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Scottish Environment Protection Agency

Improving seabed impact analysis

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463 licenced marine farms
235 operational in last 3 years

Environmental risks

Large **organic carbon** inputs

- Concentrations of biomass vastly elevated over “natural” conditions
- Waste feed and faecal material
- Causes oxygen depletion within sediments and in extreme cases in overlying water column

Medicines

- Anti-parasitic treatments
- May be toxic to faunas, particularly crustaceans

Environmental risks

SEPA's role is to ensure seabed impacts are acceptable

This typically involves defining limits on impacts

- Intensity of impact
- Area of impact
- Absolute physical accumulation
- Ecological response

If these are to be enforced effectively, SEPA needs to **understand dynamics of how impacts form**

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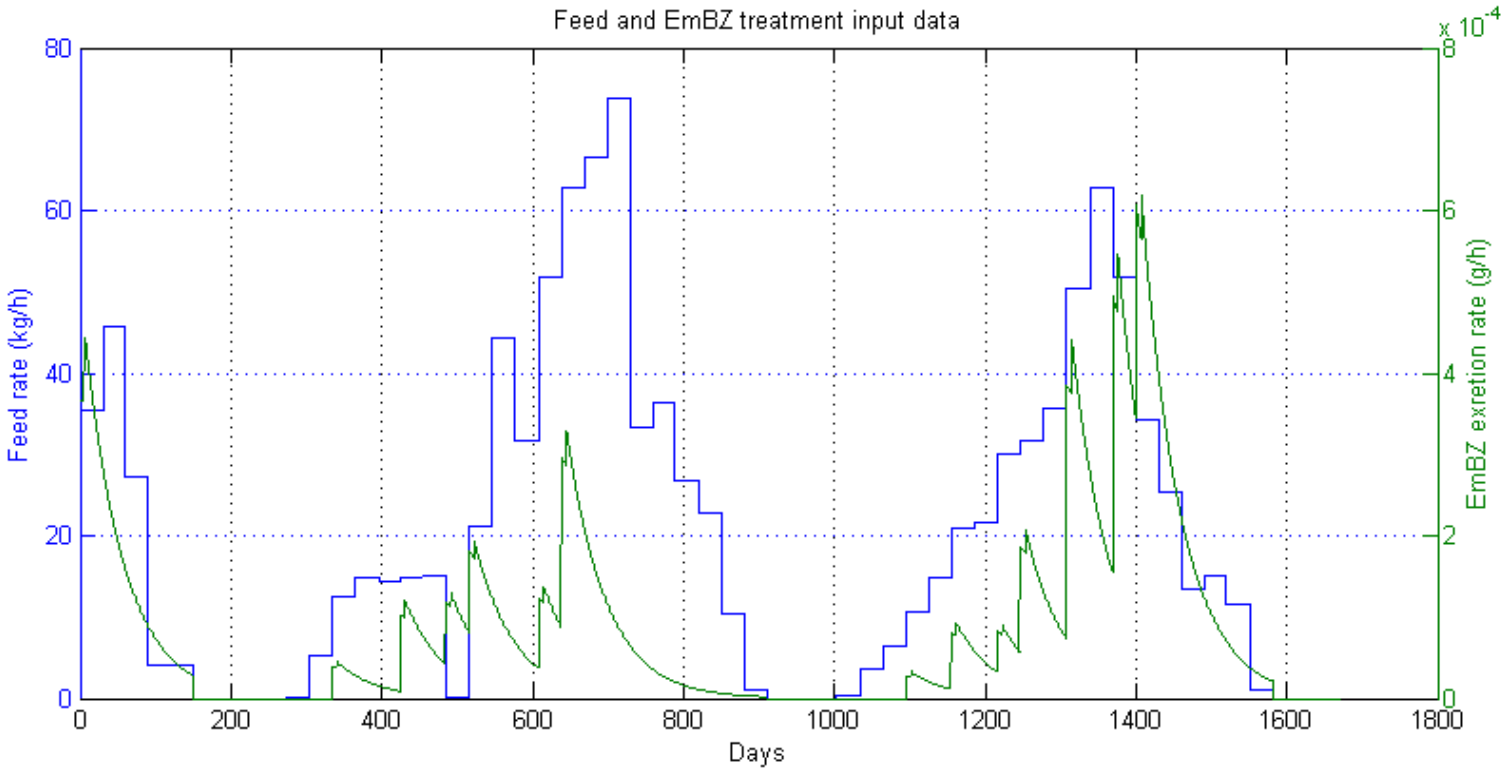
What controls seabed impacts?



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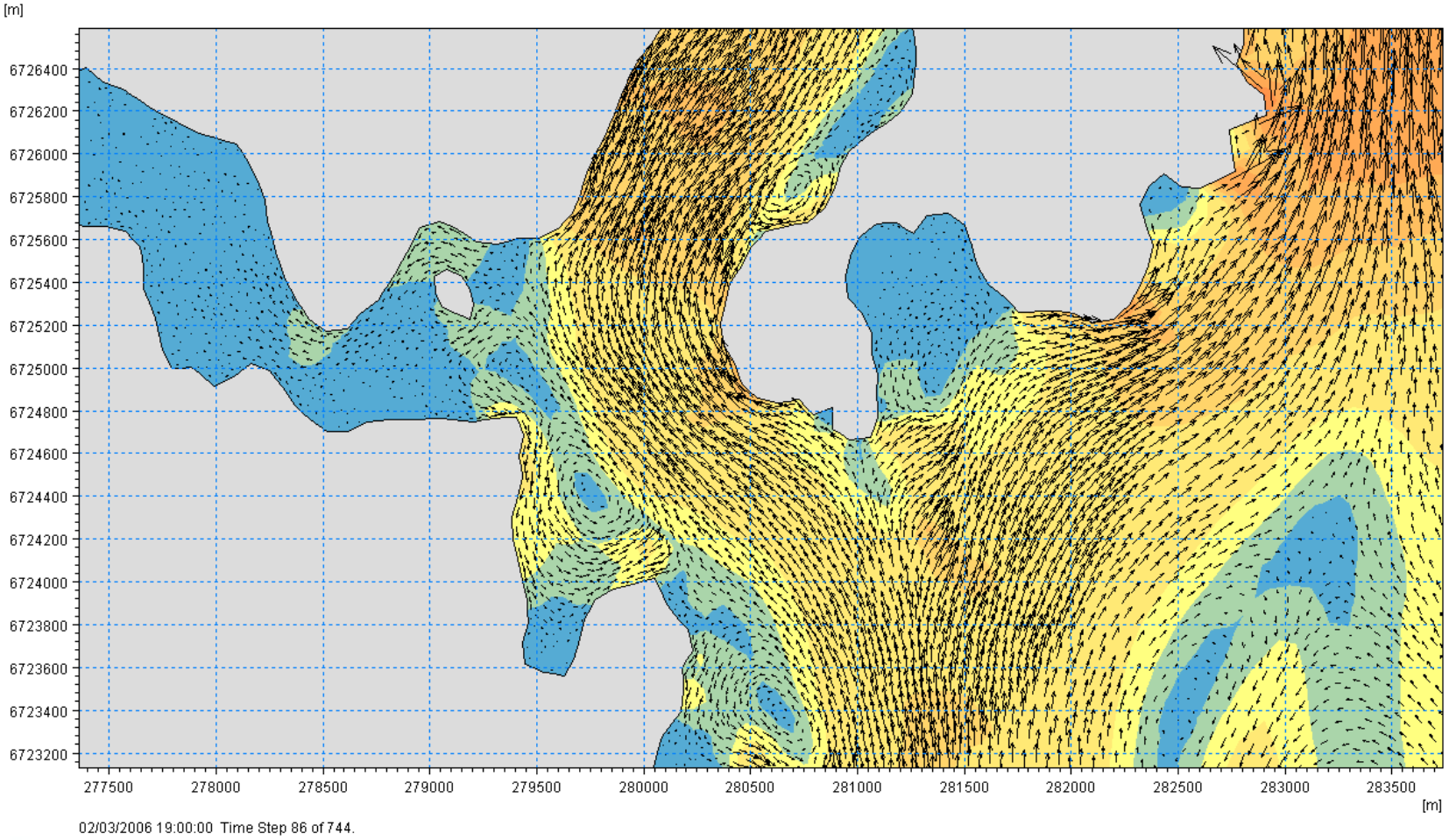

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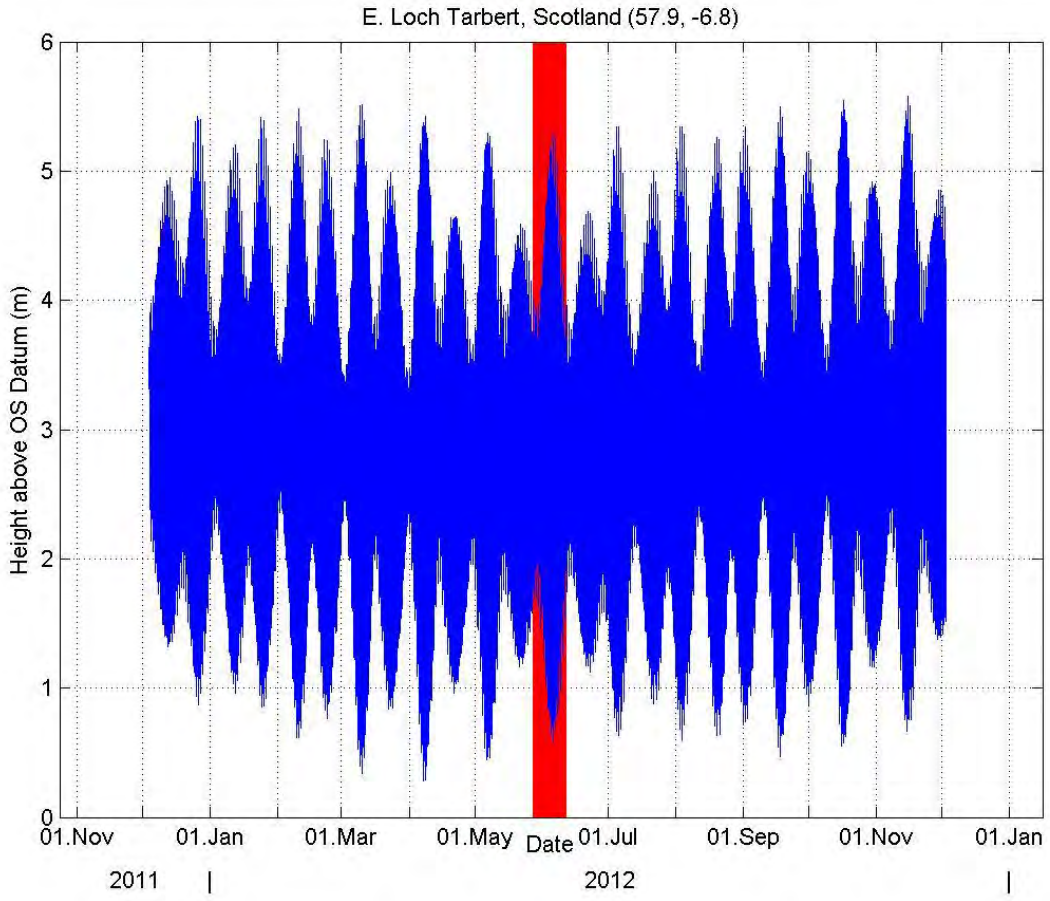

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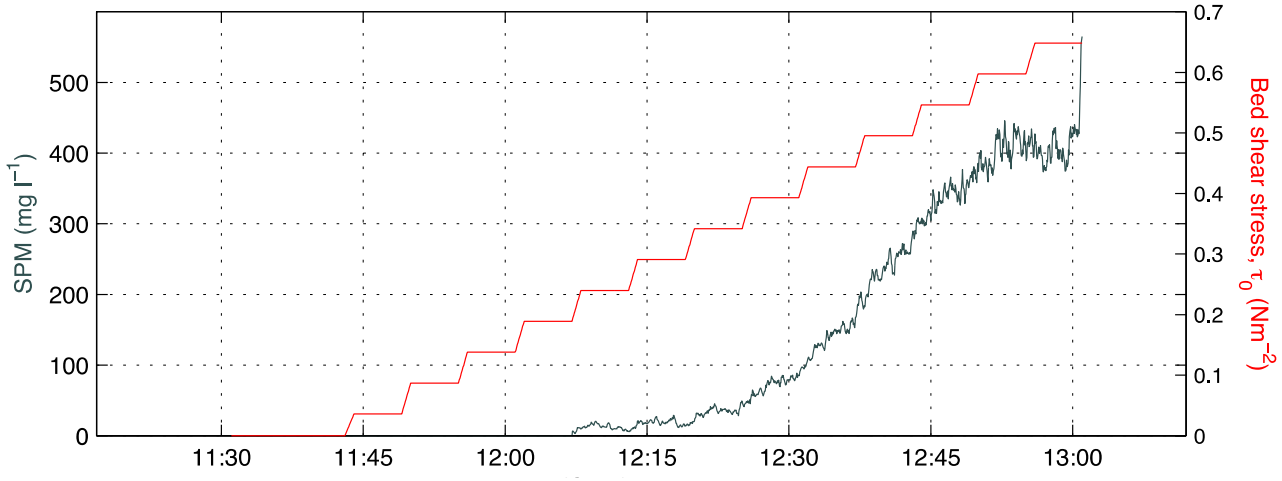

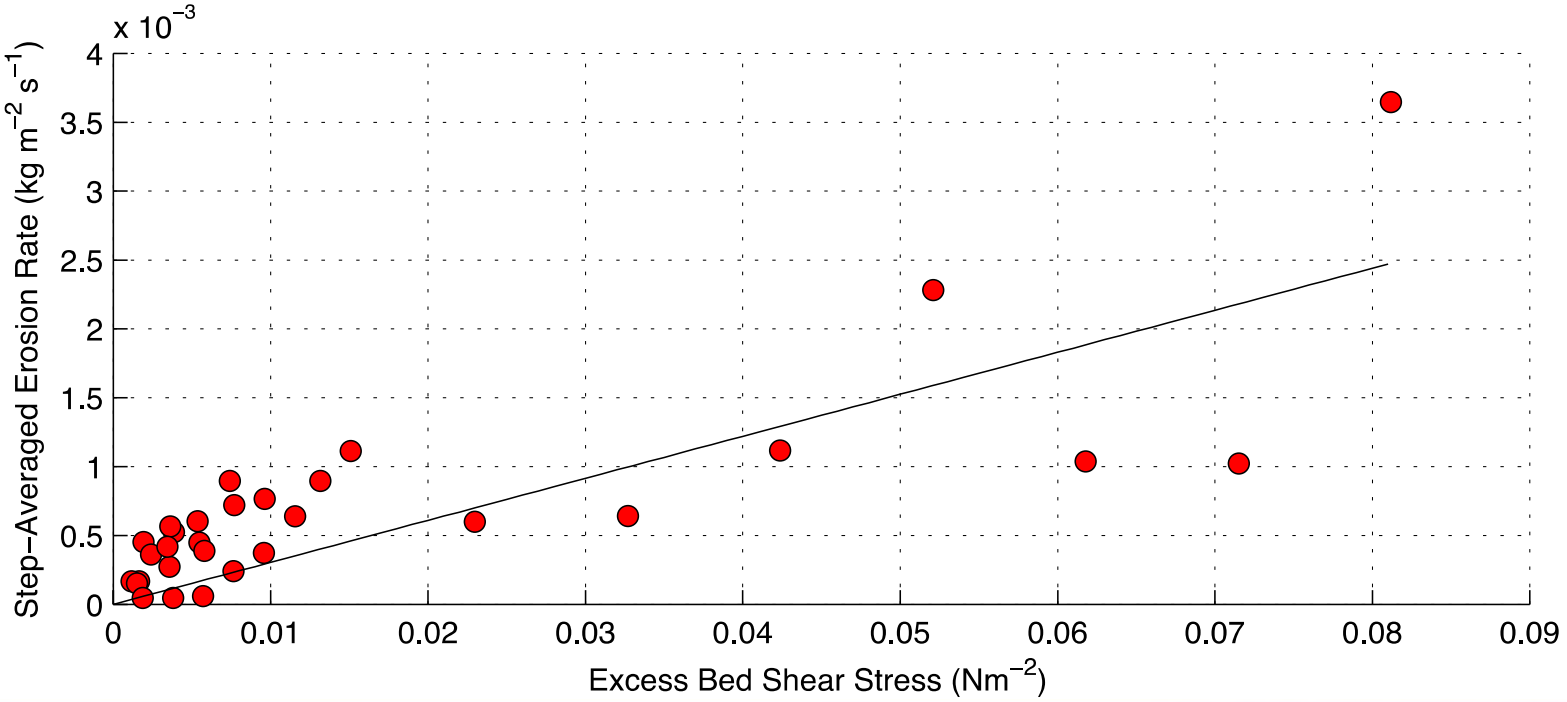

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What controls seabed impacts?

- Farm operation/activities
- Particle properties
- Sediment transport processes
- Complex tidal and meteorological forcings
- Seabed ecology

Impacts are spatially and temporally complicated

How do we understand seabed impacts?

Monitoring

- Current SEPA policy is to monitor the seabed around farms at **2 sampling locations**
  - “cage-edge”
  - “far-field”
- Motivated by license compliance
- Very poor resolution of spatial impact

How do we understand seabed impacts?

Modelling

- Range of modelling techniques available with differing sophistication
- Crucial for risk assessment of proposed, future discharge
- But how well do they perform?

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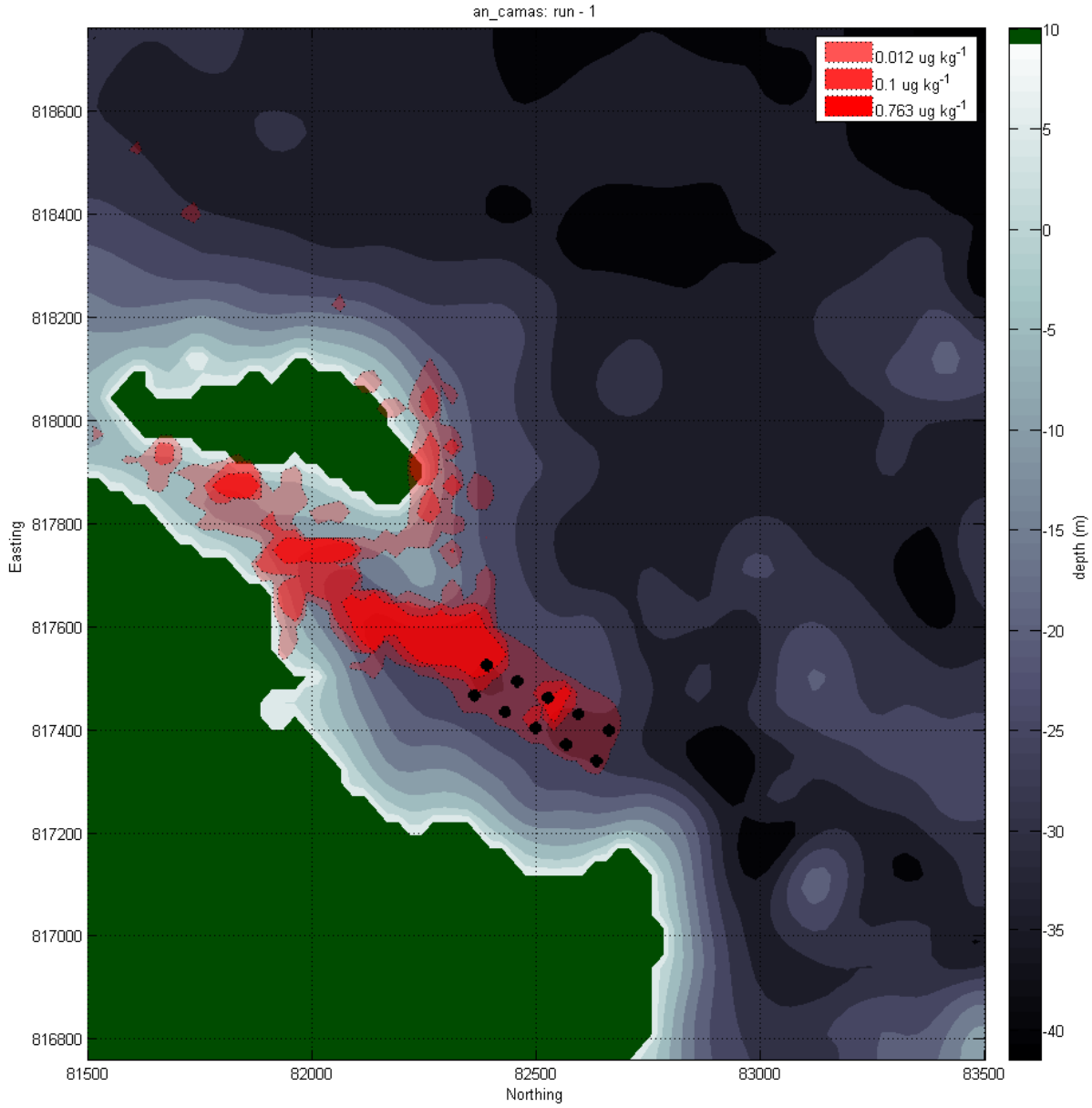

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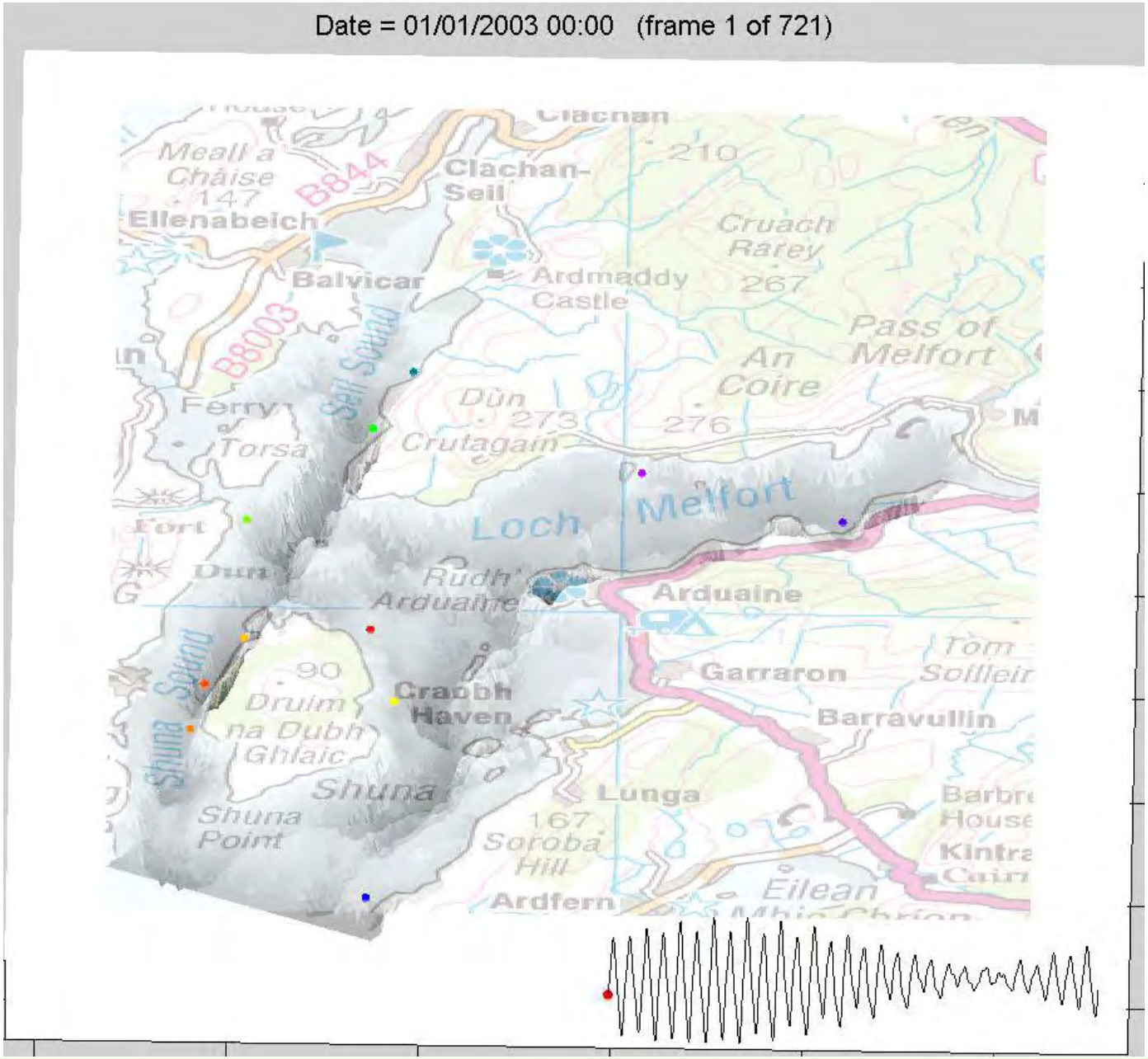

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Problem 1: what is actual impact?

In order to regulate activities effectively we need to know *what* their impacts are

Are there statistical approaches that can inform how to optimally sample the seabed to get the best understanding of a complex impact?

When? Where? How many samples?

And what forms of analysis can be used to best characterise the impact?

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Problem 2: how good is model?

Robust modelling requires calibration and validation

These involve comparing model results with empirical data

What is the best sample strategy for model calibration/validation?

How can we most effectively summarise the fit between complex real and modelled impacts?

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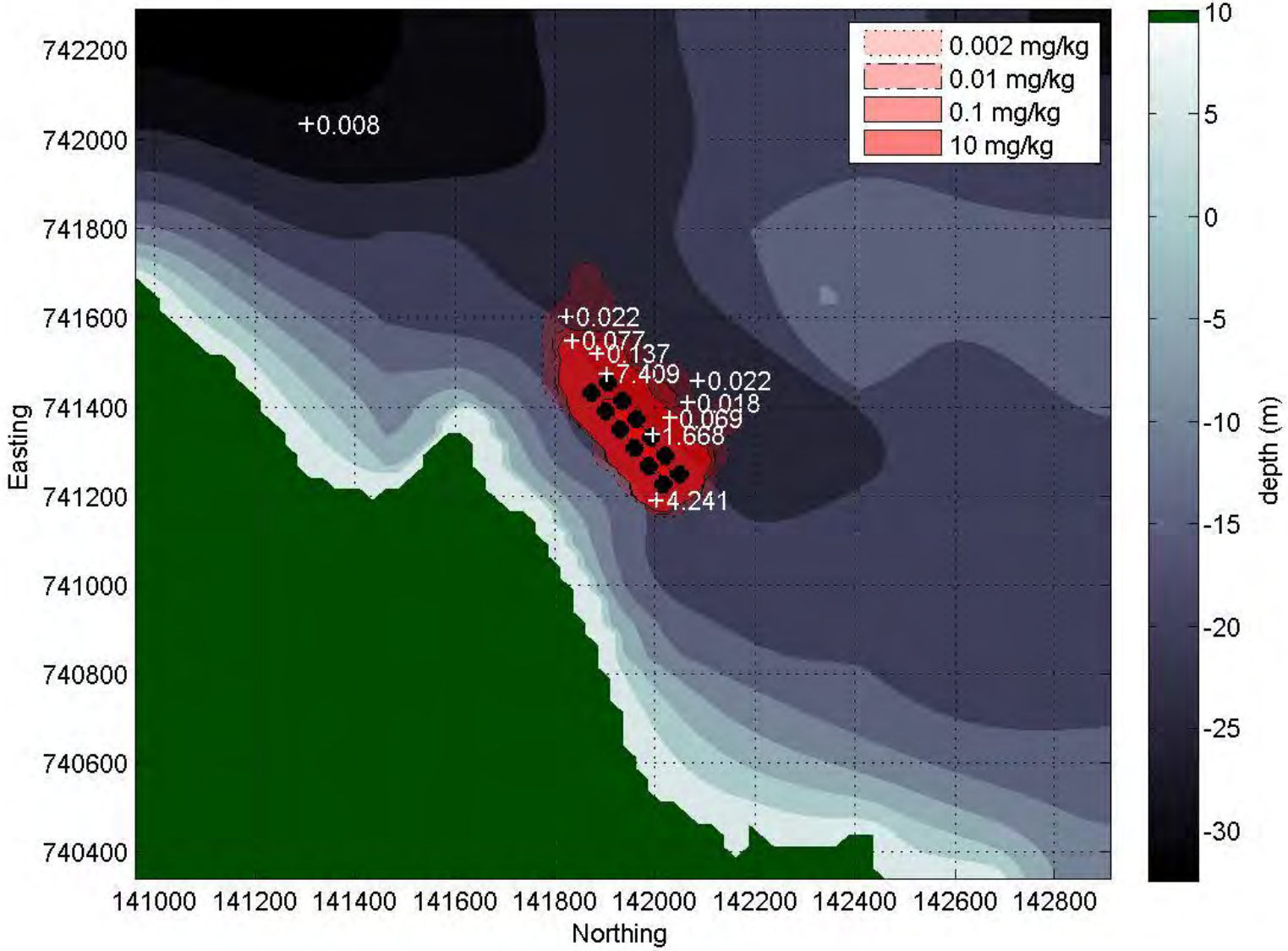

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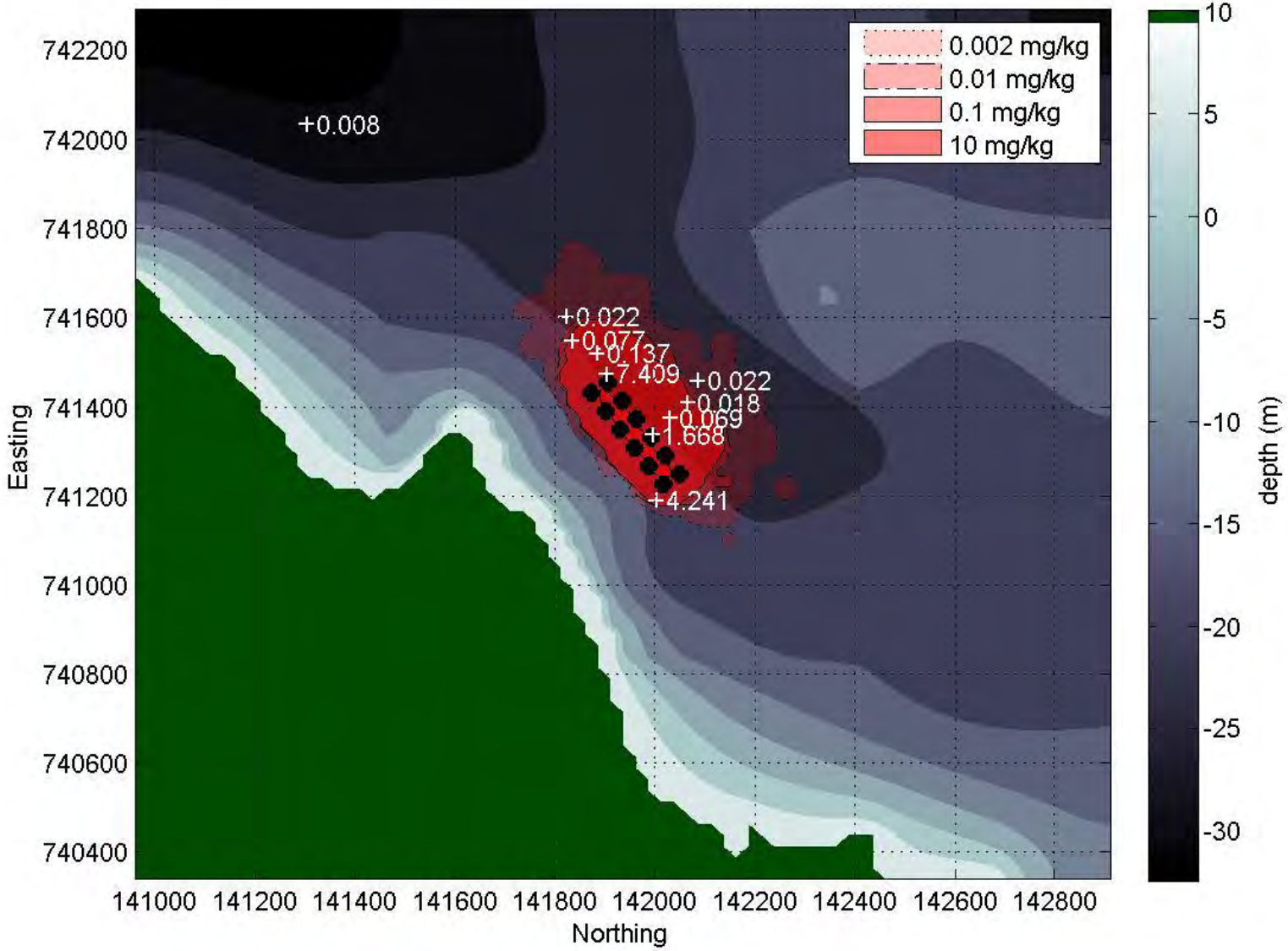

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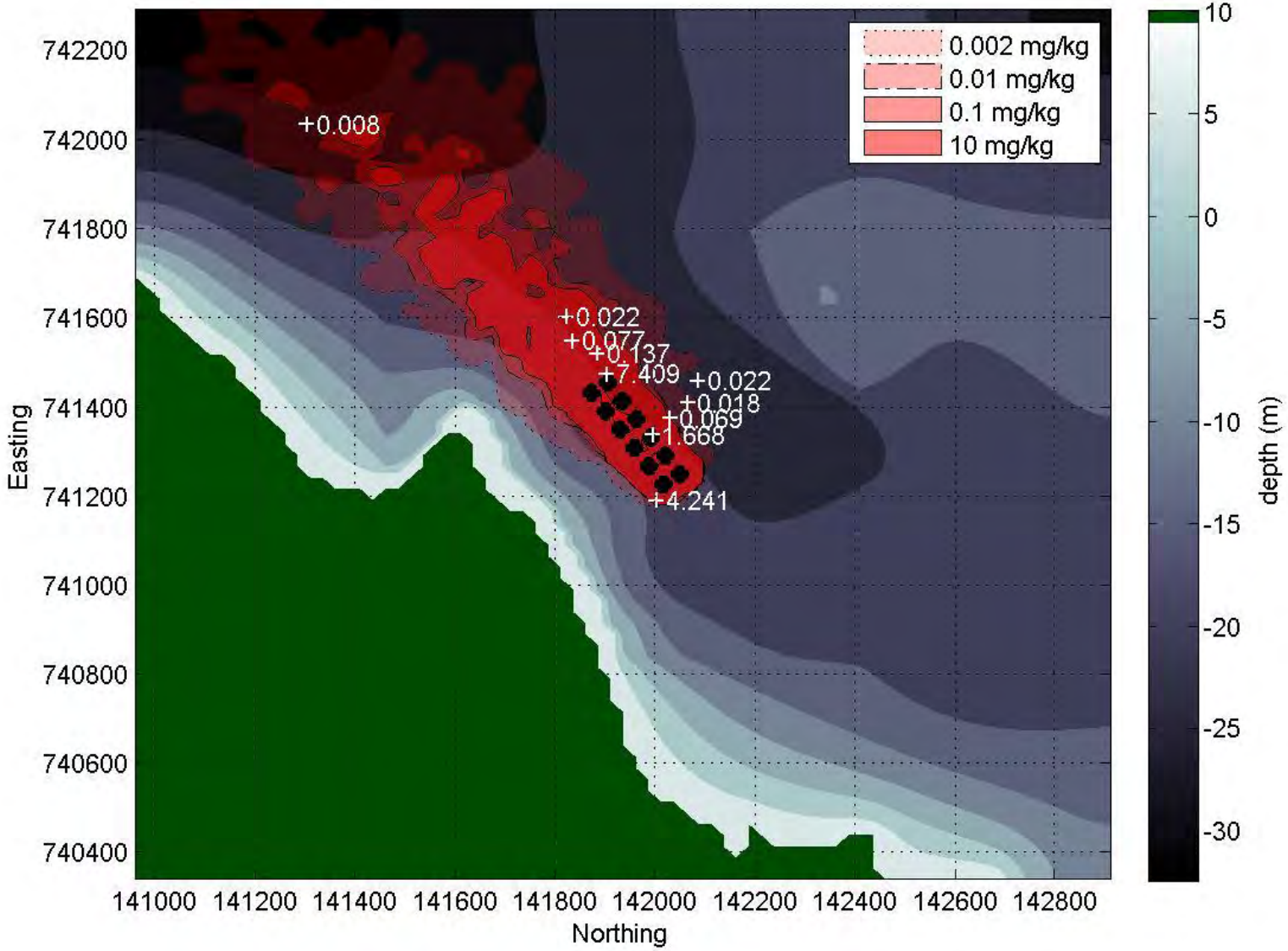

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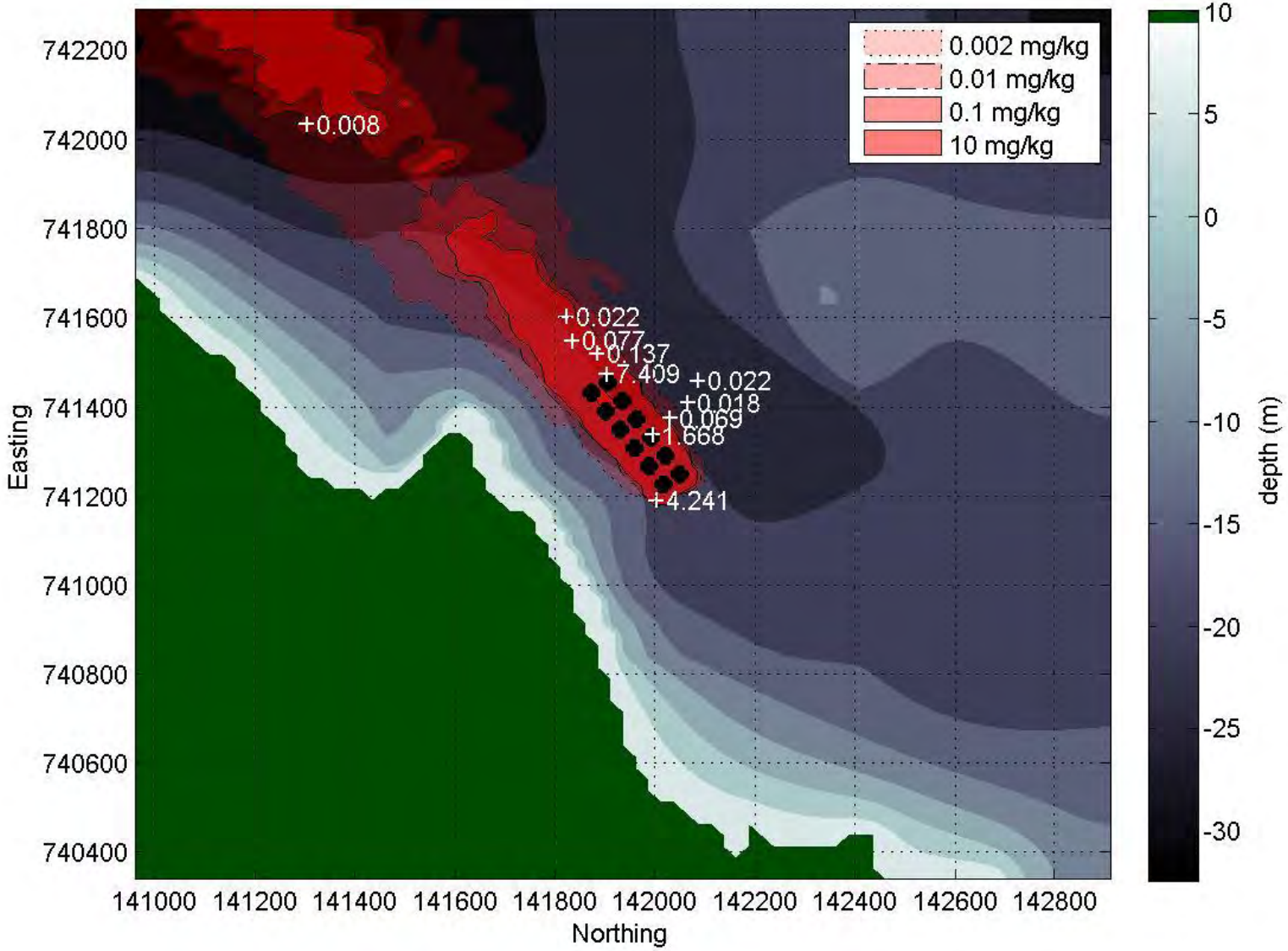

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Challenge

- How to best characterise a real seabed impact
- How to best compare real and modelled seabed impacts

Thanks.