Overview of 4-D Interpolator Prediction End Points With Discussion on use in Criteria Assessment.

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Statement of goal

Goal is to build a tool to be used in the improved assessment of short term criteria such as weekly mean and daily minimum.

We do NOT expect this tool to accurately predict DO in a specific hour on a specific date, but instead to assess the frequency of violations during an assessment period.

The Bay Oxygen Research Group (BORG) Team

CBP Coordination
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Statistics and Programming
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Modeling Group
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GIS support
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EPA Guidance
Jim Hagy

Conceptual diagram

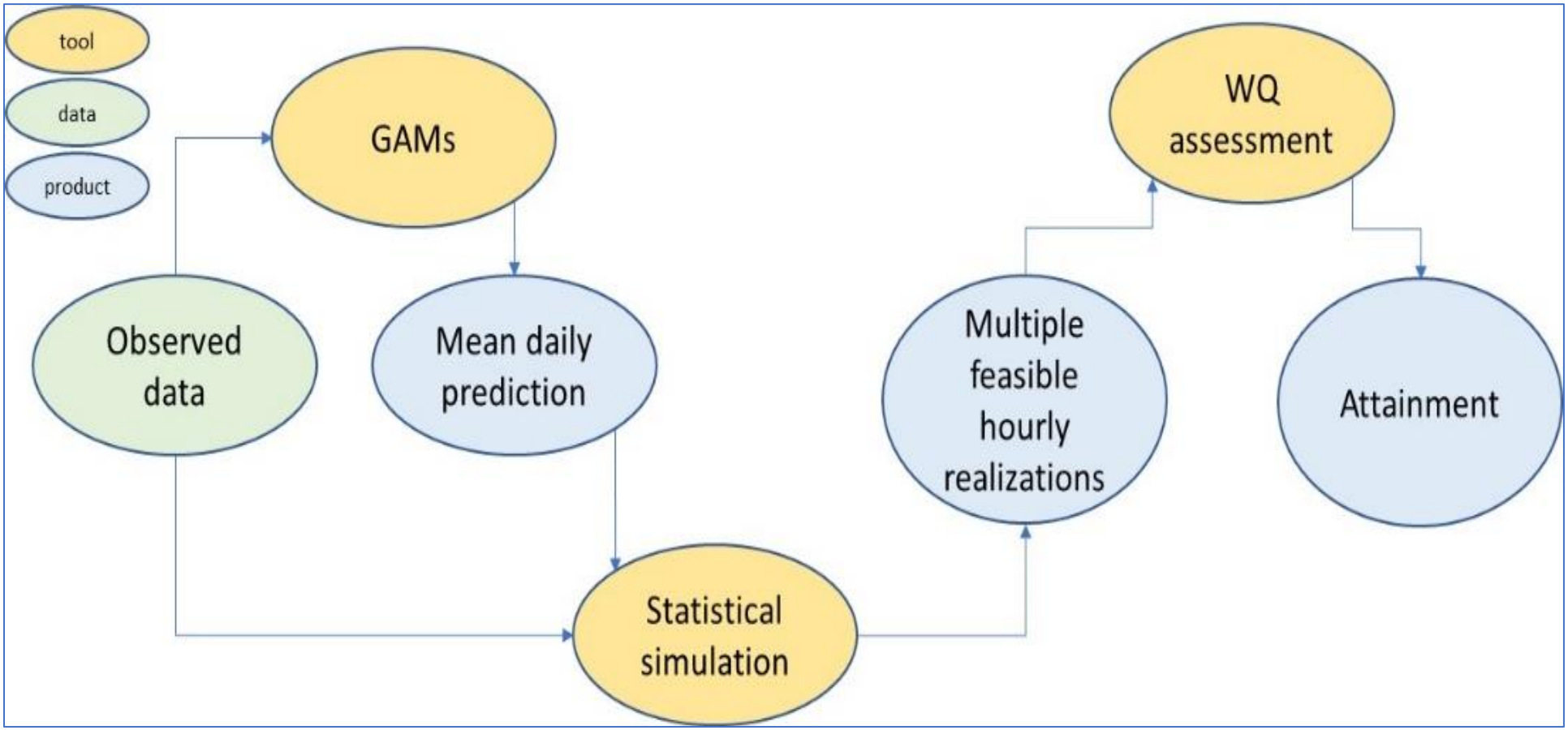


Figure 1: Interpolation and attainment assessment system

First: Consider what happens in the **GAMs** tool

Second: Consider what happens in the **Statistical Simulation** tool.

Third: Consider Possibilities for **WQ Assessment**

The GAM tool

Captures large scale variation in DO as a function of

Estuarine Longitude
Estuarine Latitude
Sample Depth
Bottom Depth
Long term trend
Seasonal Trend.

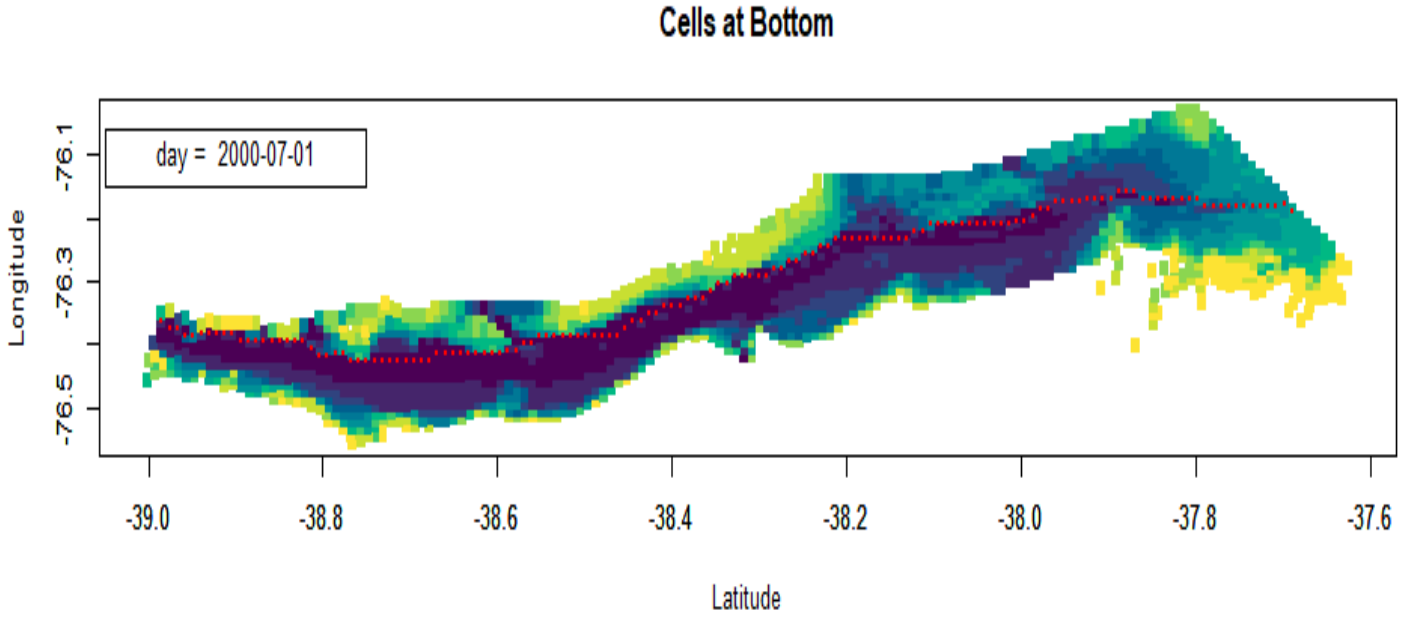
Predictor variables must be known in 4-D space

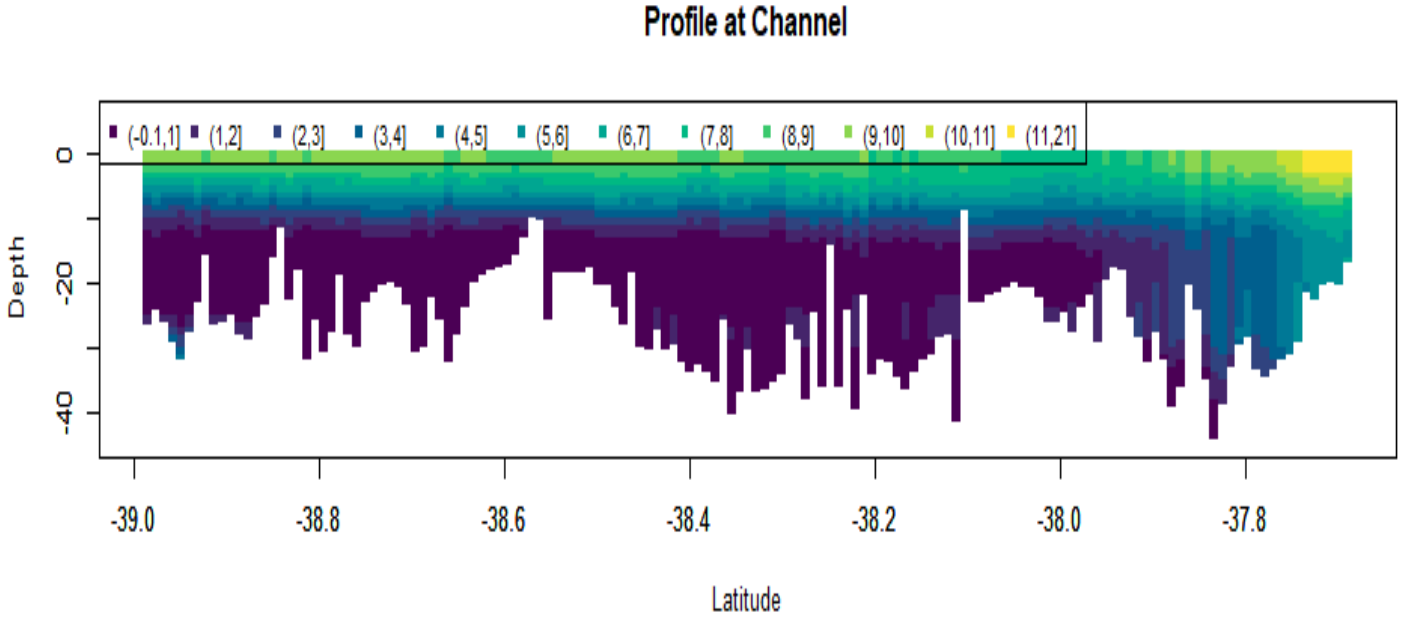
Produces a predictions in a time x depth x longitude x latitude lattice at a resolution of:

Time:	**one per day**
Depth:	**one per meter**
Longitude:	**1 per kilometer**
Latitude:	**1 per kilometer**

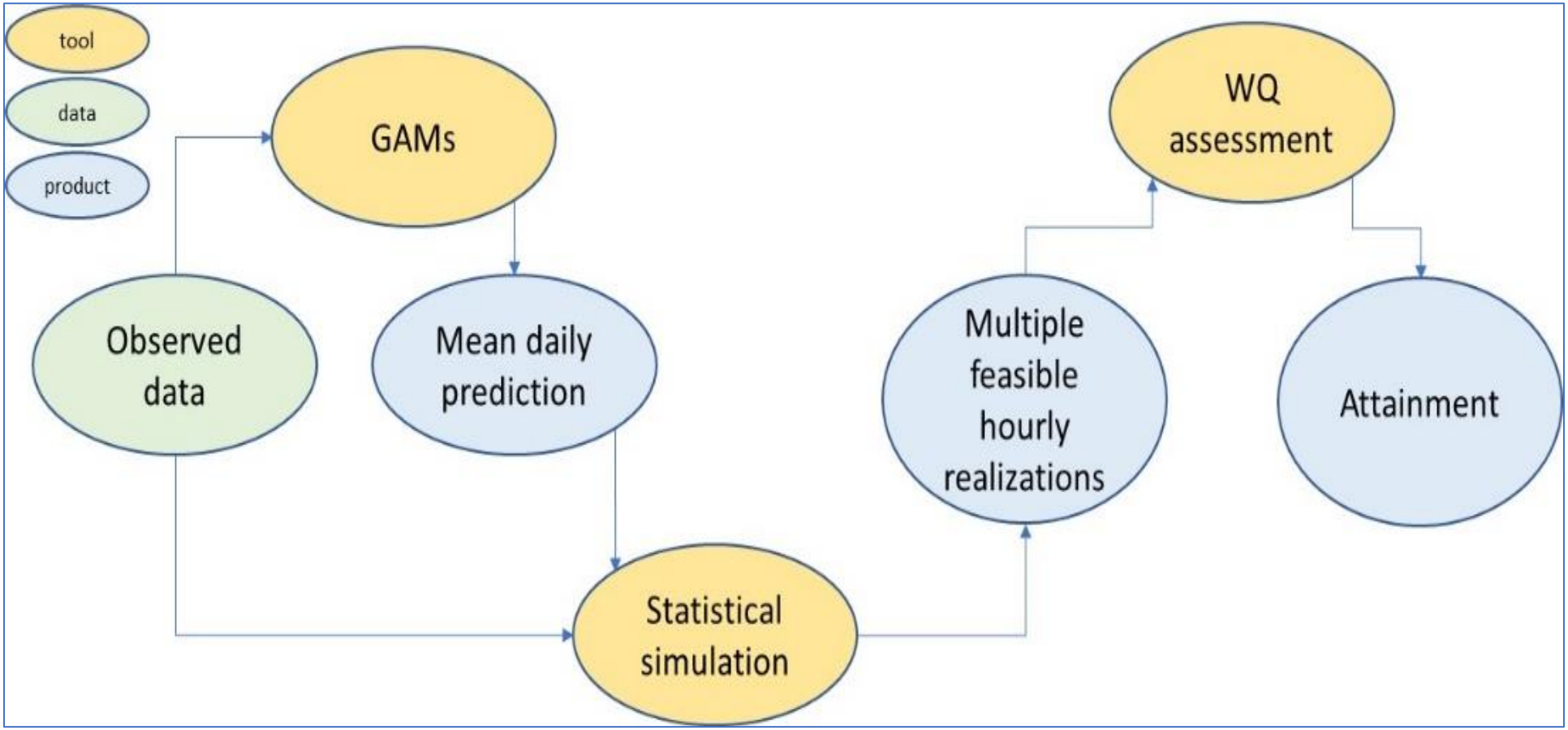
r-square ~ 0.85

Plane and Profile views of the Model Prediction Space.



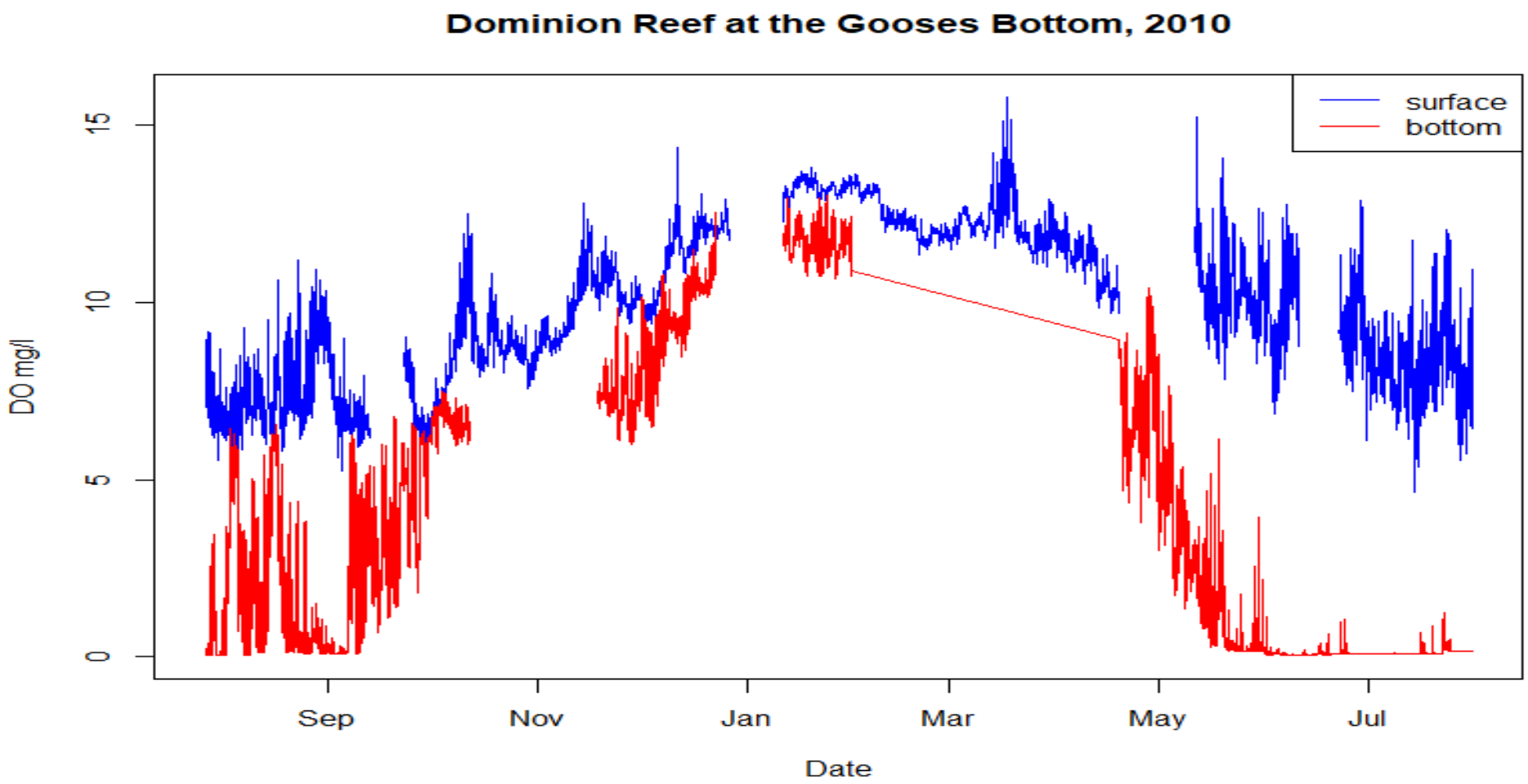


Next we look at High Frequency Temporal variation.

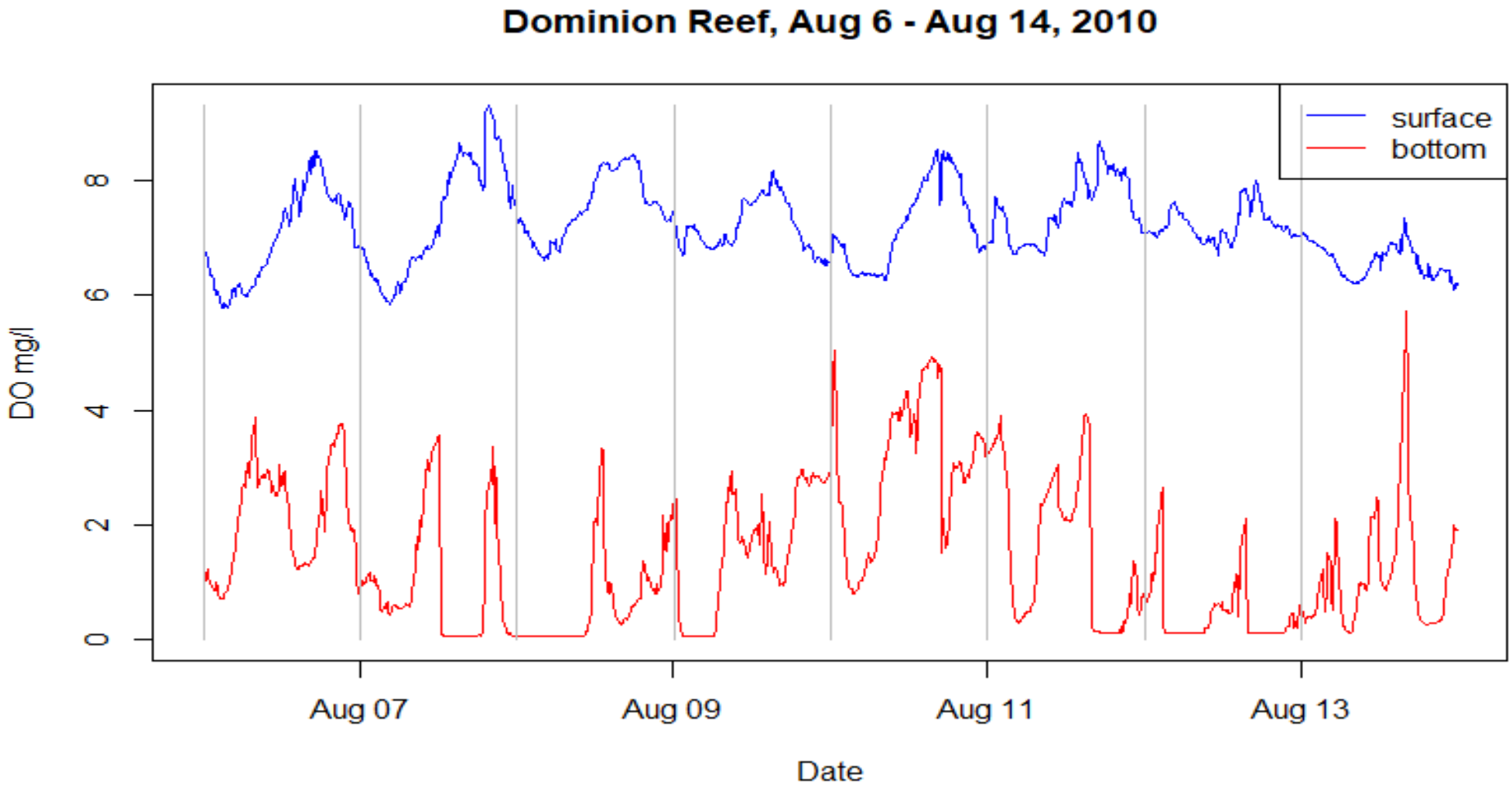


Second: Consider what happens in the **Statistical Simulation** tool.

Test data.

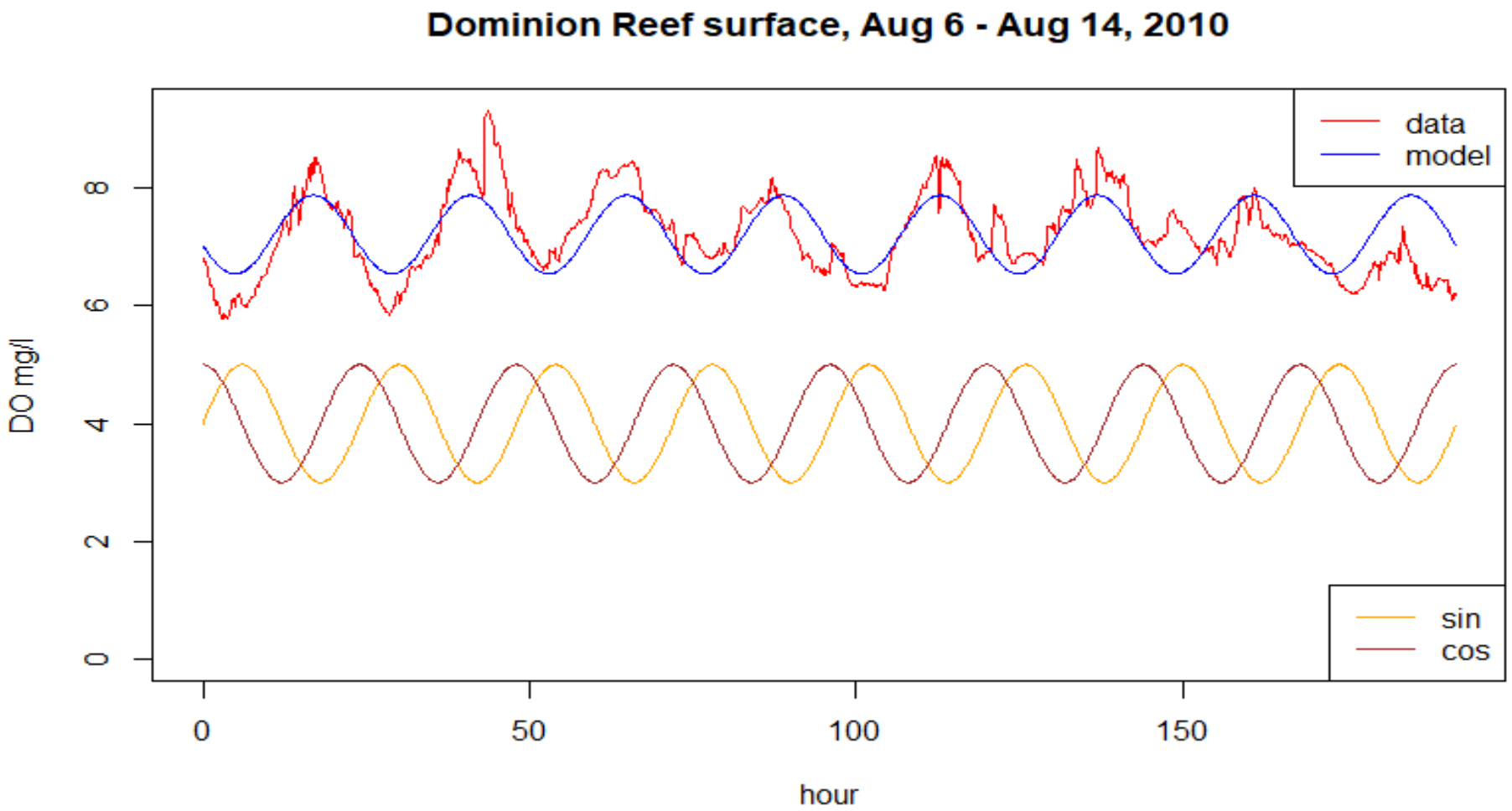

Dominion Reef at the Gooses Bottom, 2010
surface
bottom
DO mg/l
0
5
10
15
Sep
Nov
Jan
Mar
May
Jul
Date

Taking a closer look at a narrow window.



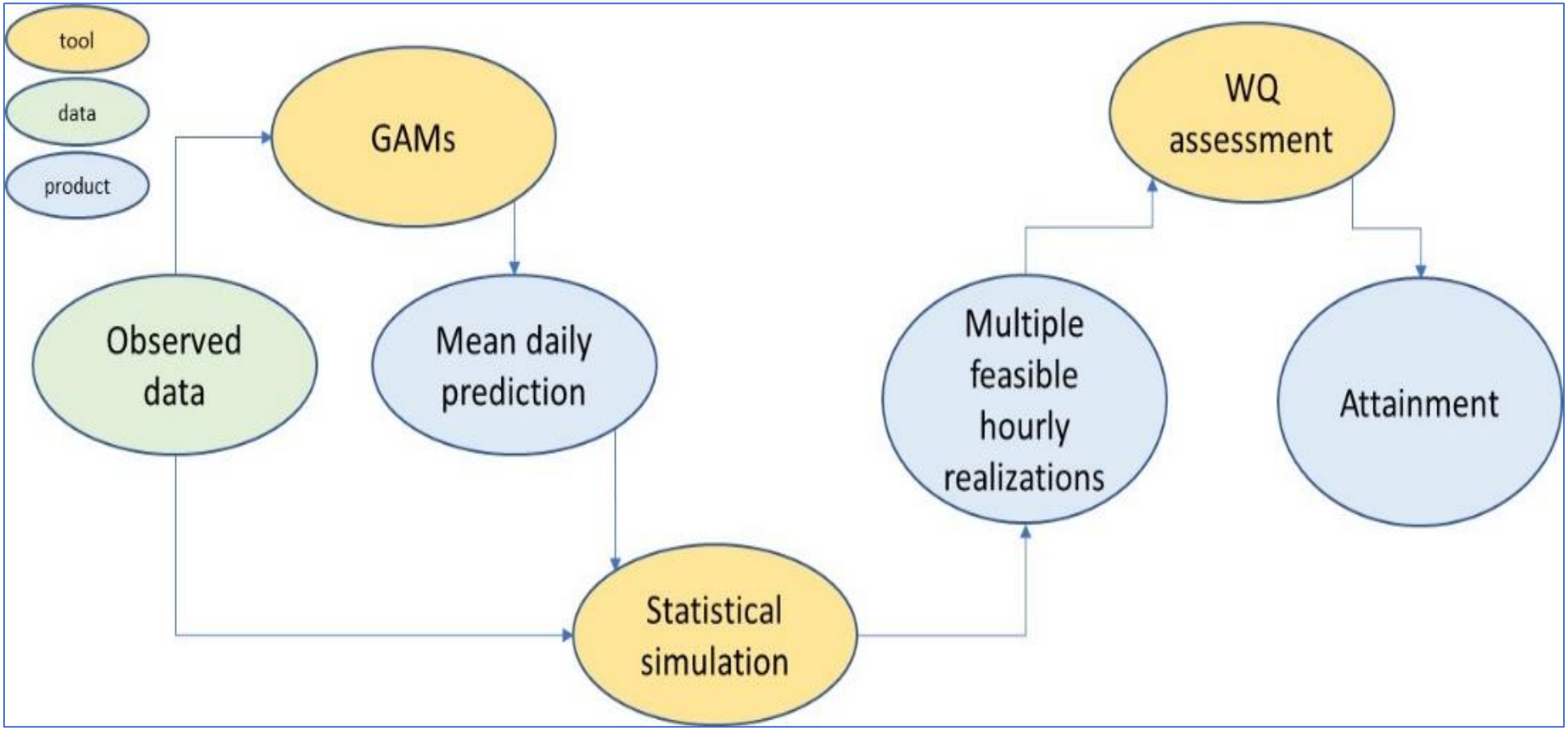
This week of data shows a clear diel signal in the surface water and evidence of a tidal signal in the bottom water (Jim Hagy suggested looking for this).

Basic Fourier Analysis



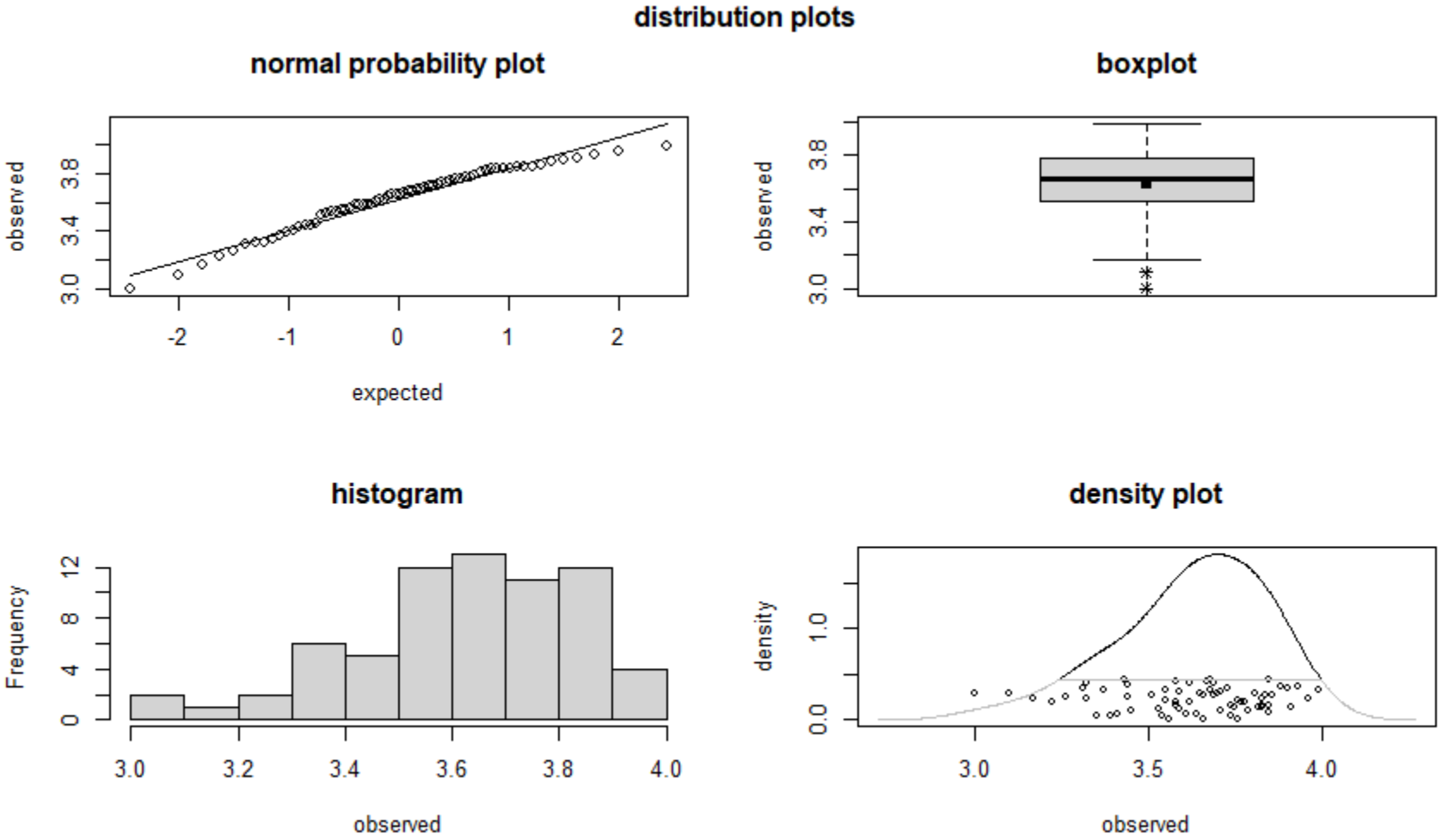
+ targets specific known periodicity
+ does not require evenly spaced data
+ yields amplitude information of signal
- targets specific known periodicity
- assumes stationarity (constant periodic cycle)

Next we look at Interpolator Output and WQ Assessment



Third: Consider what happens in the **WQ Assessment** tool.

For every point in the 4-D lattice there will be a distribution of feasible predictions:

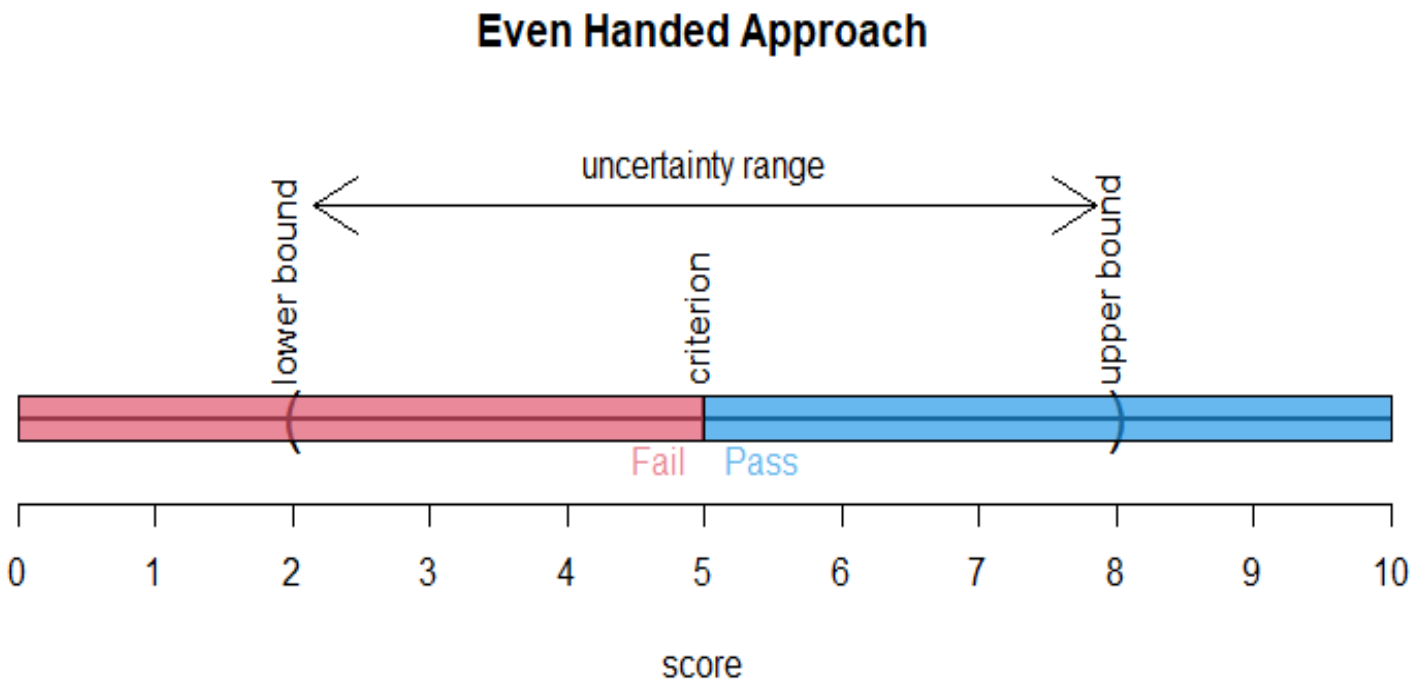


Approaches to Aggregation

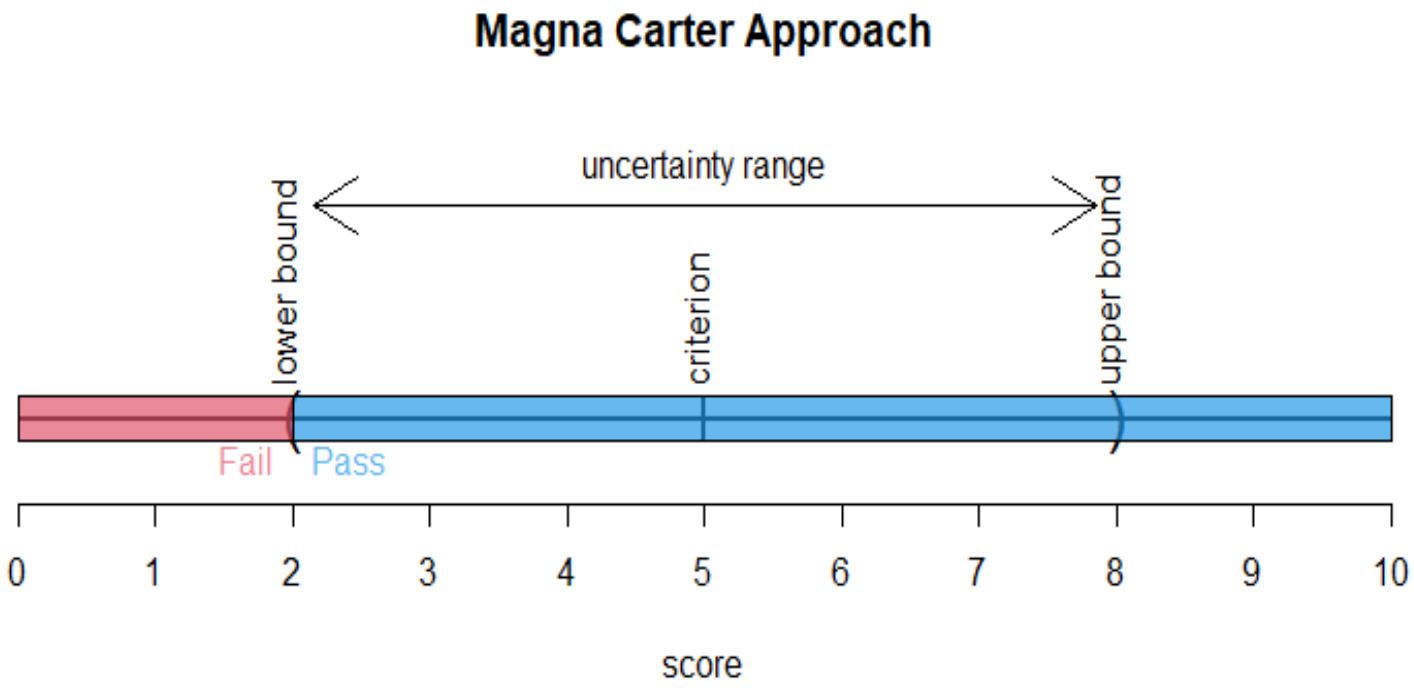
- **Average predictions by lattice point – compute one CFD.**
- **Compute a CFD for each simulation – assess the cloud of CFDs**

Will be dependent on developing a Criteria Assessment philosophy for dealing with uncertainty.

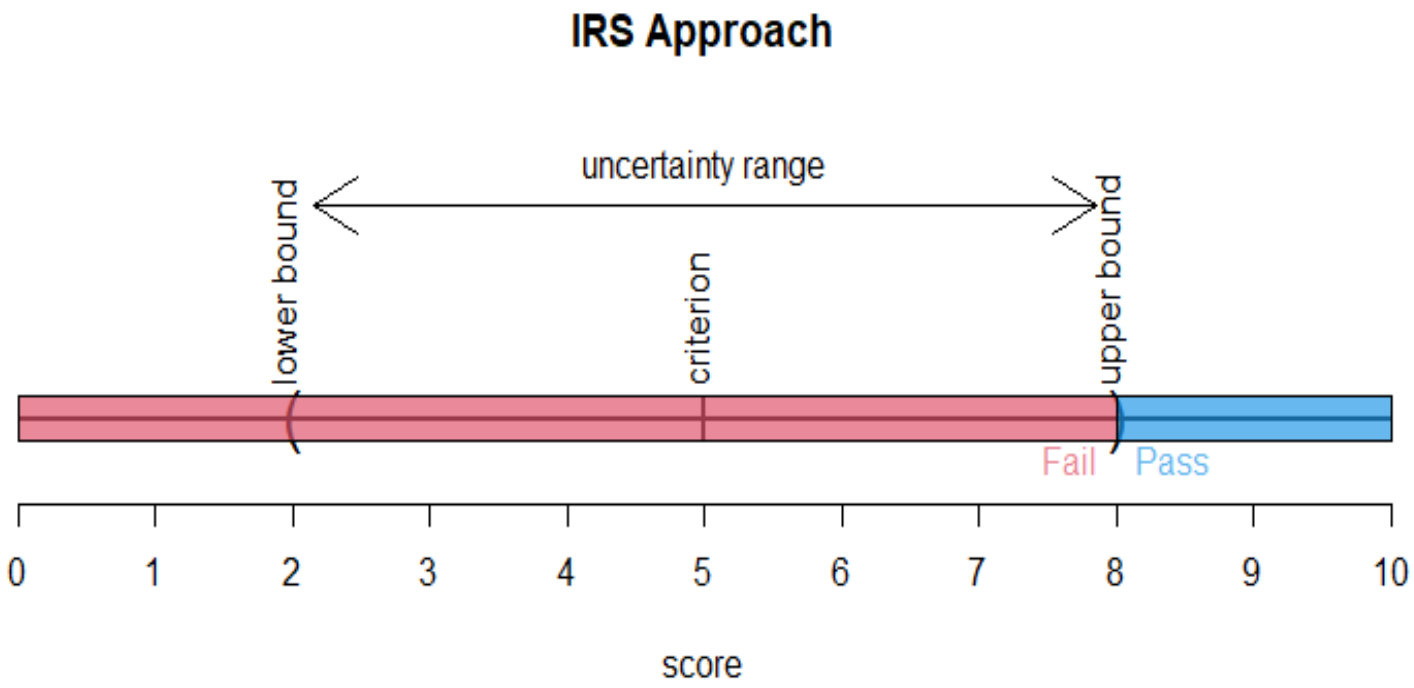
The next slides present 5 approaches to dealing with uncertainty in Criteria Assessment



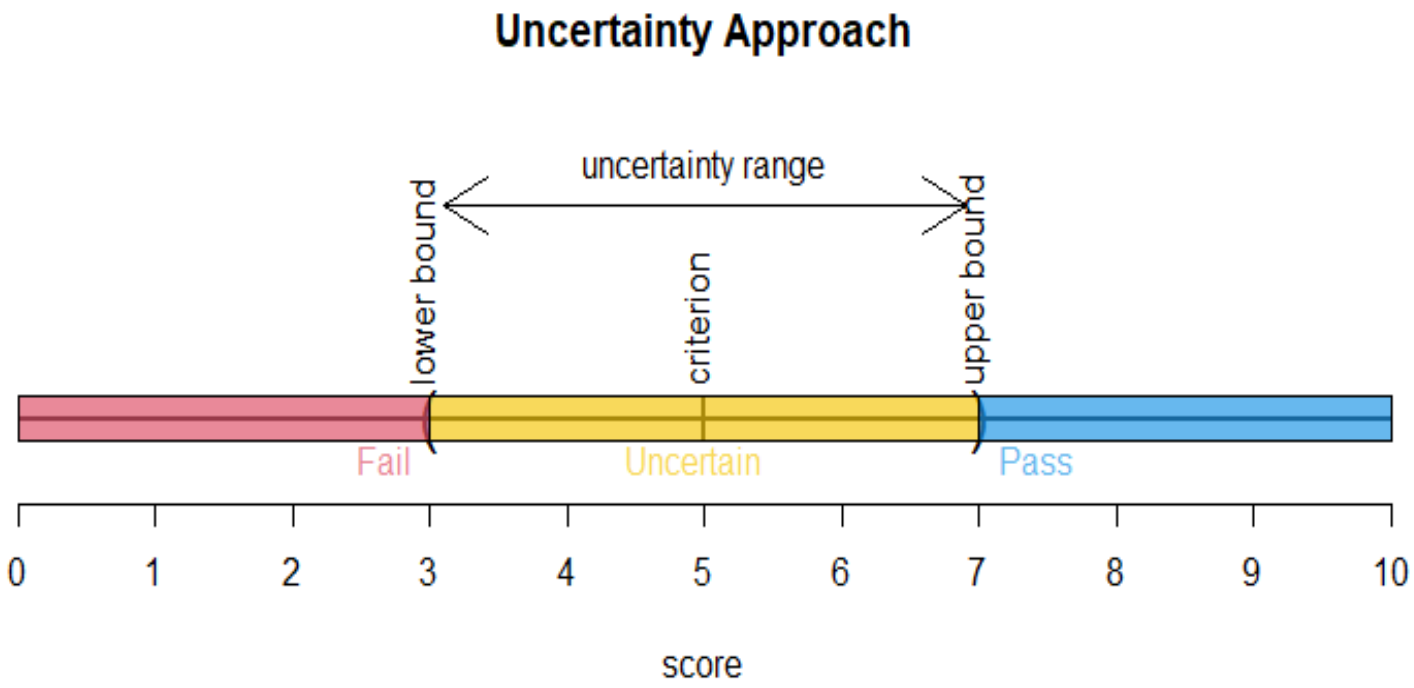
The **Even Handed Approach** deals with uncertainty by ignoring it.



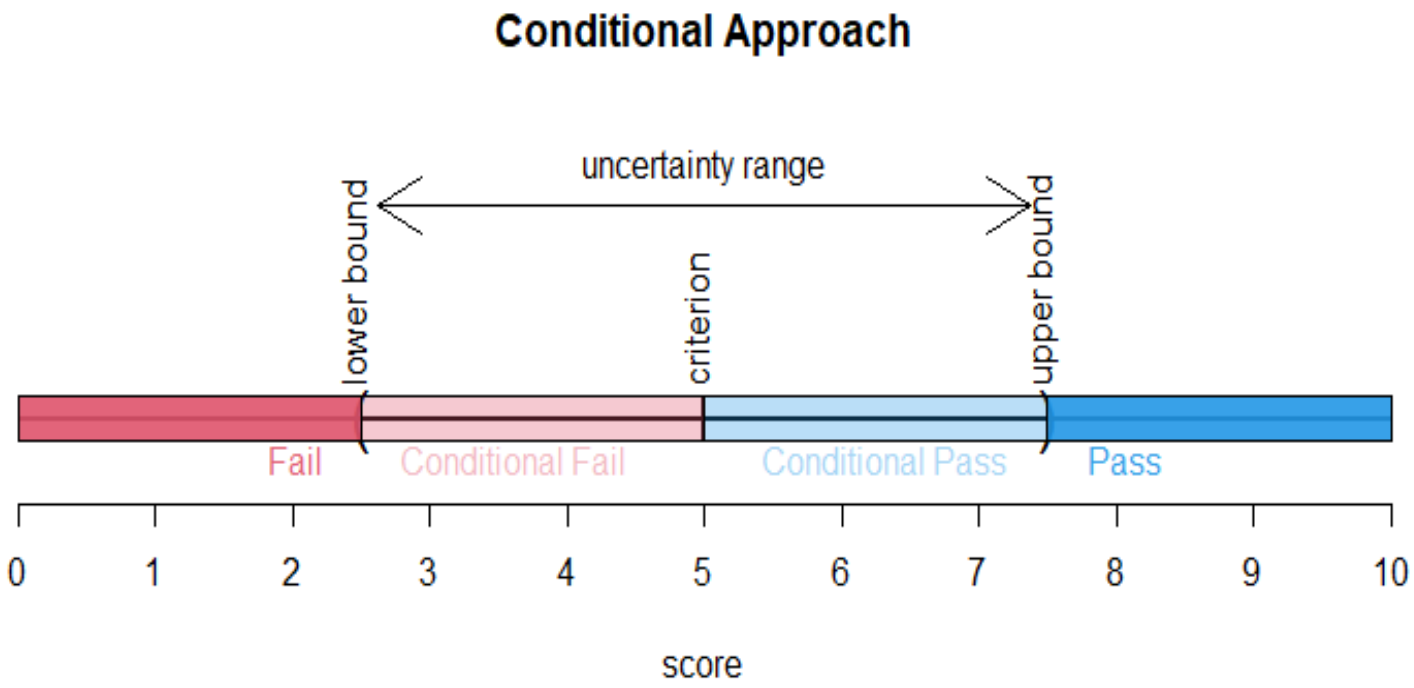
The **Magna Carter Approach** gives the benefit of uncertainty to Regulated Parties.



The **IRS Approach** gives the benefit of uncertainty to protecting the environment.



The **Uncertainty Approach** introduces a trinary end-point.



The **Conditional Approach** introduces a quaternary end-point.

Questions / Discussion: