Rain Check: New Tools to take the Guesswork out of Weather Delays

In Conjunction with the Associated General Contractors of America
Mike Bennett

Mike is the VP of Sales and Product Strategies at Athenium Analytics. In his time with the company, he has worked closely with the product and tech teams to shape the direction of current and future products; spent time in business development to help spearhead the growth of Athenium Analytics into new industries including construction; and managed strategic accounts of the company's largest customers and investors.

In his current role, Mike collaborates with industry partners to identify ways in which Athenium Analytics can provide solutions to their precise needs. A graduate of Cornell University, Mike's background is in meteorology and data.
Athenium Analytics background

• Web-based **decision-support** software for insurance, government, financial trading, & construction organizations
• **60+ carrier clients**, including **3 of top 5** P&C insurers in U.S.
• Industry-leading products for underwriting, claims, quality assurance & risk management
  o **Gauge** – peril risk scoring and analysis
  o **GaugeConstruction** – site & phase-specific risk assessment
  o **Dexter** – post-event weather forensics & verification
  o **Beacon** – proprietary forecasts & hurricane predictions
  o **IRIS** – high-resolution machine vision insights
  o **Atlas** – comprehensive global weather database
  o **teamthink** – carrier performance analytics
Product suite

- Leverages deep machine-learning, natural language processing & artificial intelligence
- Empowers risk measurement, mitigation & management
- Integrates client data into solutions – enhancing utility & effectiveness
De-risk the weather in construction
Weather risk in construction

“The construction industry loses billions of dollars on delays and failures caused by bad weather. Buildings are damaged during storms; sites turn into seas of mud; freezing temperatures make it impossible to pour concrete.”

“Every state in the country has been impacted by at least one billion-dollar disaster since 1980.”
More extreme weather disasters

14

Weather disasters with losses exceeding $1 billion in 2018
Annual disasters have doubled

6.2
Average annual $1B+ disasters: 1980 - 2018

12.6
Average annual $1B+ disasters: 2014 - 2018
Changing climate

- Heavy-precipitation events have increased by 30% in the last century
- Temperatures have risen more than 2 degrees since 1950
- Days above 90 degrees expected to increase on average 20-30 days by 2050
A costly risk

“UK weather extends project durations by an average of 21%. However, using climatological data derived from weather observations when planning could lead to average reductions in project durations of 16%, with proportional reductions in indirect and overhead costs.”

- Ballesteros-Pérez et al (2018) Incorporating the effect of weather in construction scheduling and management with sine wave curves
GaugeConstruction

Understand your weather risk.
Mitigate valuable lost time.
Plan with confidence.
GaugeConstruction

- Deliver short-term, long-term & post-event weather analytics to contractors
  - Optimized configurability to consider every project’s critical path
- Manage long-term risk through phase-specific risk analysis
- Calculate potential lost-weather days through use of historical weather data
- Receive hyper-local post-event weather notifications
- Configure forecast alerts for appropriate perils & thresholds
- Track tropical disturbances & risk through 10-day hurricane track & intensity forecasts
Who’s Using It

Planning & scheduling
I need a better way to assess and mitigate the weather risk both in the long-term and short-term on new projects

Site superintendent
I need a better and more accurate way to notify my workers of upcoming impactful weather to manage on-site safety

Project manager
I need better documentation of what the weather was at our project sites to bring to the owners and insurance carriers
Request a demo

www.athenium.com/construction

30% Discount for AGC Members

We’re pleased to offer members of the Associated General Contractors of America an exclusive 30% discount on Gauge Construction. Enter your AGC member ID when you register and receive 30% off your annual or monthly subscription.

Redeem Your Discount Now
Mike Bennett
Vice President, Sales
Athenium Analytics

Mike.Bennett@athenium.com
Appendix
Phase risk scoring
Assessing the risk of weather-related delays on construction projects

• Defining weather perils & corresponding thresholds that impede construction projects

• Expressing the risk assessment in unified format to be used by:
  o General contractors
  o Insurance carriers
  o Insurance brokers
Initial risk scoring challenges

• Variety of construction activities with various sensitivities to weather perils
• Productivity reduction vs. activity stoppage in a weather event
• Use of customized tools & methods to overcome weather events
• Feasibility vs. inability to perform tasks in a weather event
• Differences in standards & safety procedures in construction companies
Phase risk scoring

Risk scoring methodology

• Four general phases of construction project were defined

Excavation  Foundation  Framing  Enclosure
“Can they continue if they have to?”

- Personnel safety
- Construction quality and standards
- Tools/equipment endurance & feasibility

- Common construction activities are considered
- In case of thresholds conflicts, the conservative threshold is taken
Phase risk scoring

Risk scoring

- Probabilities of exceeding either of the weather thresholds in a week is calculated
- Probabilities are calculated for U.S.
- Probabilities are converted to risk scores using a transfer function
  - Comparison of locations all over US
  - Local comparison of locations

<table>
<thead>
<tr>
<th>Risk Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.01%</td>
<td>0.10%</td>
<td>1%</td>
<td>2%</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
<td>70%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Phase risk scoring

Risk scoring example result

• Excavation risk score = 5
• There is between 2% to 5% chance of exceeding either of excavation thresholds during this given week
Wind at altitude
Wind at altitude: Overview

- Wind around the earth’s surface propagates in two general regions:
  - Free atmosphere (high altitudes)
  - Surface boundary layer (near ground)
- Land’s surface roughness determines surface boundary parameters
  - Boundary layer height
  - Shape of boundary layer
- Understanding of the boundary layer allows us to estimate wind at any altitude
Wind at altitude: Methodology

- Determine land surface roughness & wind exposure for a location in various directions
- Use wind exposure & guidelines (ASCE7) to establish wind boundary layer parameters
- Derive the wind at altitude based on boundary layer parameters & current surface output of wind
## Wind at altitude: Validation 1

- Methodology is validated against wind measurements at M2 Tower, Boulder, CO (below)
- High correlation & low bias/deviation is observed between wind prediction and measurements

<table>
<thead>
<tr>
<th>Altitude</th>
<th>Measured</th>
<th>Predicted</th>
<th>Bias (m/s)</th>
<th>Std Error (m/s)</th>
<th>RMSE (m/s)</th>
<th>Correlation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20m</td>
<td></td>
<td></td>
<td>-0.17</td>
<td>0.41</td>
<td>0.45</td>
<td>99</td>
</tr>
<tr>
<td>50m</td>
<td></td>
<td></td>
<td>-0.34</td>
<td>0.96</td>
<td>1.03</td>
<td>96</td>
</tr>
<tr>
<td>80m</td>
<td></td>
<td></td>
<td>-0.35</td>
<td>1.26</td>
<td>1.31</td>
<td>94</td>
</tr>
</tbody>
</table>
Wind at altitude: Validation 2

1. Methodology is validated against wind data at 80m in 22 locations around the US during past year
   - Various climate & wind regime
   - Various land cover

2. High correlation, low deviations & prediction error has been observed for all wind speeds
   - Standard deviation of prediction error = 1.7 m/s
   - Root mean square error = 2.0 m/s
   - Correlation of than 86%

3. Similar validation for high winds (wind at 80 m>15 m/s)
   - Standard deviation of prediction error = 2.4 m/s
   - Root mean square error = 4.2 m/s
   - Correlation of more than 95%
Thank you.

www.athenium.com
Washington, D.C.  Dover, NH  Waltham, MA