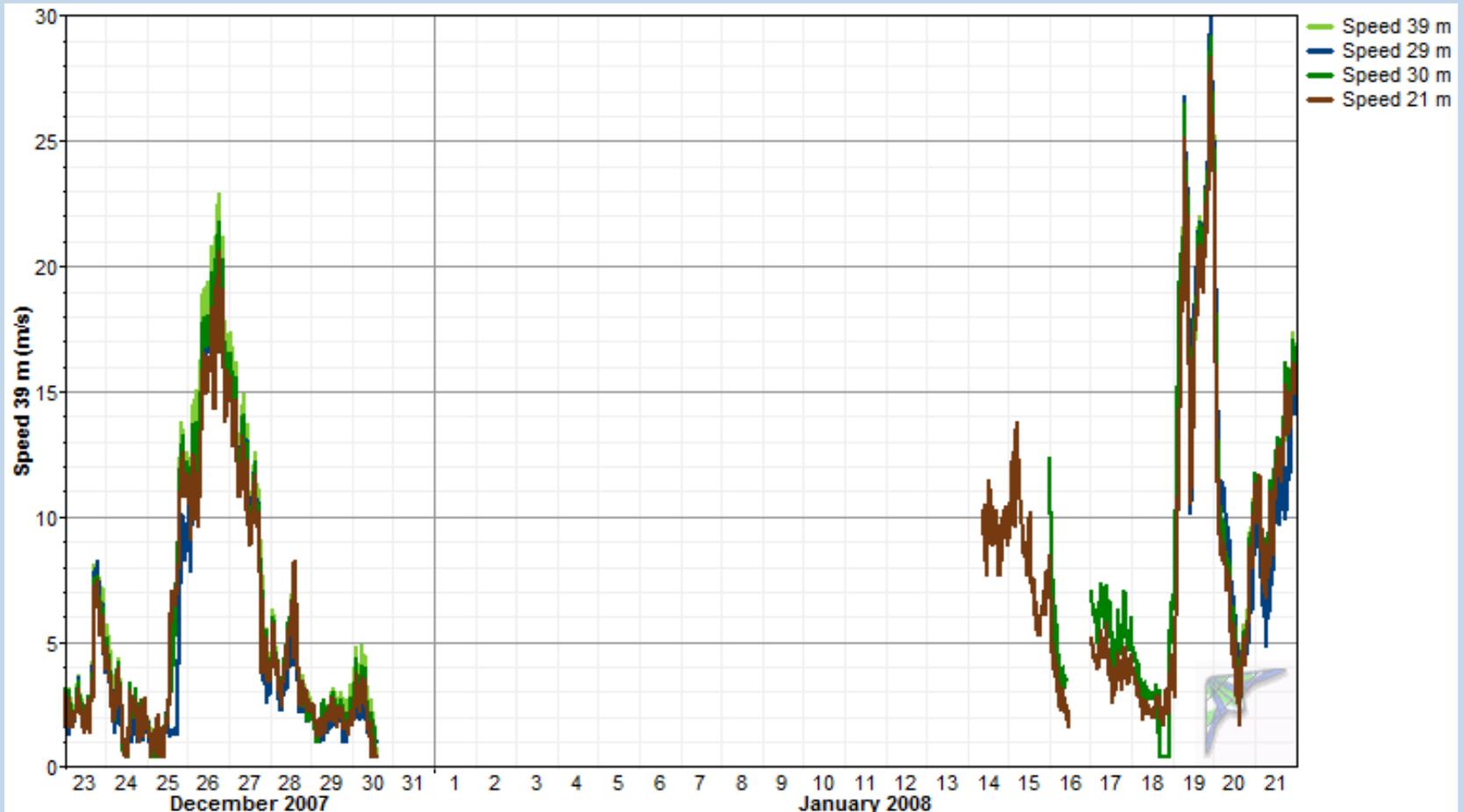


# Rime Ice

1<sup>st</sup> significant problem – iced sensors and loss of data during prime windy (winter) months

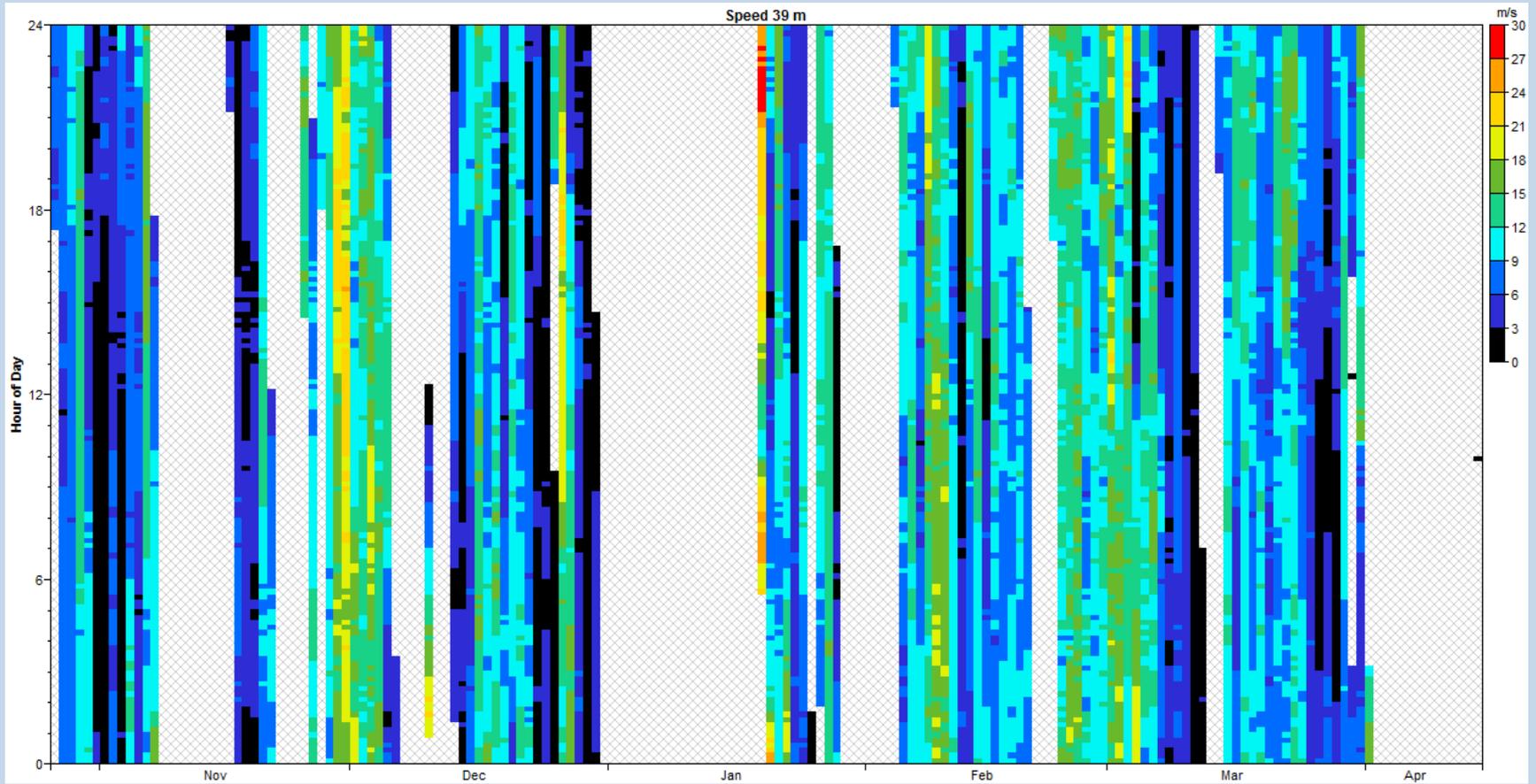
- Supercooled water vapor freezes on contact and accretes
- Very difficult and expensive to remotely power heated sensors
- Access to line power is best solution if possible for heated sensors

# Data loss due to rime ice

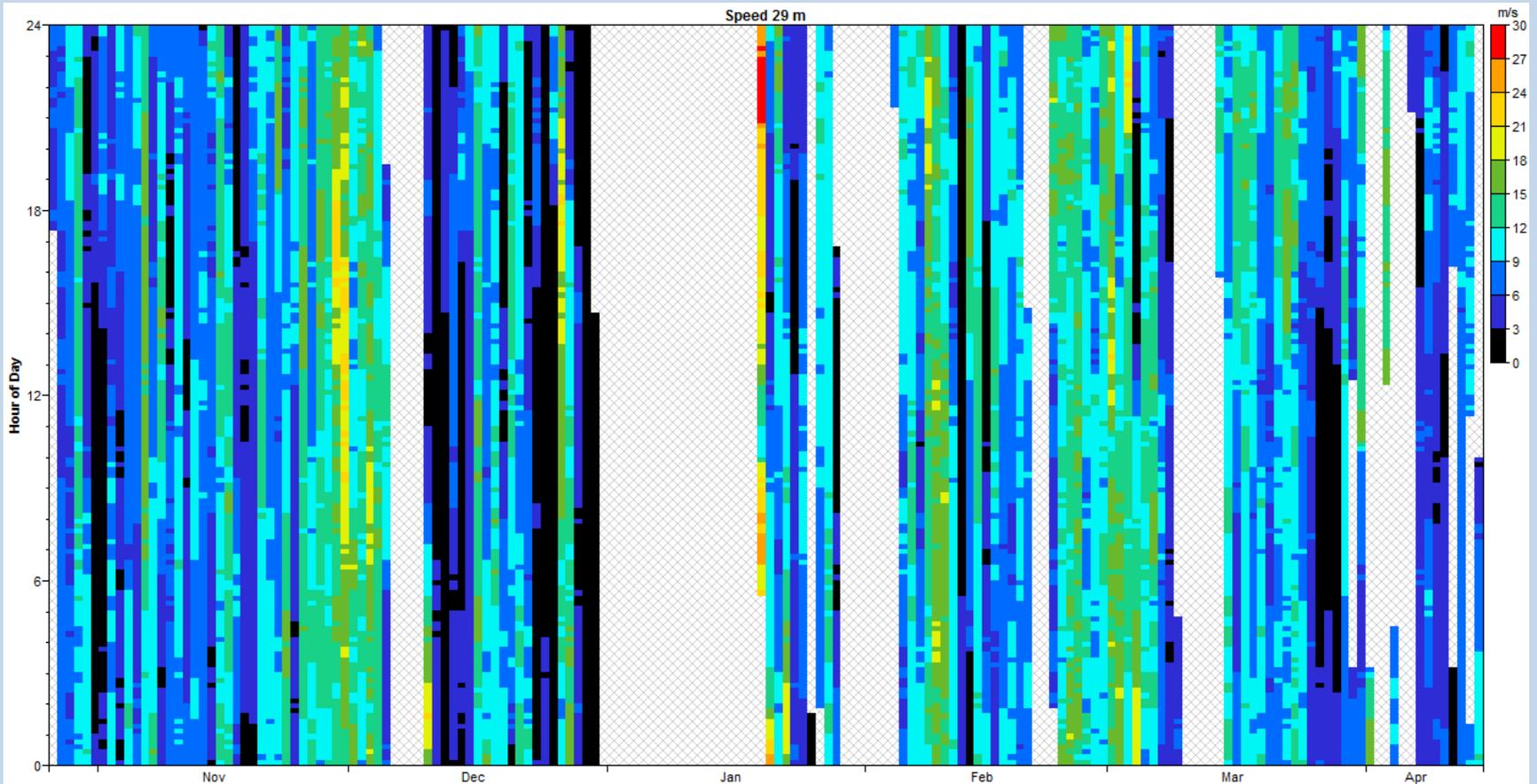


Note: NRG standard #40C anemometers, but 29 m anemometer is NRG IceFree III; even the heated anemometer was disabled

# Data loss due to rime - #40S anemometer



# Data loss due to rime – NRG IceFree III anemometer (line power)



## 2<sup>nd</sup> problem of rime ice...



Rime ice is predictable on all alpine and/or higher elevation sites in subarctic and arctic climates (all of Alaska or similar latitudes)

# ... is collapsed met towers



Solutions – new NRG and SecondWind 10-inch, ice-rated met towers, lower heights, especially in winter



# Permafrost



- Difficult anchoring of guy wires
- Tundra sensitive and easily damaged making use of heavy equipment impossible in summer
- Tower will “sink” in soft tundra

# Cold Temperatures



- Difficult work environment – slow and cumbersome
- Hard on batteries – logger, drills, cameras, etc.
- Icing problems (rime and freezing rain)
- Winter at high latitudes means short work days and expensive installations

# My Experience

- Recommend a reconnaissance visit to work out siting and logistic issues prior to erecting the met tower
- Work with local labor hires
- Upfront plan to deal with permafrost if present
- Anticipate rime ice at higher elevations
- Work out data collection plan with local personnel if modems aren't possible or used
- Avoid working in the winter to lower the cost (longer work days, fewer weather problems)