

Assessment of Science and Methodologies to Forecast Wind and Wind Gust Speed

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Motivation

- **Wind/Wind Gust “Official” in NDFD**
 - **What science exists to assist forecasters in creating sound wind/wind gust forecasts?**

Background

- **Tools:**

- Smart Tools
- **BUFKIT**
- NWP/MOS

- **Methods:**

- Wind Gust - Difference or Ratio?
- **Analyze the mixed layer and momentum transfer (BUFKIT)**
- Load and Go

Objective #1

- Provide forecasters with sound ways to use BUFKIT to forecast **sustained** wind speed during “high wind” situations

Methodology #1

- **Use cases that:**
 - Contained 20 “high wind” events (Spring 2006)
- **Hourly NCDC observation data**
 - KRSL, KSLN, KHUT, KICT, KWLD, KCNU
- **BUFKIT Data**
 - NAM, GFS, RUC
- **Considered wind speeds forecast or observed AOA advisory criteria**

Methodology #1 Cont'd

- **Forecast wind:**

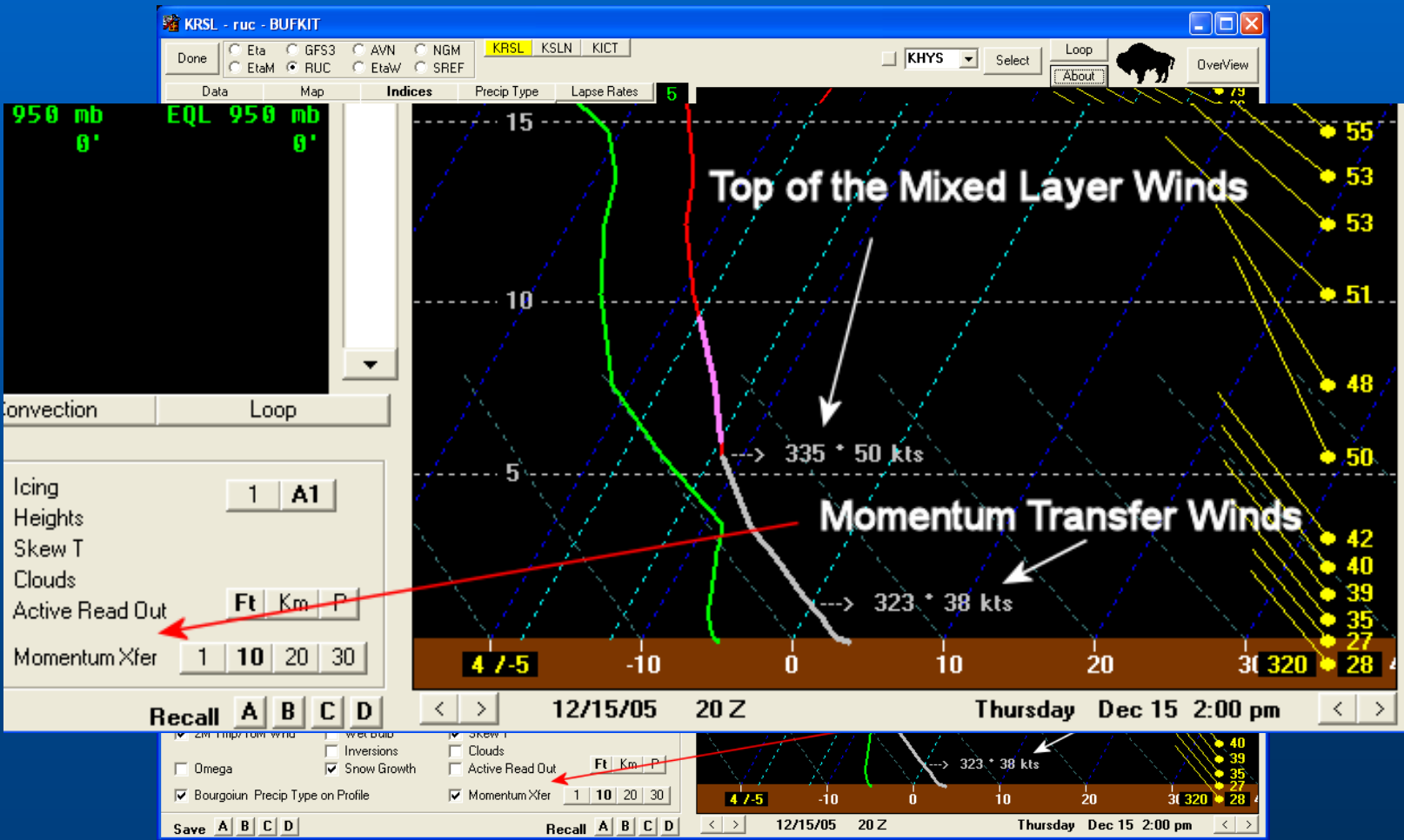
- **Model-X (e.g. NAM-X)**

- NWP model forecast “Momentum Transfer Wind” in the Mixed Layer

- **Model-T (e.g. NAM-T)**

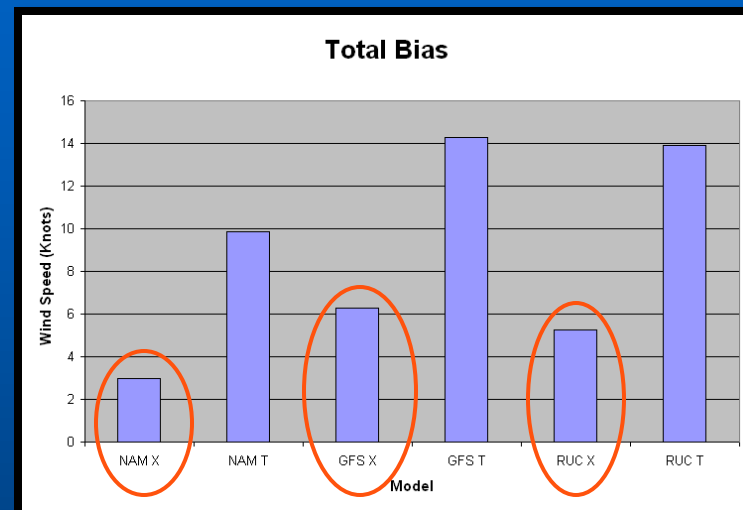
- NWP model forecast wind speed at the top of the Mixed Layer

Methodology #1 Cont'd

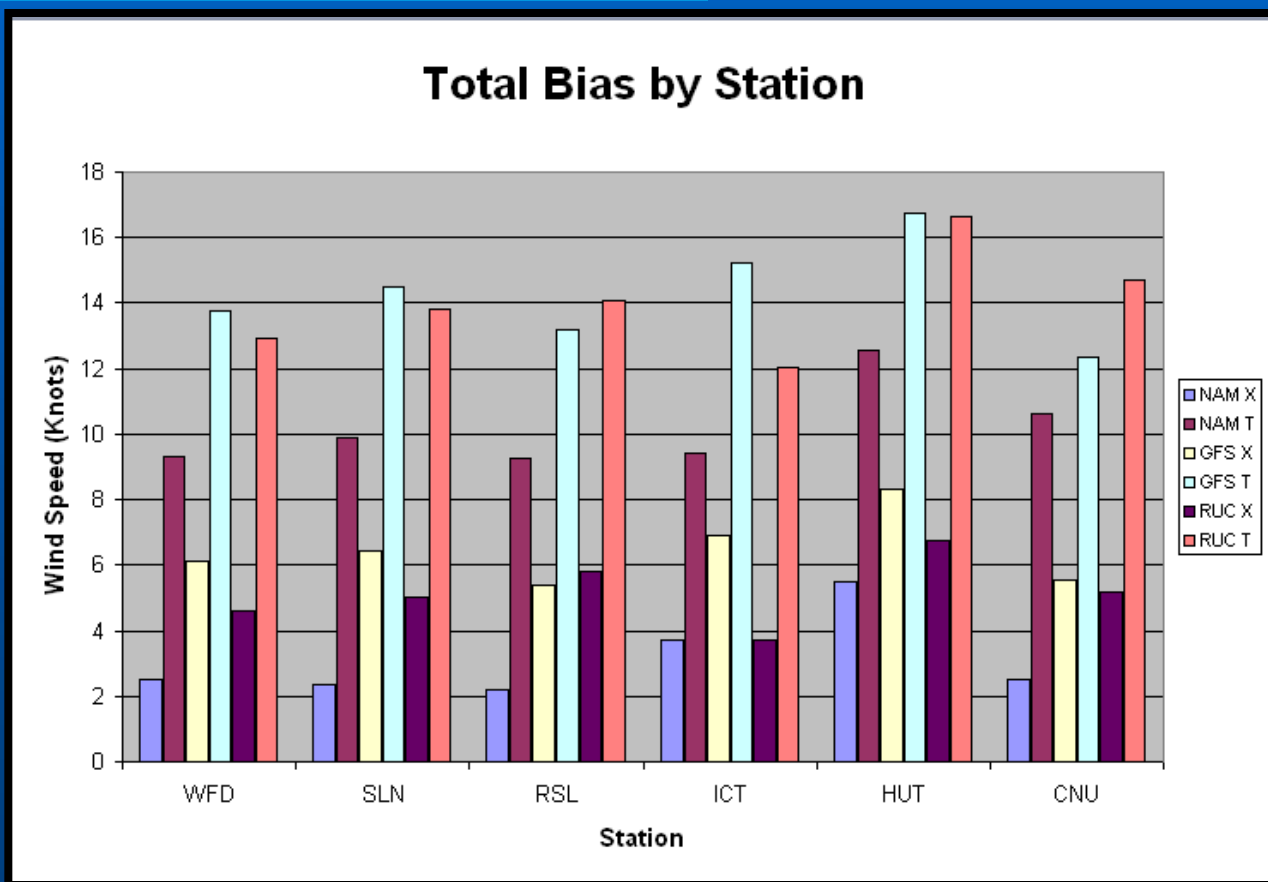


Forecasting w/ BUFKIT

- NWP forecasts too high
- Mixed layer approximation best



Forecasting w/ BUFKIT



Objective #1

- Provide forecasters with sound ways to use BUFKIT to forecast **sustained** wind speed during “high wind” situations
- **NAM: Best estimate of surface sustained wind using BUFKIT momentum transfer mixed layer wind (slight high bias = about 2-3 knots)**

Objective #2

- Provide forecasters with **sound science** in creating a **wind gust forecast**

Science – Where Are We?

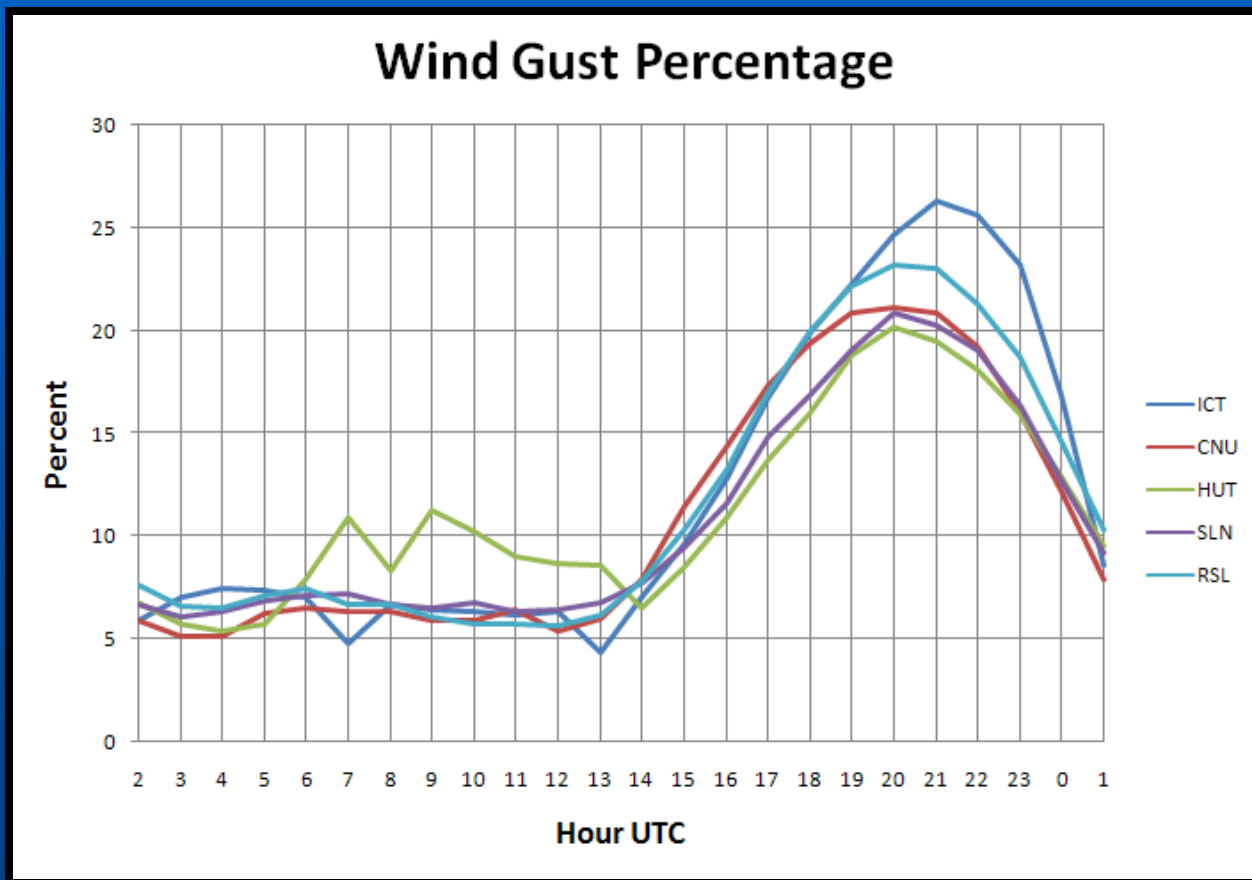
- How do you populate your wind gust grid?
 - Smart Tool: 5
 - **Load and Go (GMOS): 3**

- Why do you it that way?
 - **“I don’t know”**: 3
 - “Looks/works the best”: 3
 - “Internal Decision”: 2

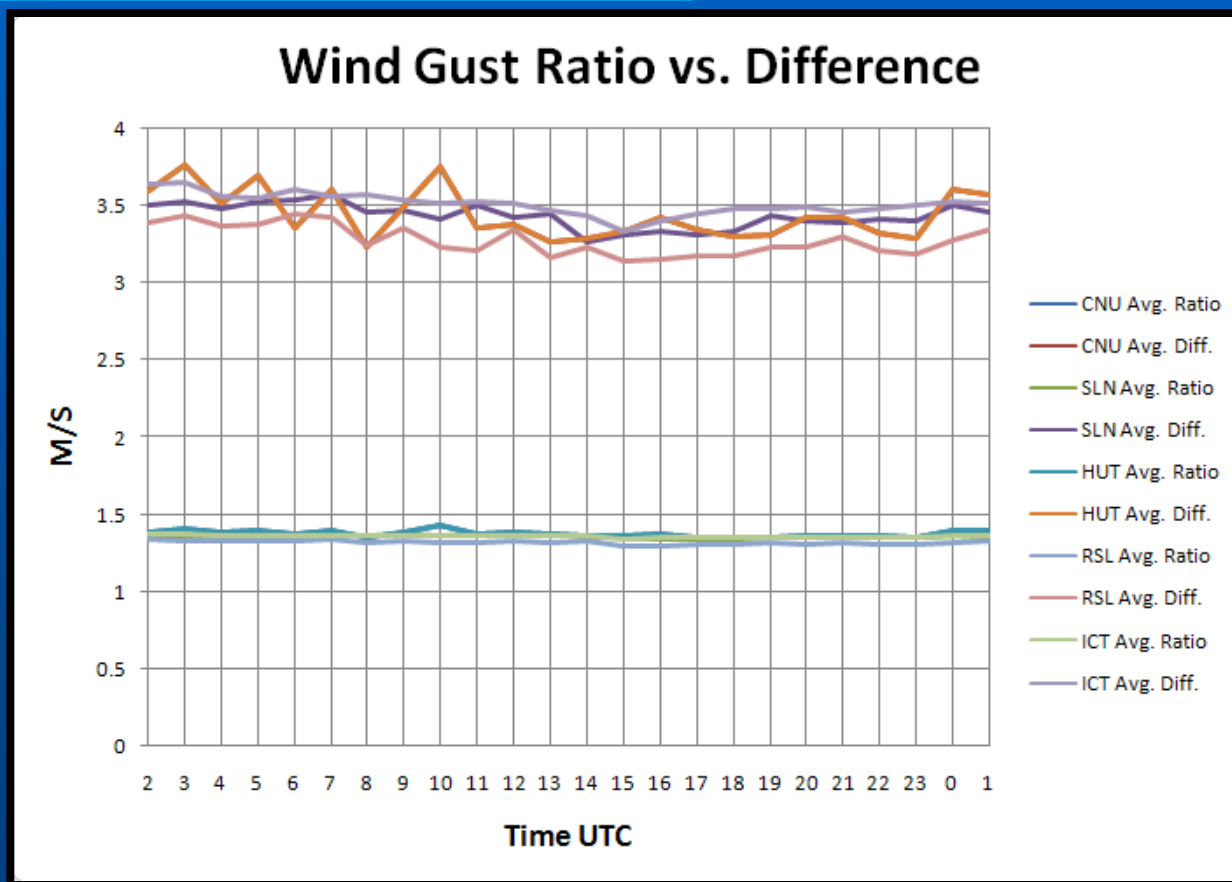
Methodology #2

- **30 years worth of hourly observation data from NCDC**
 - KRSL, KSLN, KHUT, KICT, KCNU
 - 1.4 million obs
- **Examine which was the best method (tool) to calculate a wind gust from the sustained wind**

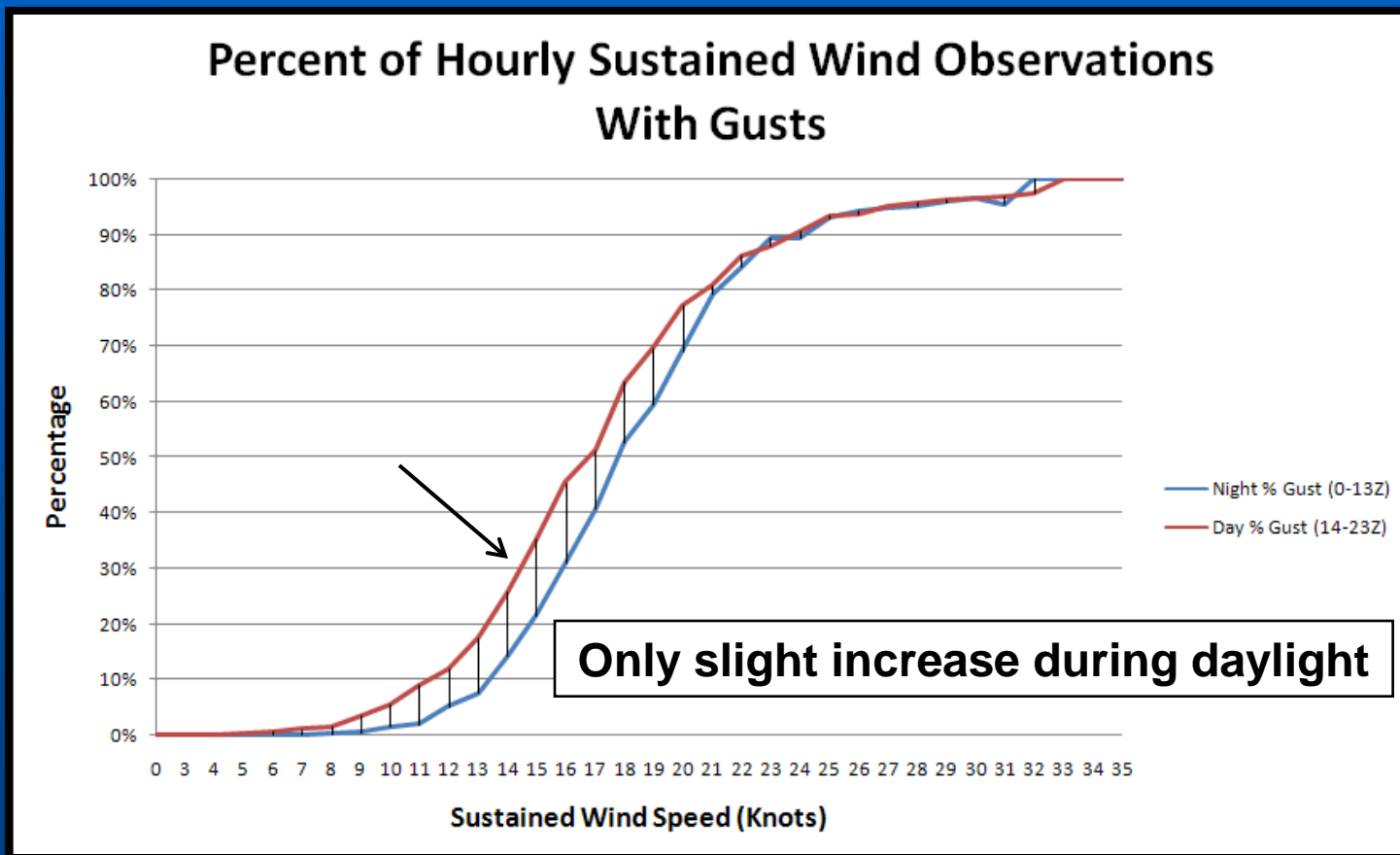
Timing of the Wind Gust



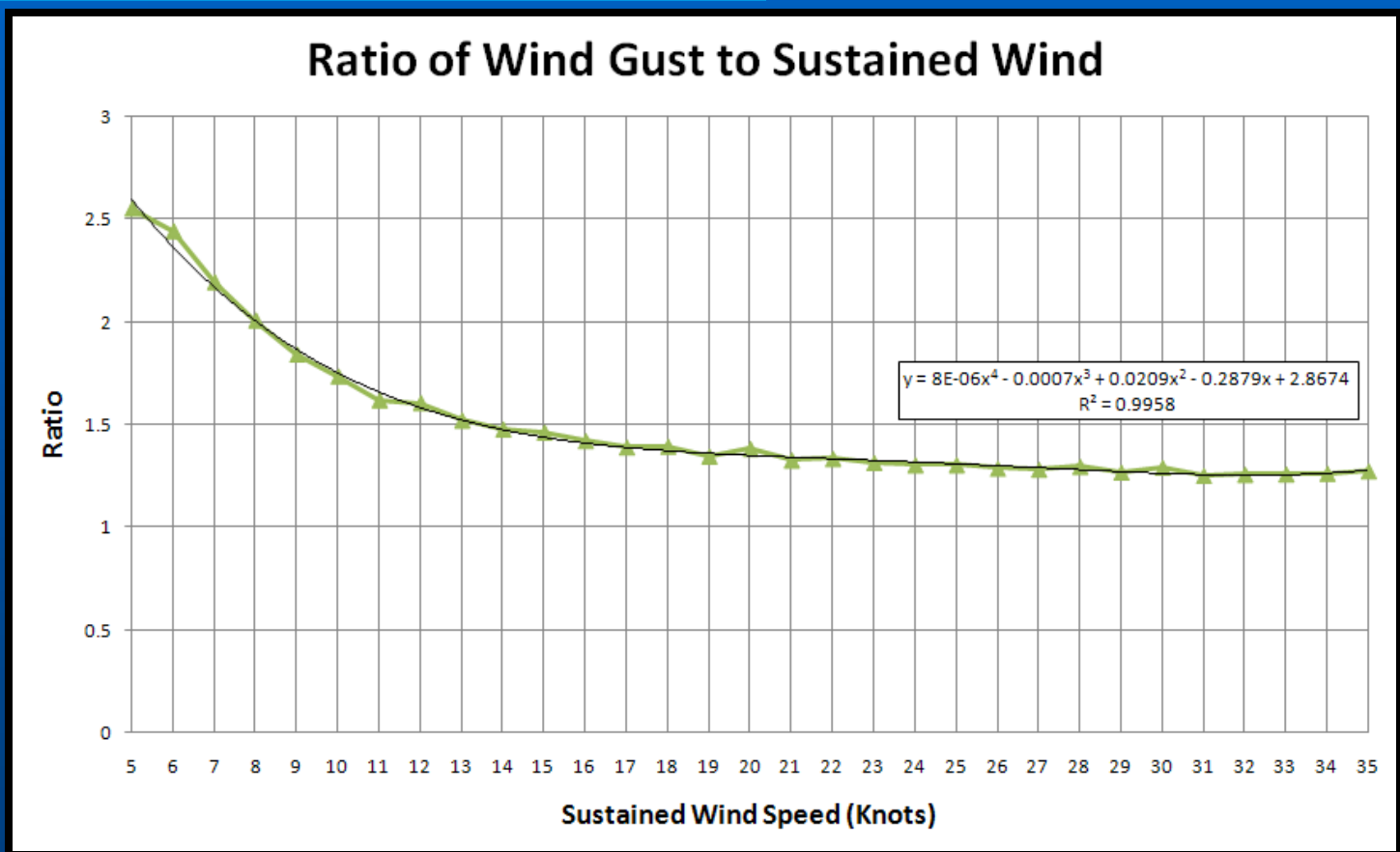
Gust Creation Comparisons



Character of the Wind Gust



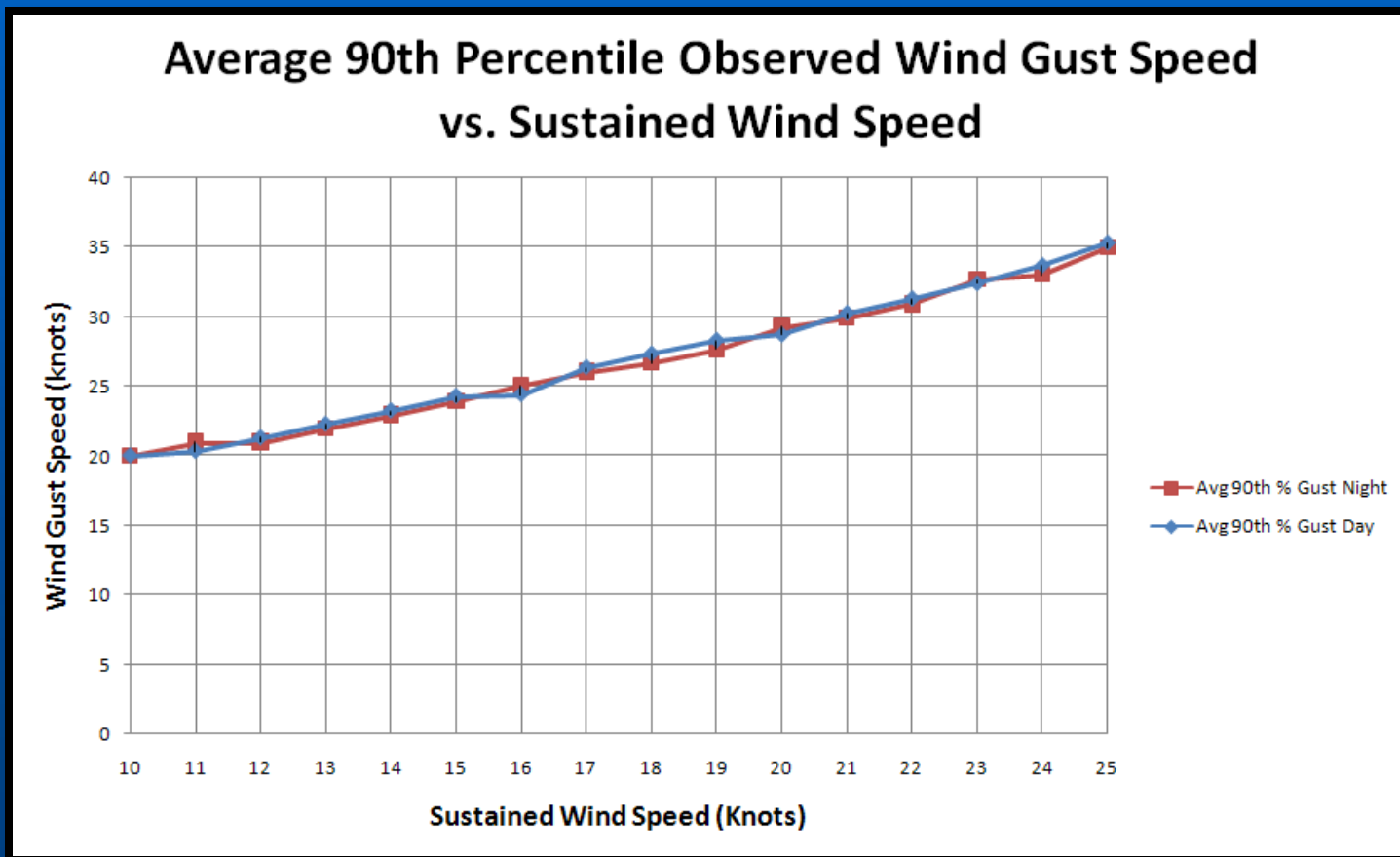
Forecasting Wind Gust



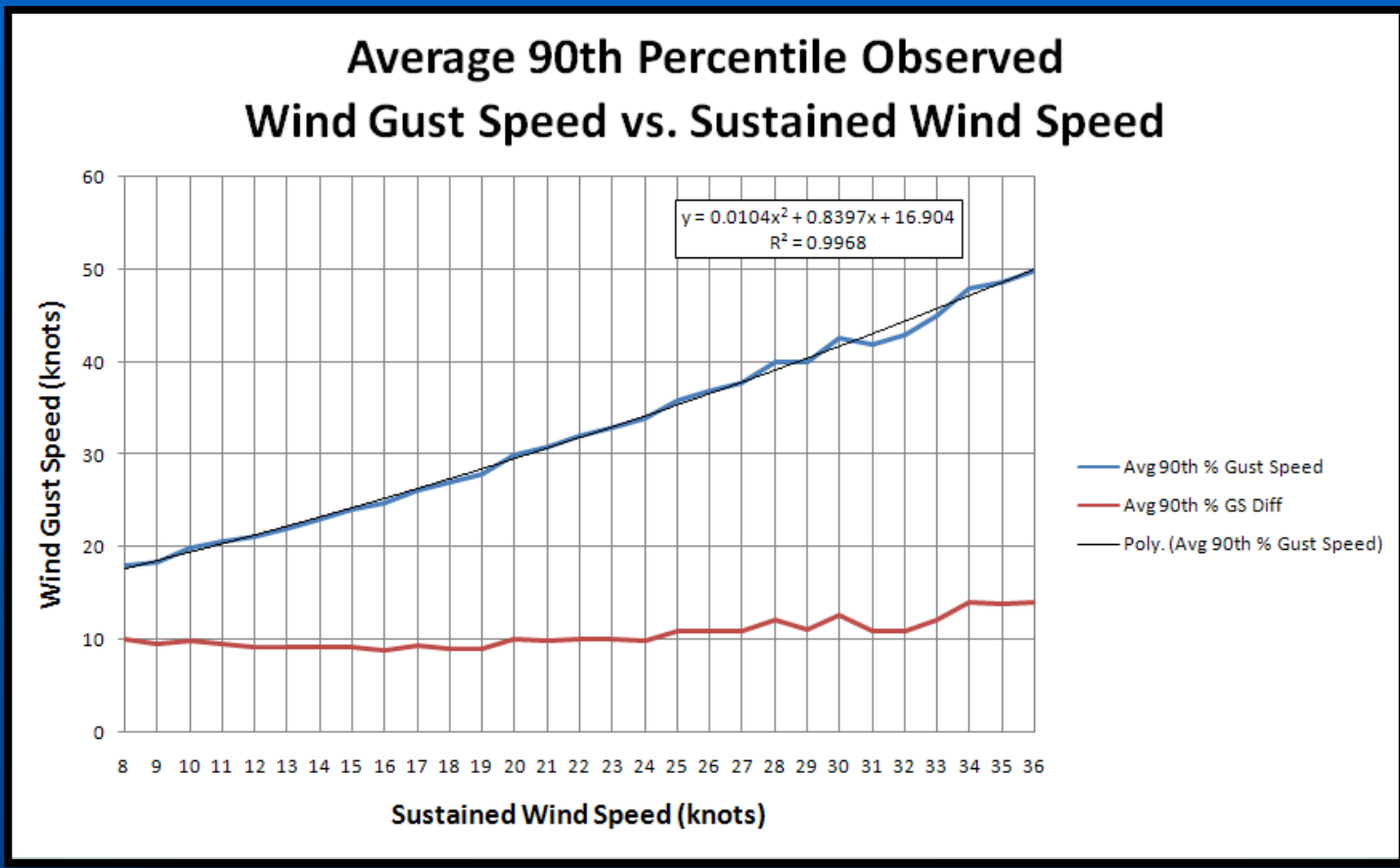
New Services? – 10% POE Grid

- **Objective:**
 - Provide the customer with decision making support using a CDF (Cumulative Distribution Function) or 10% POE

Character of the 90th % Wind Gust



Character of the 90th % Wind Gust



Conclusions

- Using BUFKIT Momentum Transport Winds for gradient sustained wind forecasts – **NAM Good!**
- **Use a Gust Factor (ratio) for wind gust forecasts**
- **Smart Tool Developed to use regression equation (ratio) to produce wind gust and 90% POE automatically (R=99.6%)**