



Optimising Lidar Campaigns – What to keep in mind using a roaming lidar

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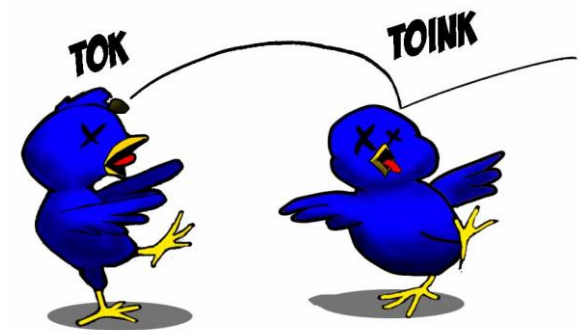
Why roaming remote sensing(RS)

Kill two birds

A “fixed” mast paired with a mobile (roaming) unit, which typically a couple of months.

Motivation for Roaming Lidar (or RS):

- Kill two birds with one stone: More + higher measurements
- Reduce spatial extrapolation error
- Consequently reduce uncertainty = lower LCOE





Is there a crux?

BUT:

You need MCP (Measure-Correlate-Predict) to “connect” the roaming data string with fixed mast data string

...which will be seasonally biased?

So, we trade spatial extrapolation error ↔ seasonal bias

Pest ↔ **Cholera**



Is this relevant?

How did we find out?

- Treat two masts on one site as if one of the two were a roaming lidar
- 6 sites (Turkey, South Africa) with ≥ 2 masts
 - Maximum distance between masts 10km
 - Minimum 80m measurement height
 - IEC compliant mounting
 - Measnet calibrated First Class anemometer
 - Minimum 1 year data, high recovery rate
 - For most masts tower shadow could be removed

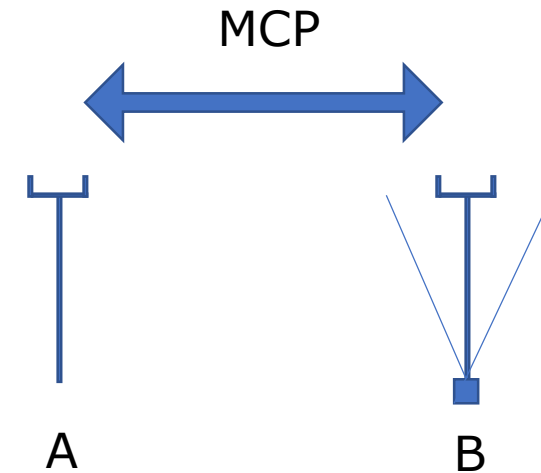
First Aim:

- Check seasonality

Is this relevant?

Methodologies:

- Keep one mast (A) as “permanent” – full period
- Pretend second mast (B) to be “roaming”
- Chop data from second mast (B) in subsets
 - 3 months
 - 6 months
- Extend subset (B) to full period by using MCP: linear regression, 30° sectors, residuals (WindPRO default settings)
- Compare resulting wind speed with real wind speed measured at B
- And the other way round...





Is this relevant?

Results:

- The bad news: Yes, there is an issue!
- The good news: There is not always an issue!
- **The even better news: We can predict if there is an issue or not!**



Background

Seasonality

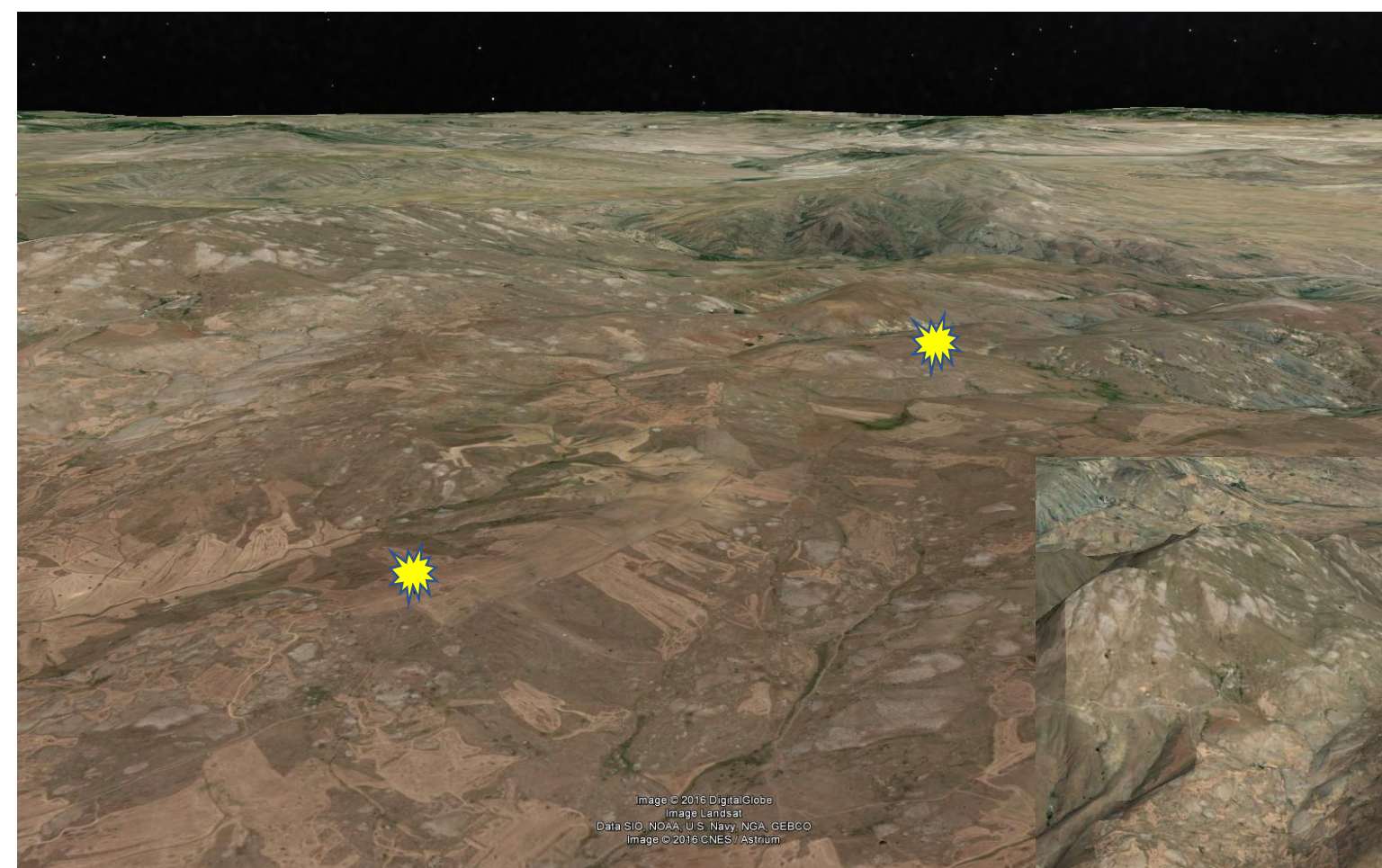
Two locations can experience different seasonal variations even if they are

- close to each other (< 5 km)
- in benign terrain ($\Delta RIX < 3$)

This fact is counter-acting the benefits of a roaming unit!

Example

Stretched factor 3



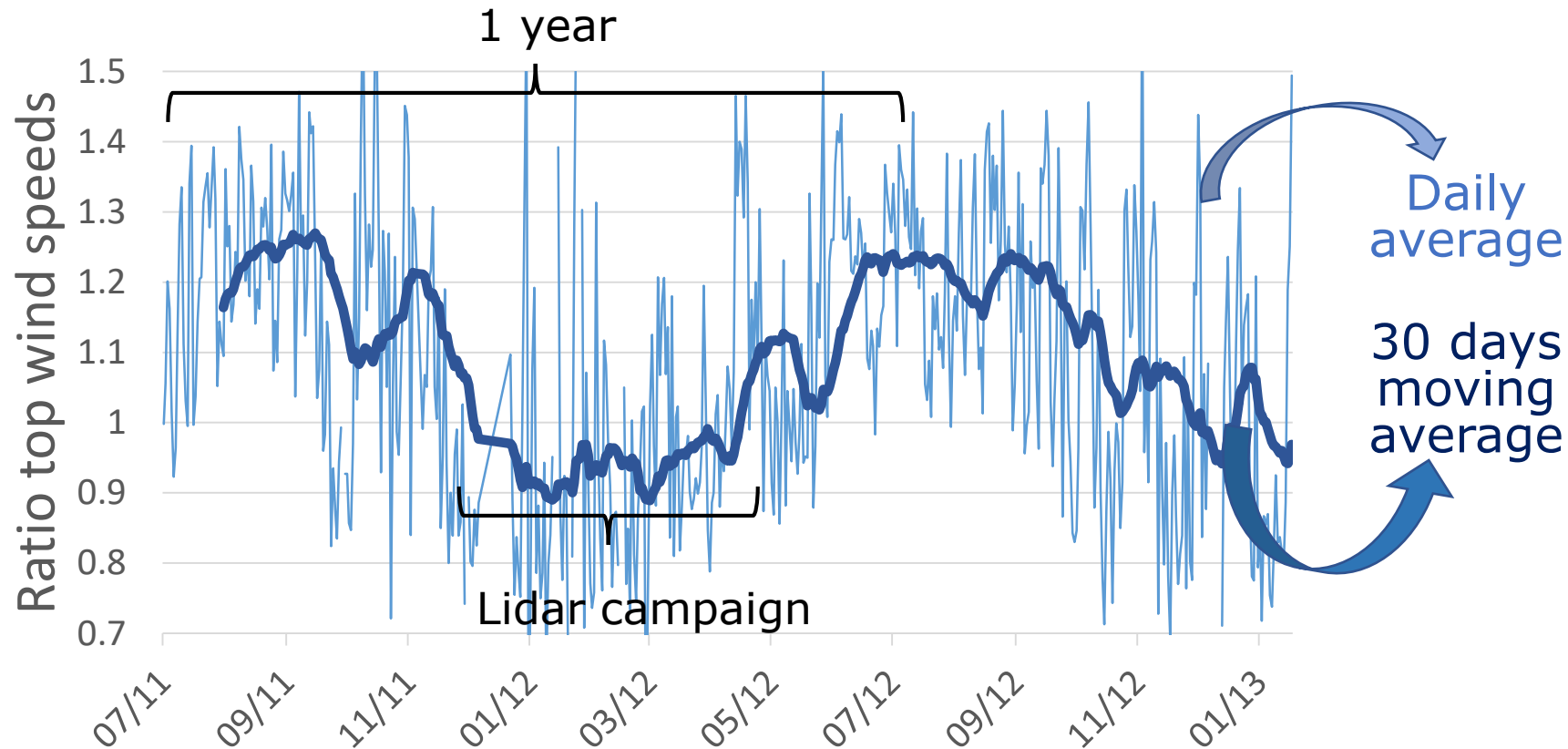
- Turkey
- Mast distance 3km
- Moderate terrain,
maximum delta RIX
1.6%

15-12-2017

Background

How to find out?

- Plot ratio of top anemometers from each mast against time
- Describes variations in space and time: "Spatial seasonality"



- Daily variations
- Seasonal variations

Consequently, a roaming unit measuring less than a year will suffer from a seasonal bias when MCPed 😞



The **BAD** News

The short answer

- In some cases a roaming unit is not paying off at all
- Using WAsP results in similar errors (but is cheaper)
- Even if the roaming device measures for either 2 x 3 months or 6 months
- Errors in the order of 6% energy production



The Good News

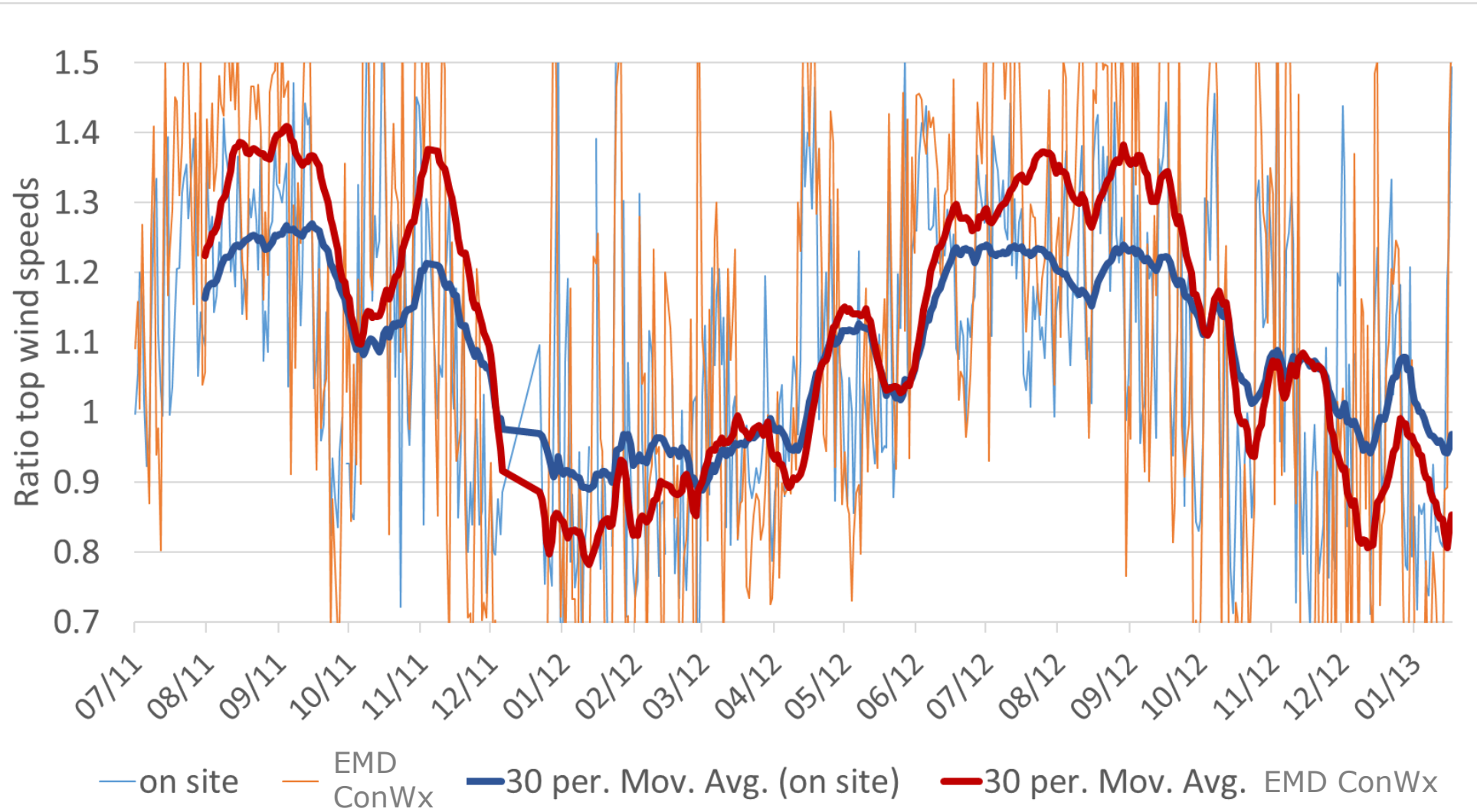
... and the **EVEN BETTER** news

Not all sites are affected!

And even better:

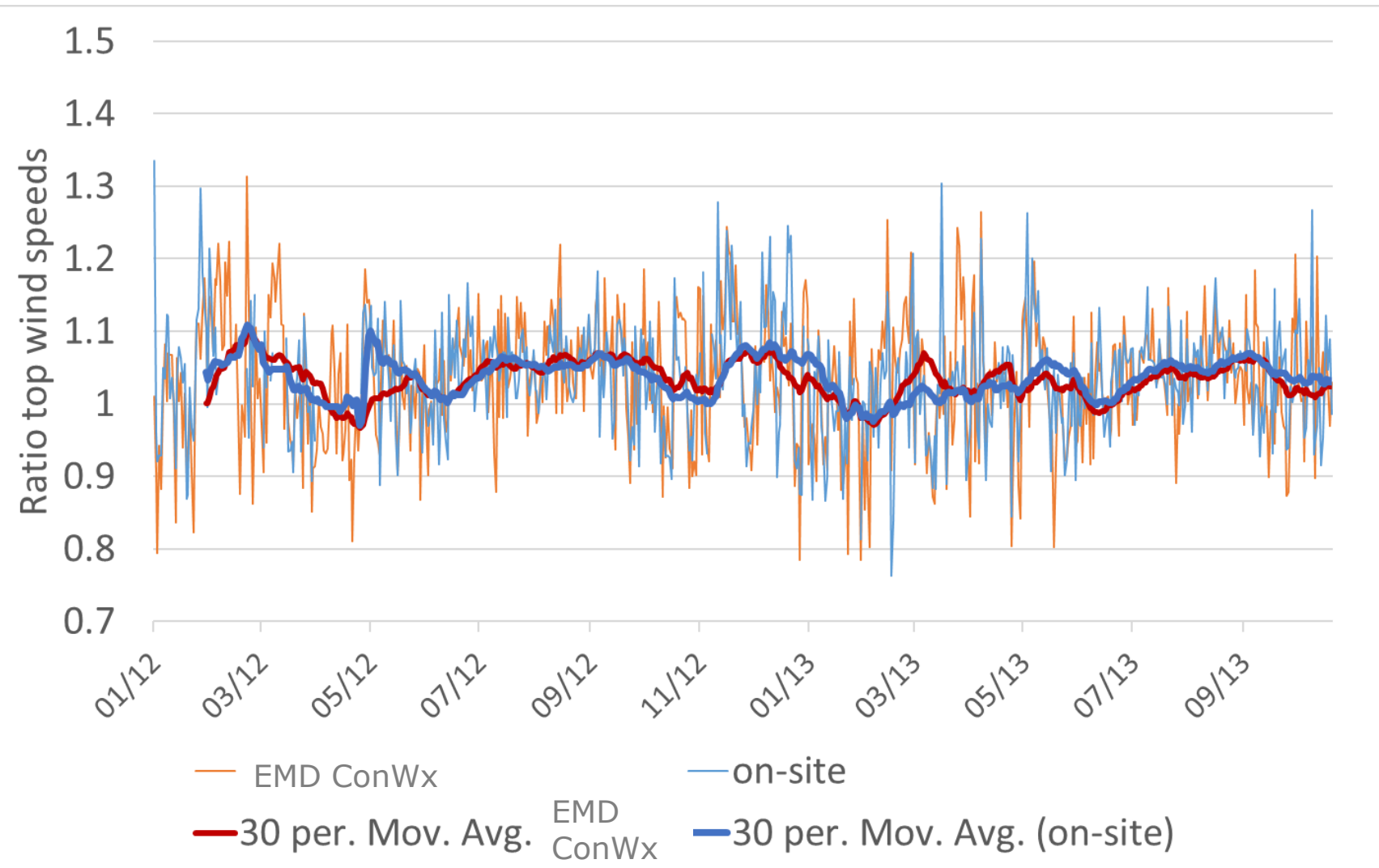
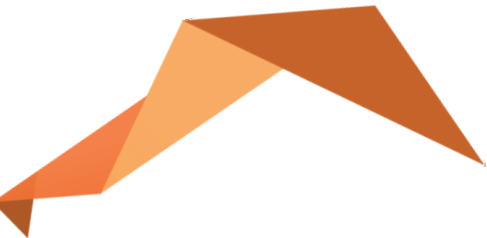
We can predict, when it happens!

Example 1



Roaming
device
not
beneficial

Example 2



Roaming
device
beneficial



EMD Wind Consulting

Check for Cost-Benefit

Before considering a roaming RS measurement campaign:

- A roaming RS device might not deliver the reduction in uncertainty you expect
- Check Spatial Seasonality!

Contact us for a non-binding offer!

EMD Wind Consulting

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