

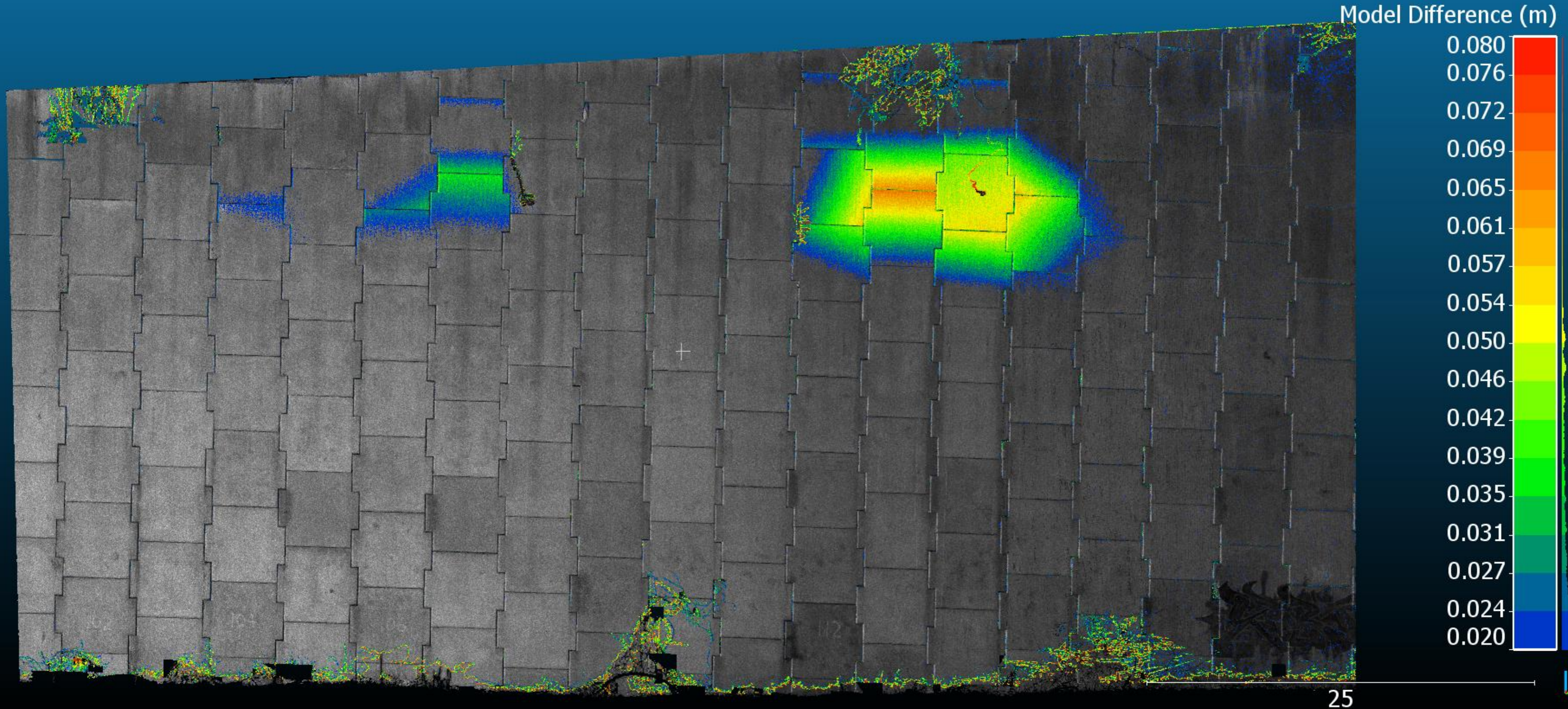
Decision-support and asset management from 3D change-maps: making simple bets from sophisticated data

Presented by: Dave Gauthier, Ph.D. P.Eng., P.Geo.

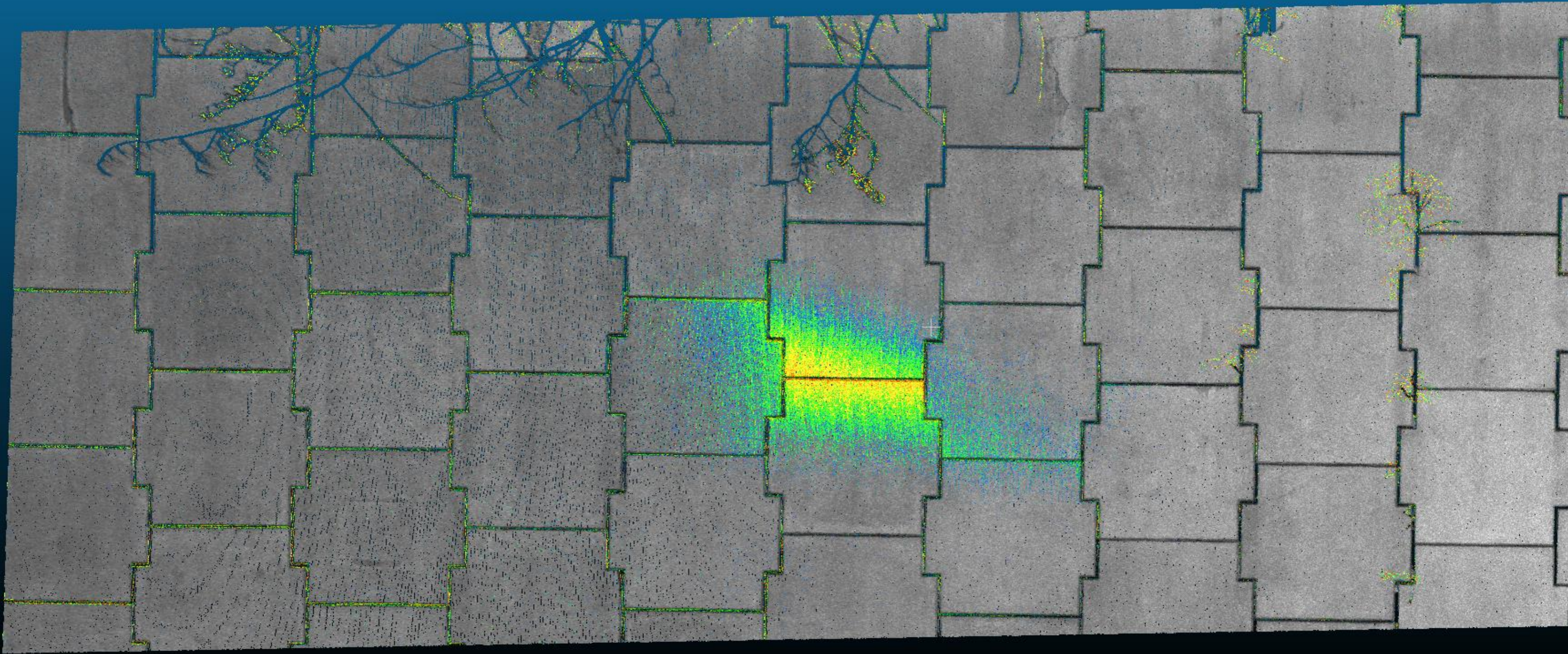
Date: January 13, 2020



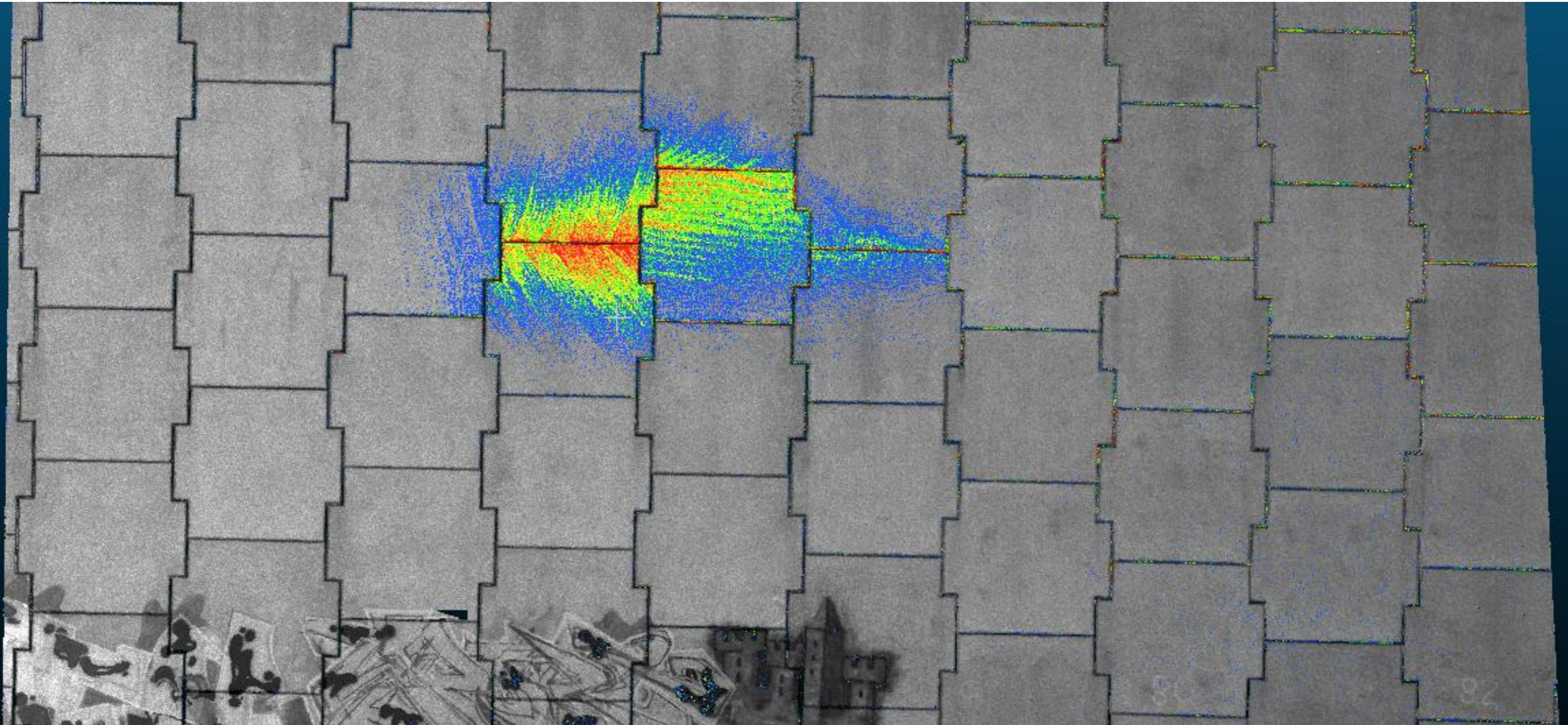
Our goal is to forecast performance. Failure usually impacts performance. Where would you put your money?



It moved. Is it moving? Now what do we do?



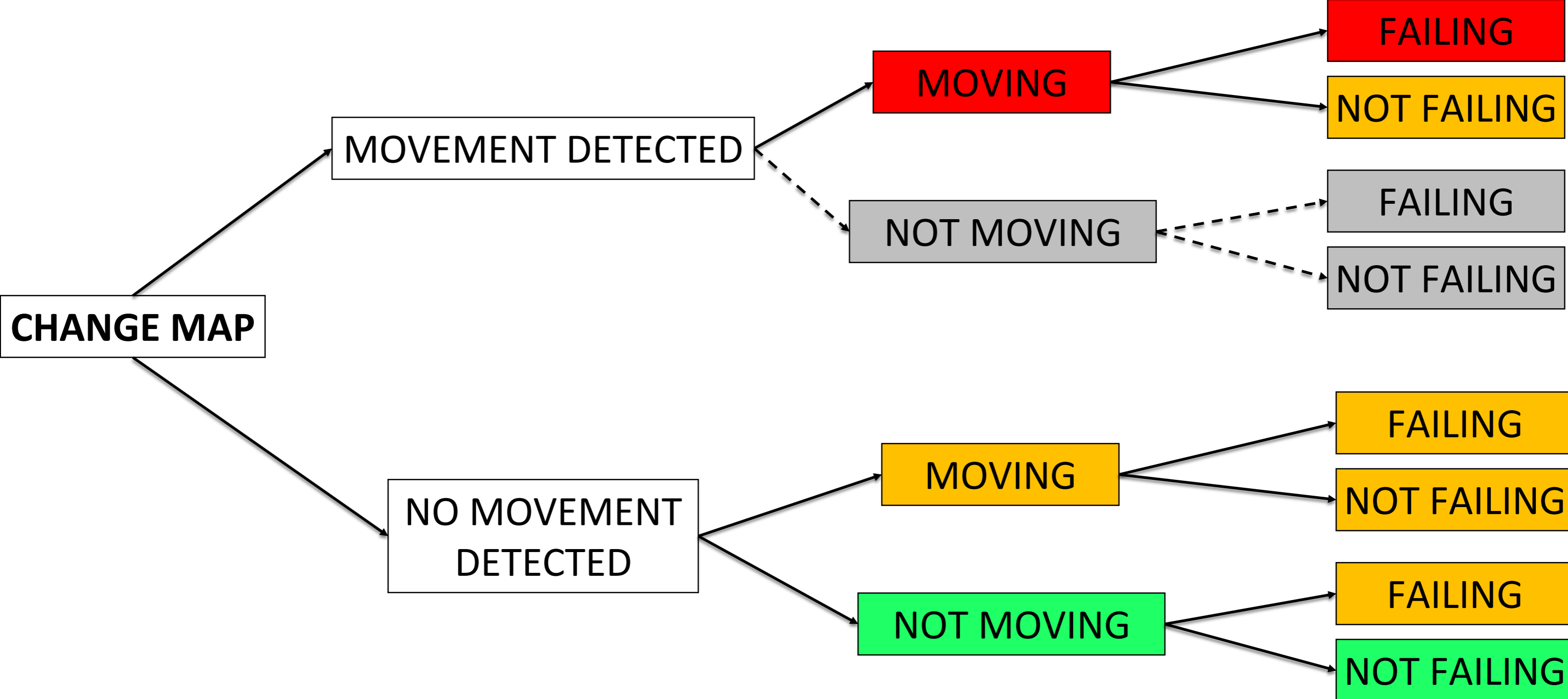
A (plausible/probable) failure process is represented, so our confidence is higher.



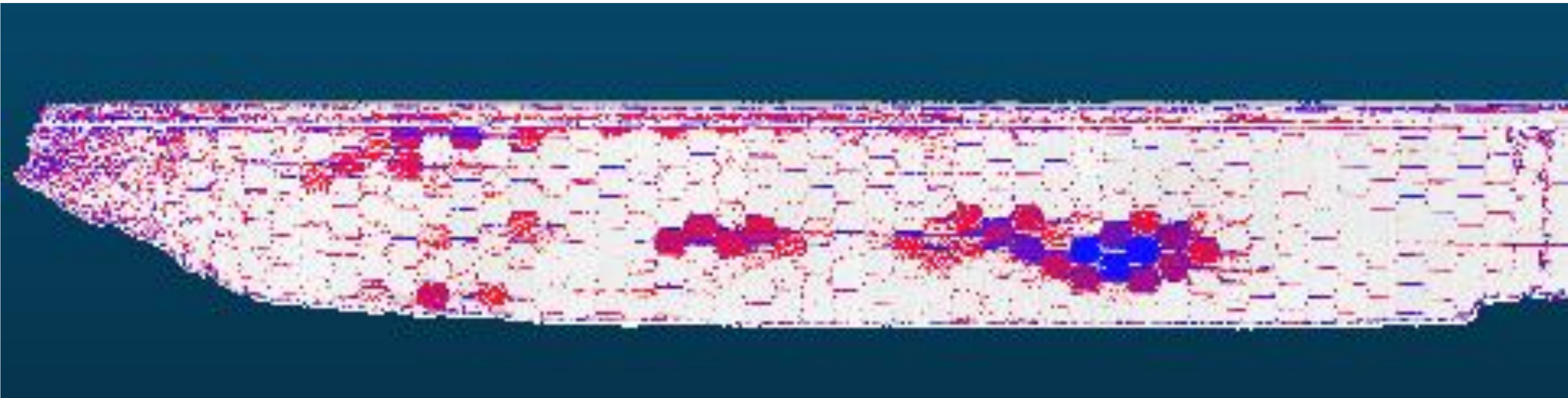
What does it mean when we don't see change? Could the wall still be changing?



There is a difference between *detected* movement, and movement



Change is usually temporal. But sometimes spatial. What does this tell us?



The power (or value) of evidence is a function of how much certainty it provides. 'Data entropy' is sometimes the term for this

CLASS I (low entropy)

- Movement detected

CLASS II (moderate entropy)

- No movement detected
- Misaligned panels
- Seepage
- Piping erosion

CLASS III (high entropy)

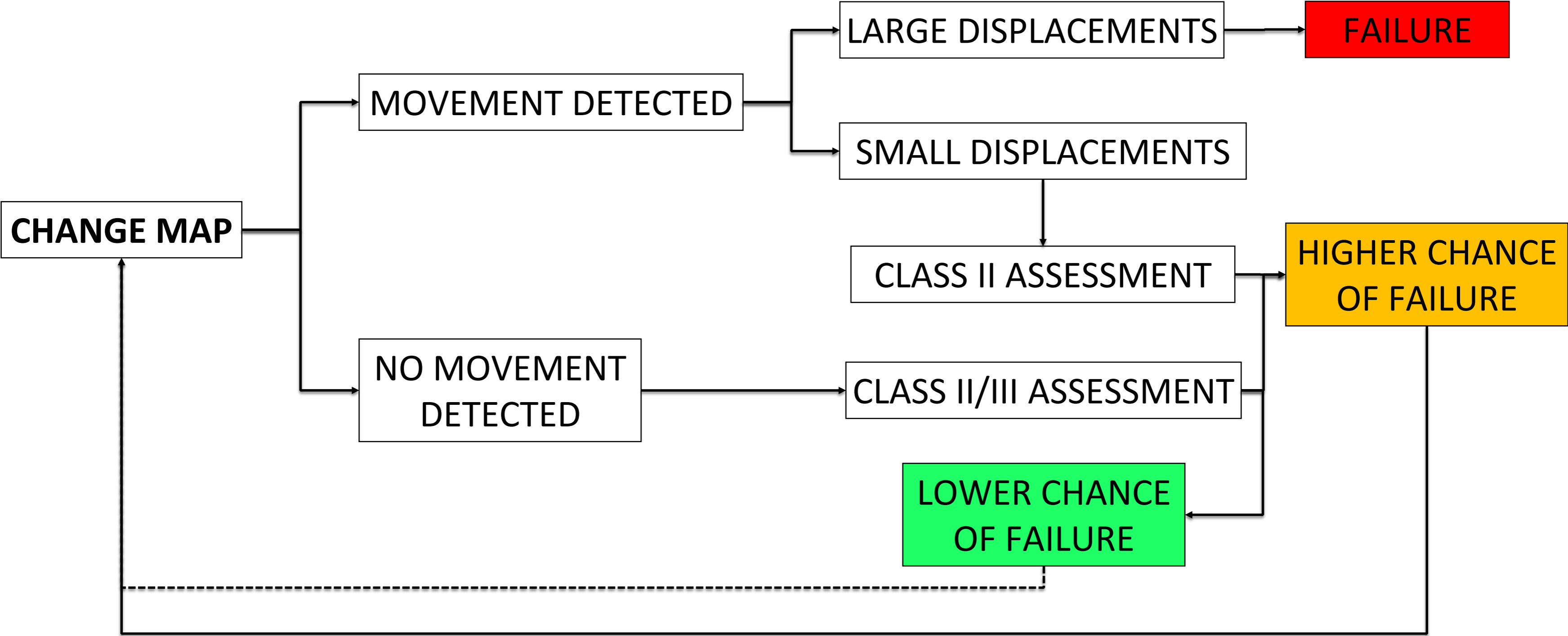
- Age
- Construction methods
- Fill material
- Strapping material
- Etc.

Highest

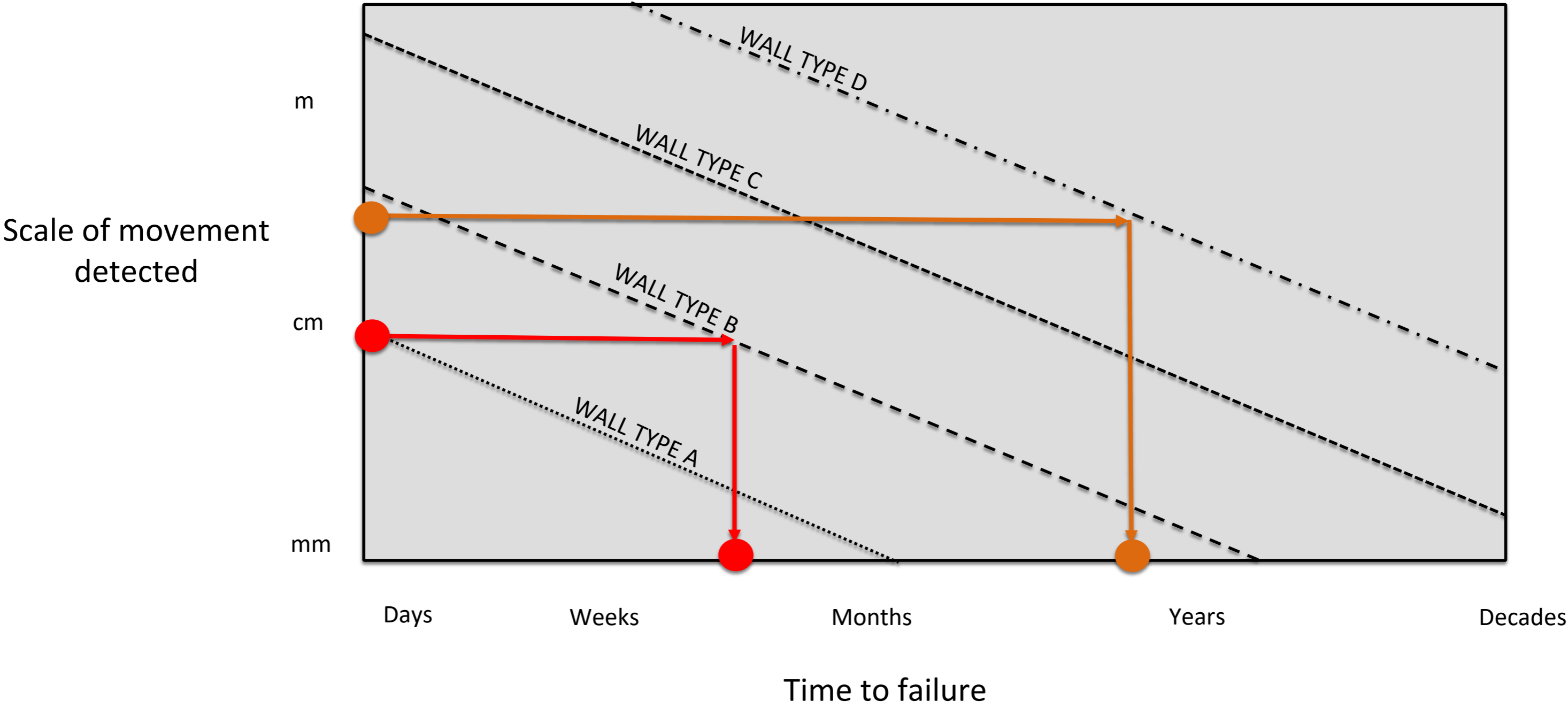
Lowest

Betting odds, power of evidence, certainty

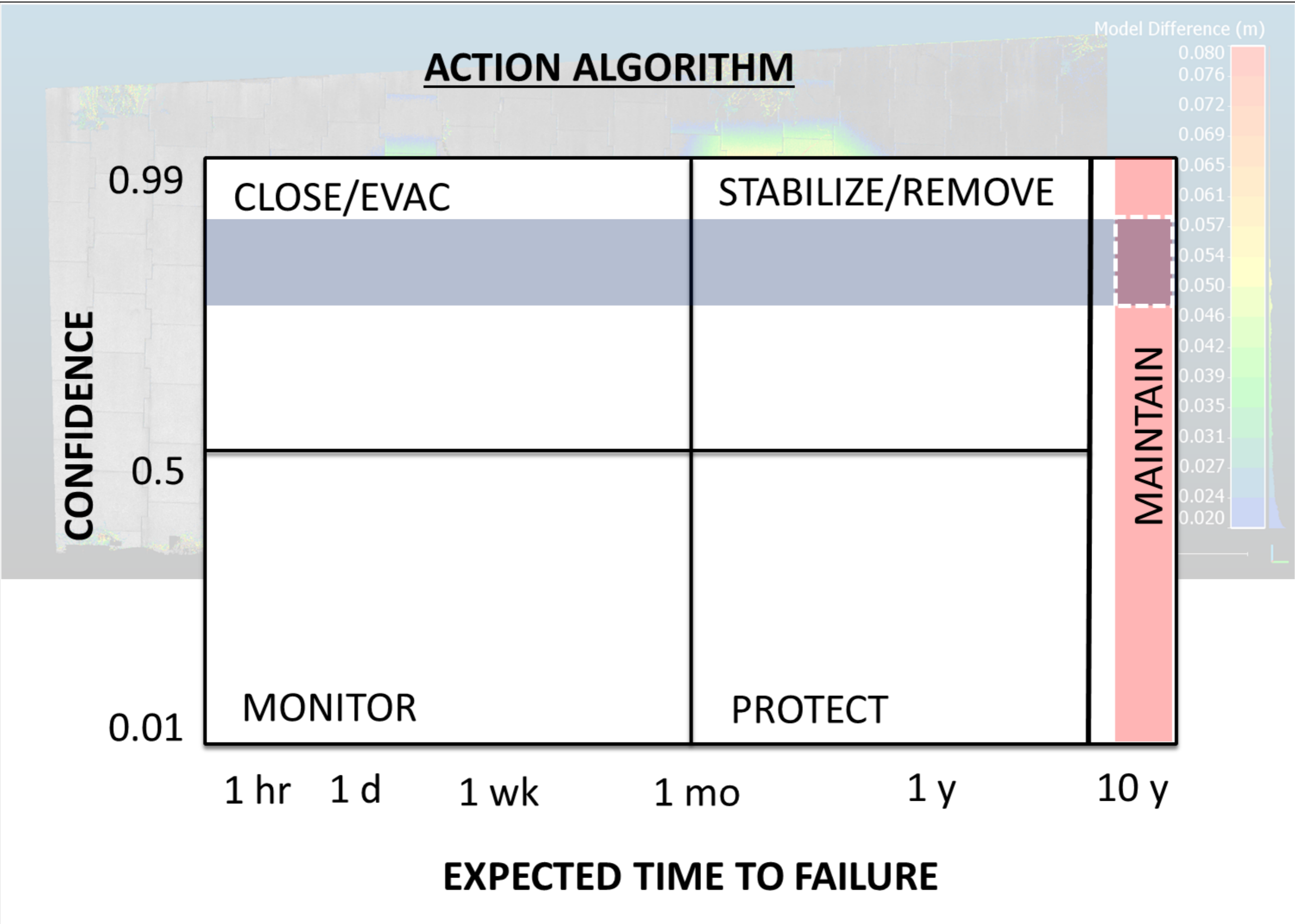
The assessment logic and action follows from the power of the evidence



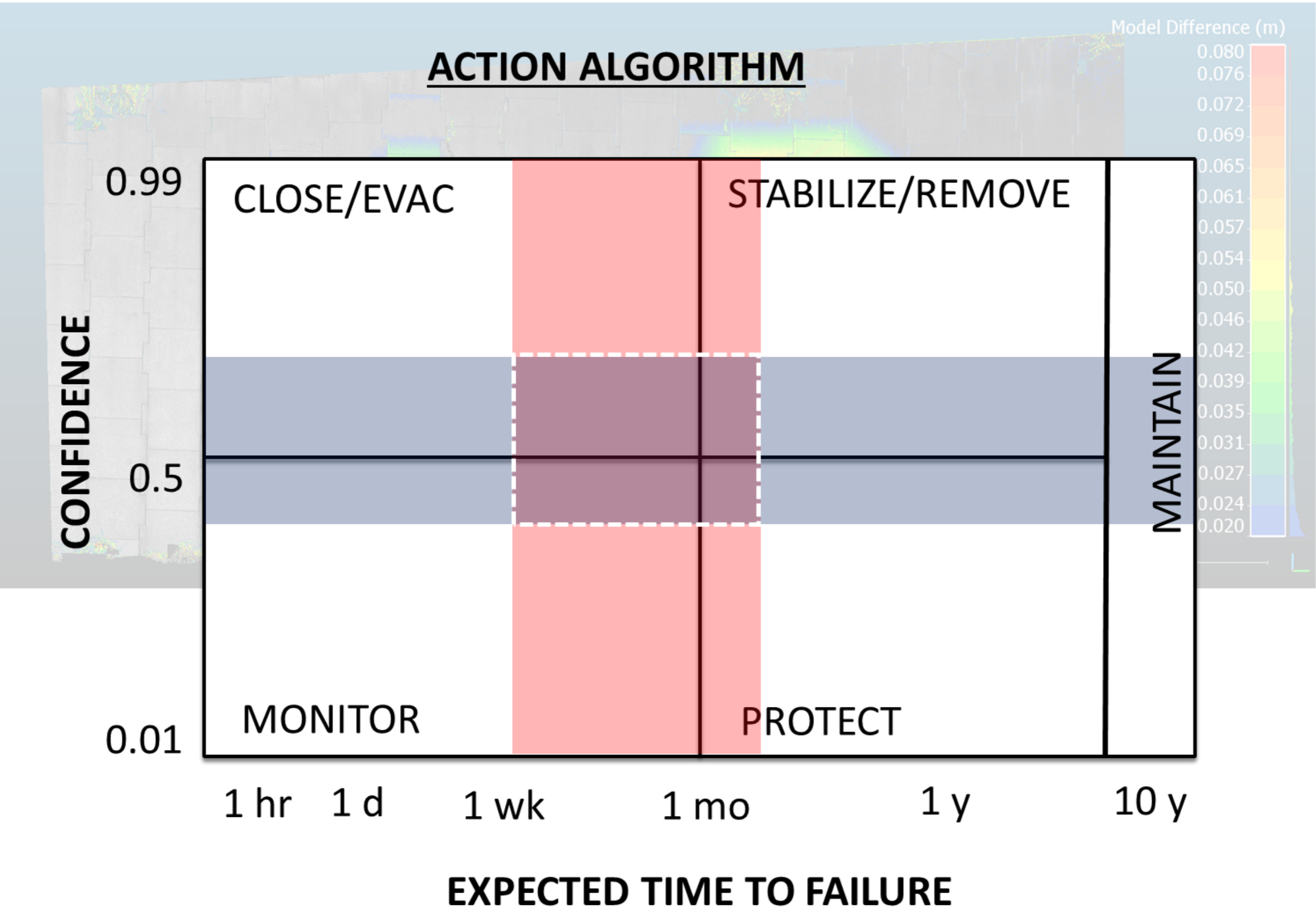
Observational approach requires a clear plan of action given different observations, which probably depends on time to failure



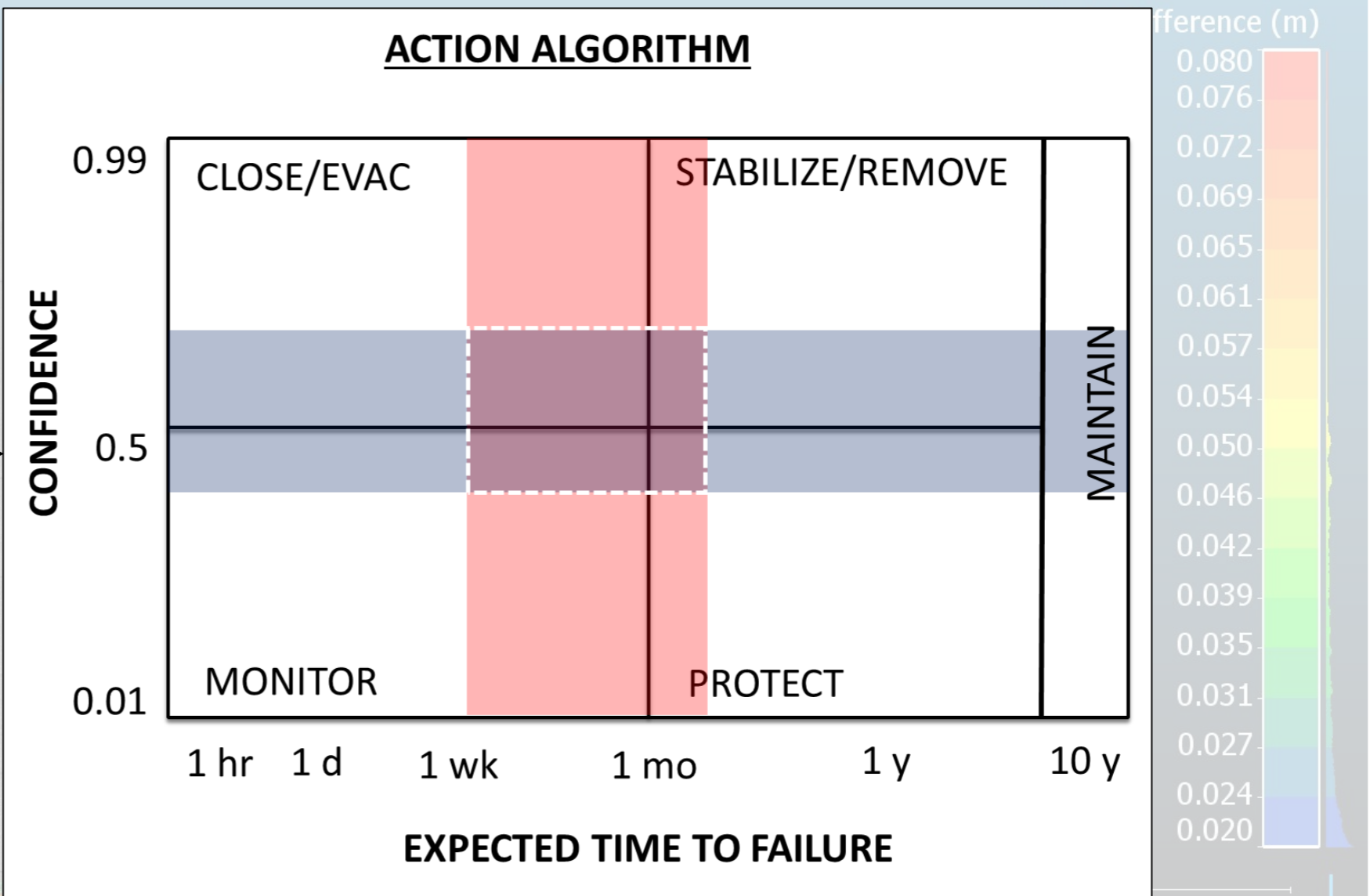
ACTION ALGORITHM



ACTION ALGORITHM



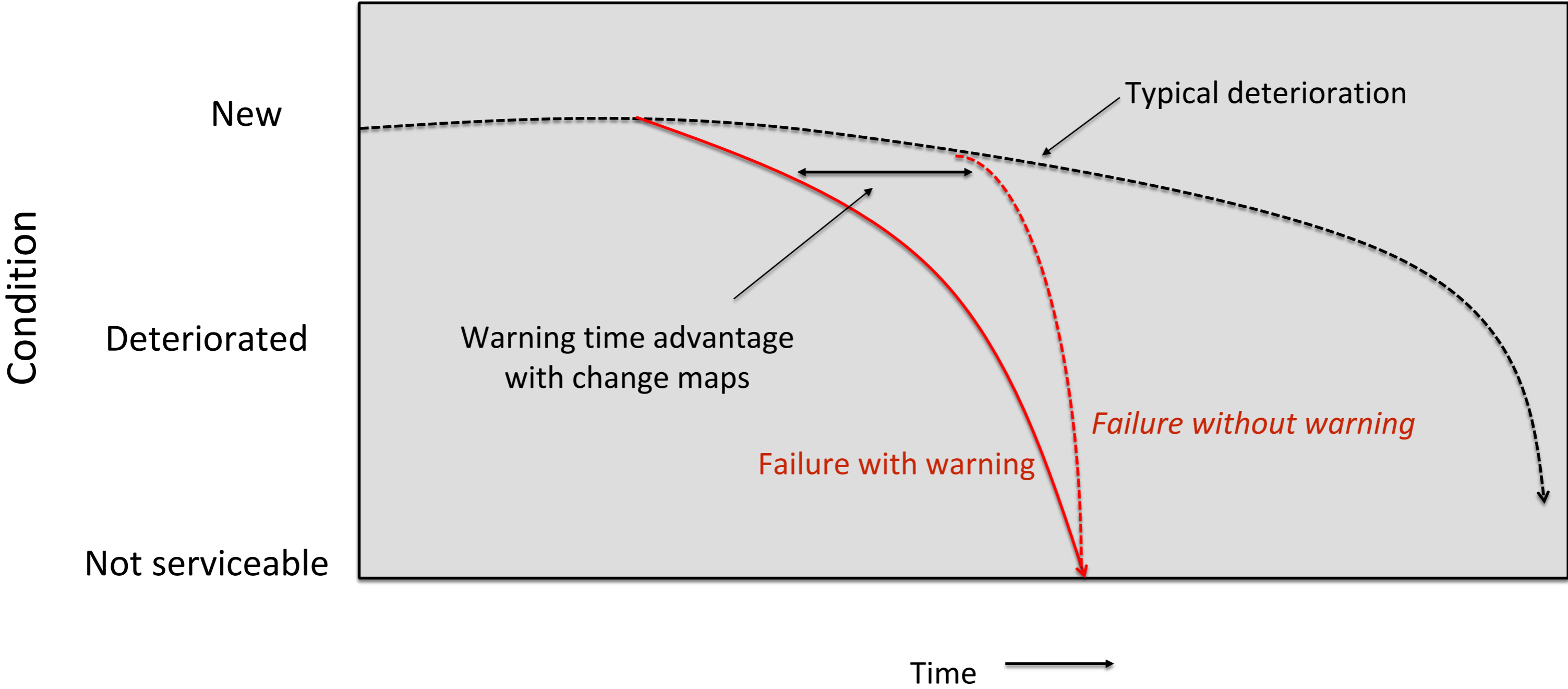
1. DATA
2. MECHANISTIC UNDERSTANDING OF THE FAILURE PROCESS
3. RISK TOLERANCE CRITERIA



Confidence level	Description
> 99%	There is no doubt
> 75%	Many panels suggesting failure in the given range
> 50%	Several panels suggesting failure in the given range
> 25%	Few panels suggesting failure in the given range
> 1%	Failure is possible in the given range

Time to failure	Description
1 hr	Panel detached, fill lost
1 day	Movement > 10 cm, major distress and fill loss
1 week	Movement of 10 cm, other distress
1 month	Movement of cm
1 year	Detectable movement
10 years	No movement but other factors

Change maps can help us detect which walls are falling off the 'typical' deterioration curve



**Thank you.
Questions?**

Prepared by: D. Gauthier, Ph.D., P.Eng., P.Geo.

Date: January 13, 2020

The logo features the letters 'BGC' in a bold, white, sans-serif font. Each letter is partially enclosed by a thin white vertical line: a line to the left of the 'B', a line between the 'B' and 'G', a line between the 'G' and 'C', and a line to the right of the 'C'.

BGC