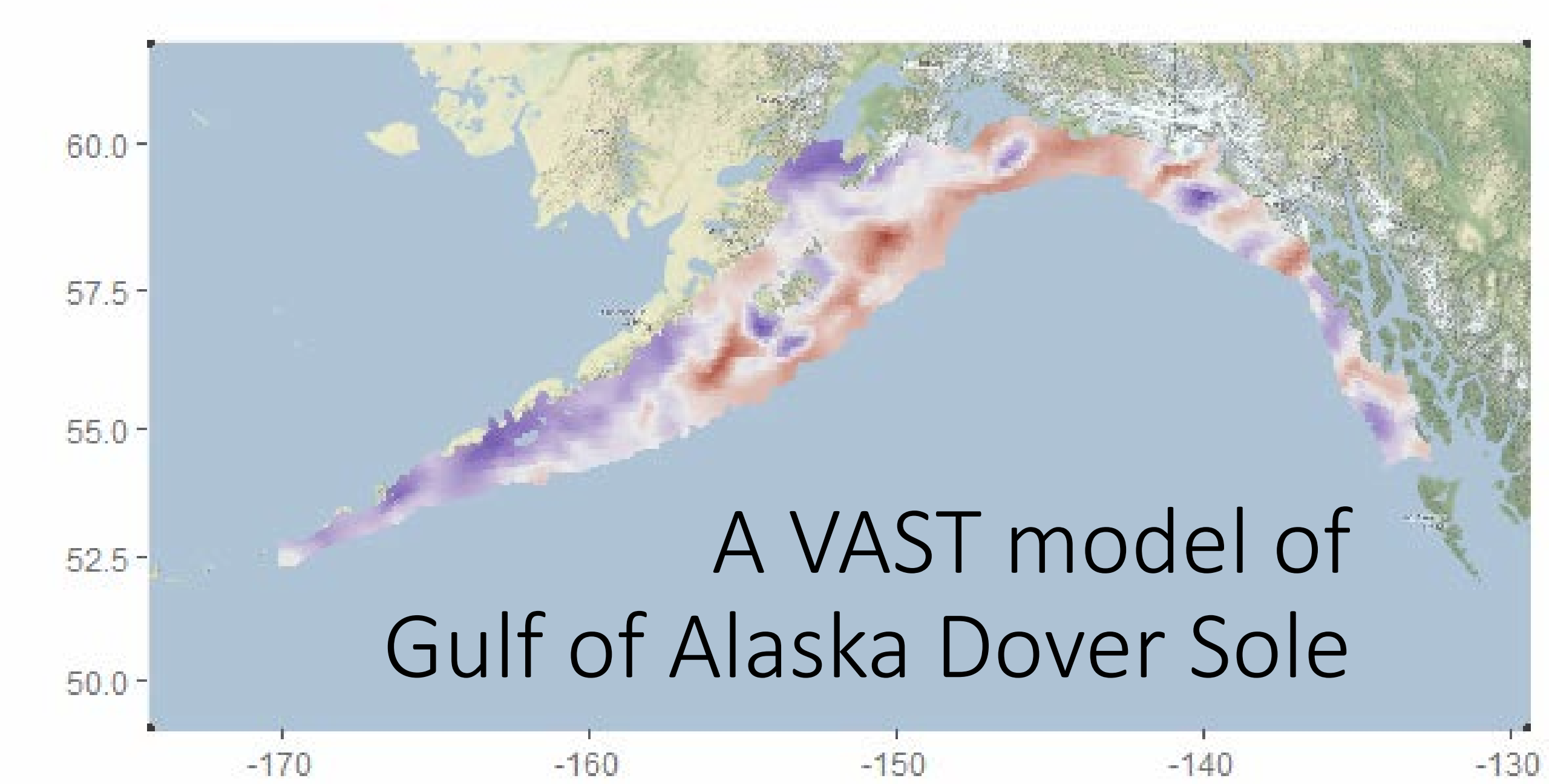
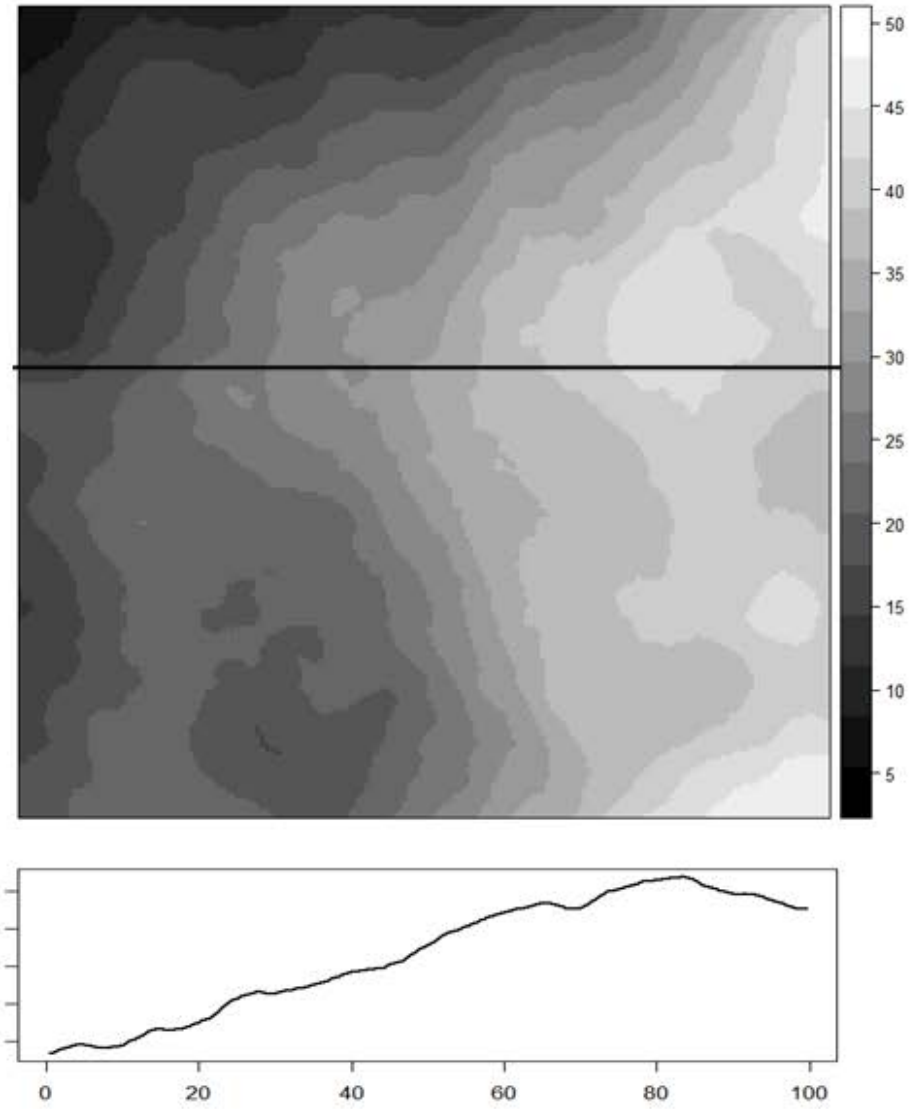


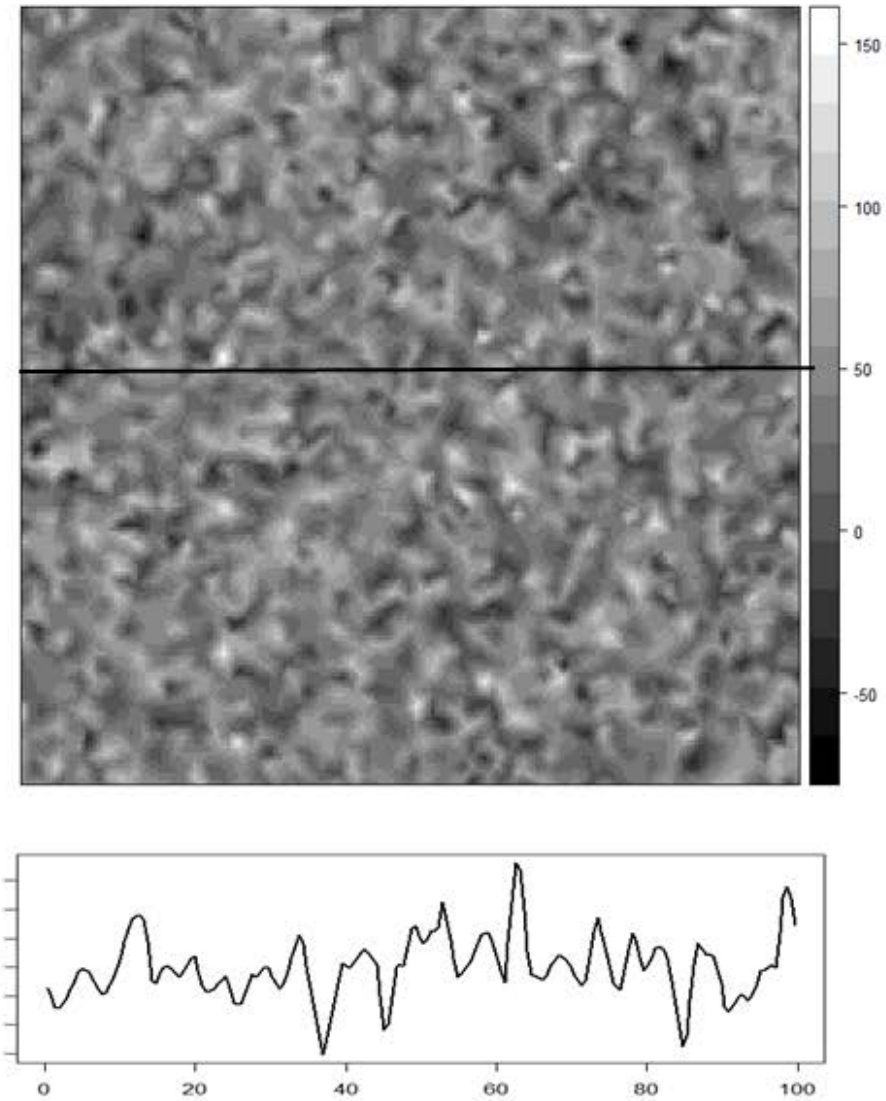
A VAST model of Gulf of Alaska Dover Sole

Andrea Havron, Carey McGilliard

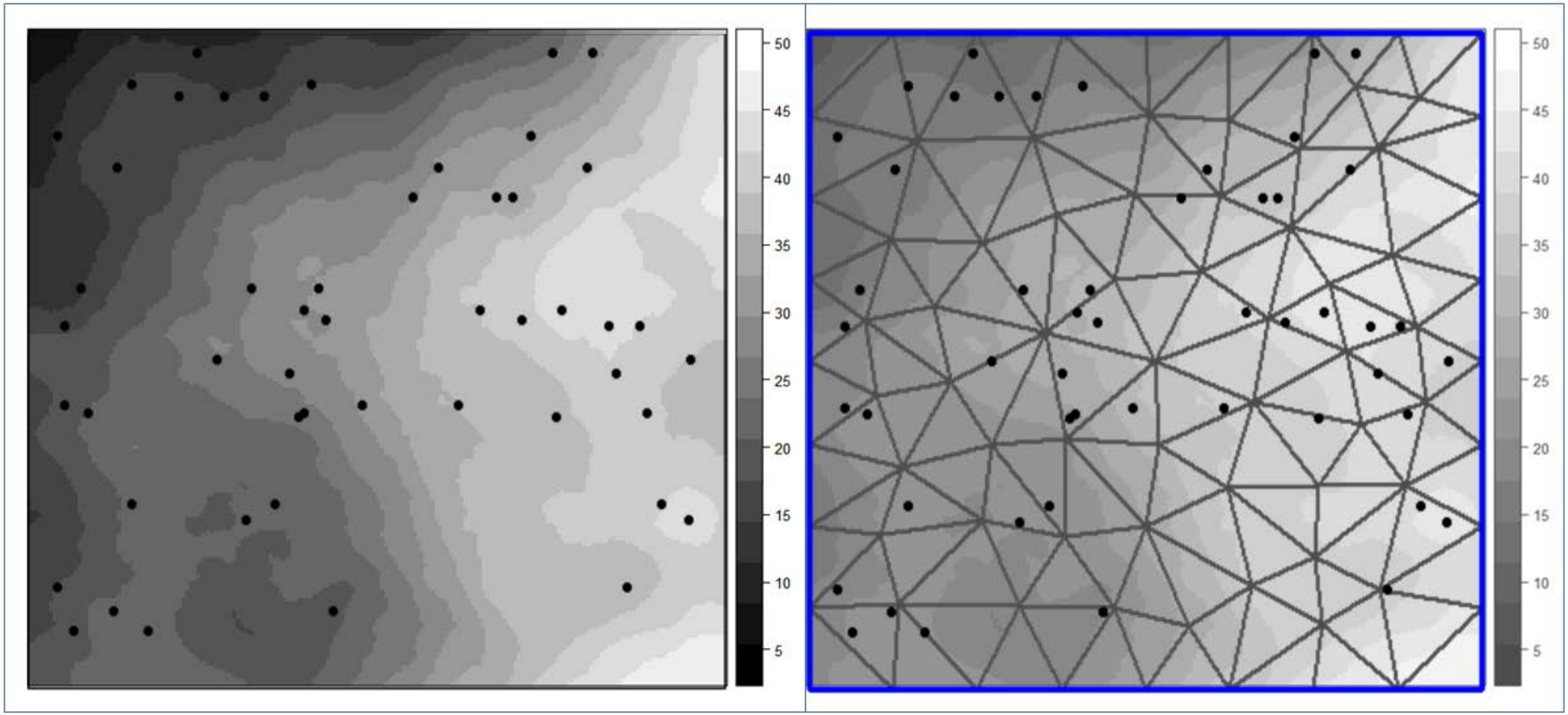
Positive Correlation



Random Pattern

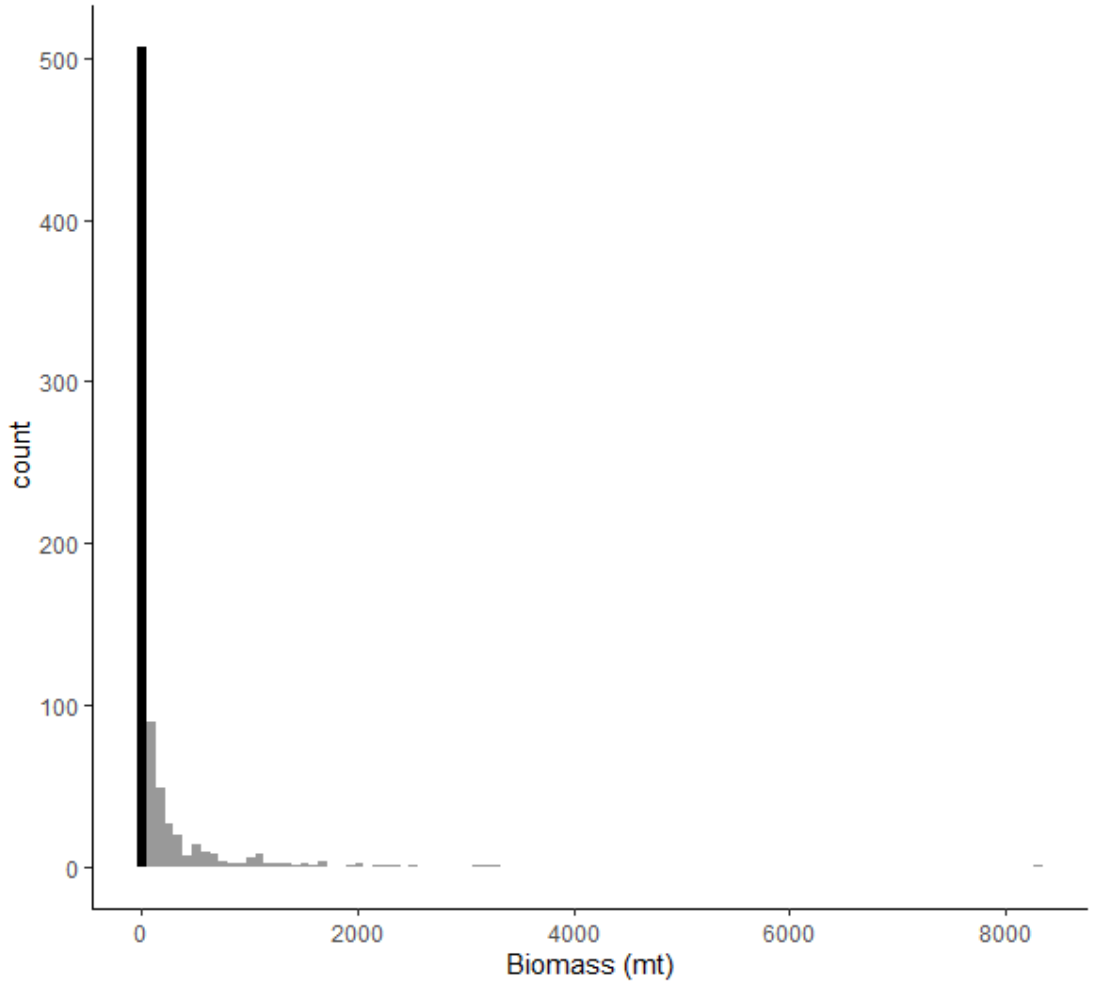


Triangulated Mesh



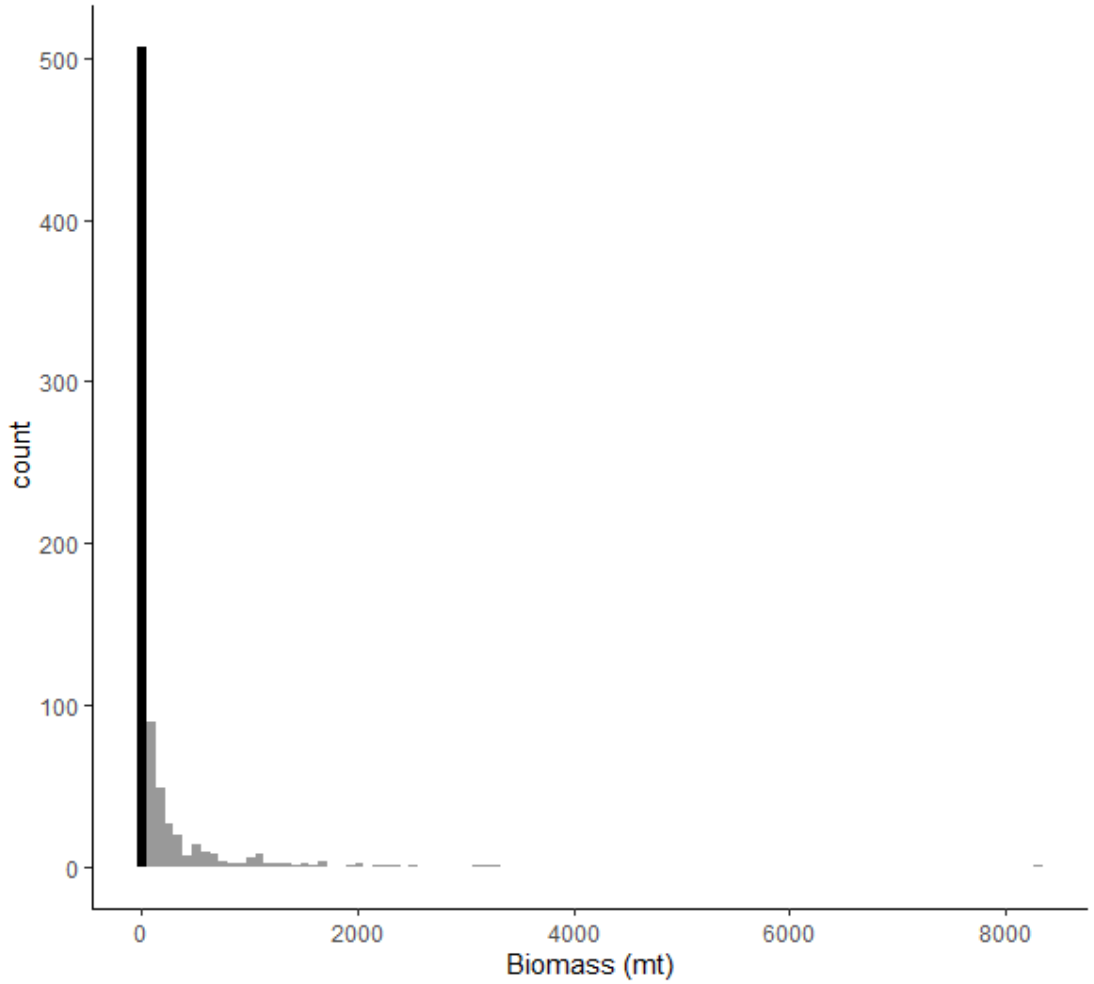
VAST Decisions for Survey Indices

- Observation Model
- Spatial/Spatio-temporal Model
- Additional Random Effects
- Adding Covariates



VAST Decisions for Survey Indices

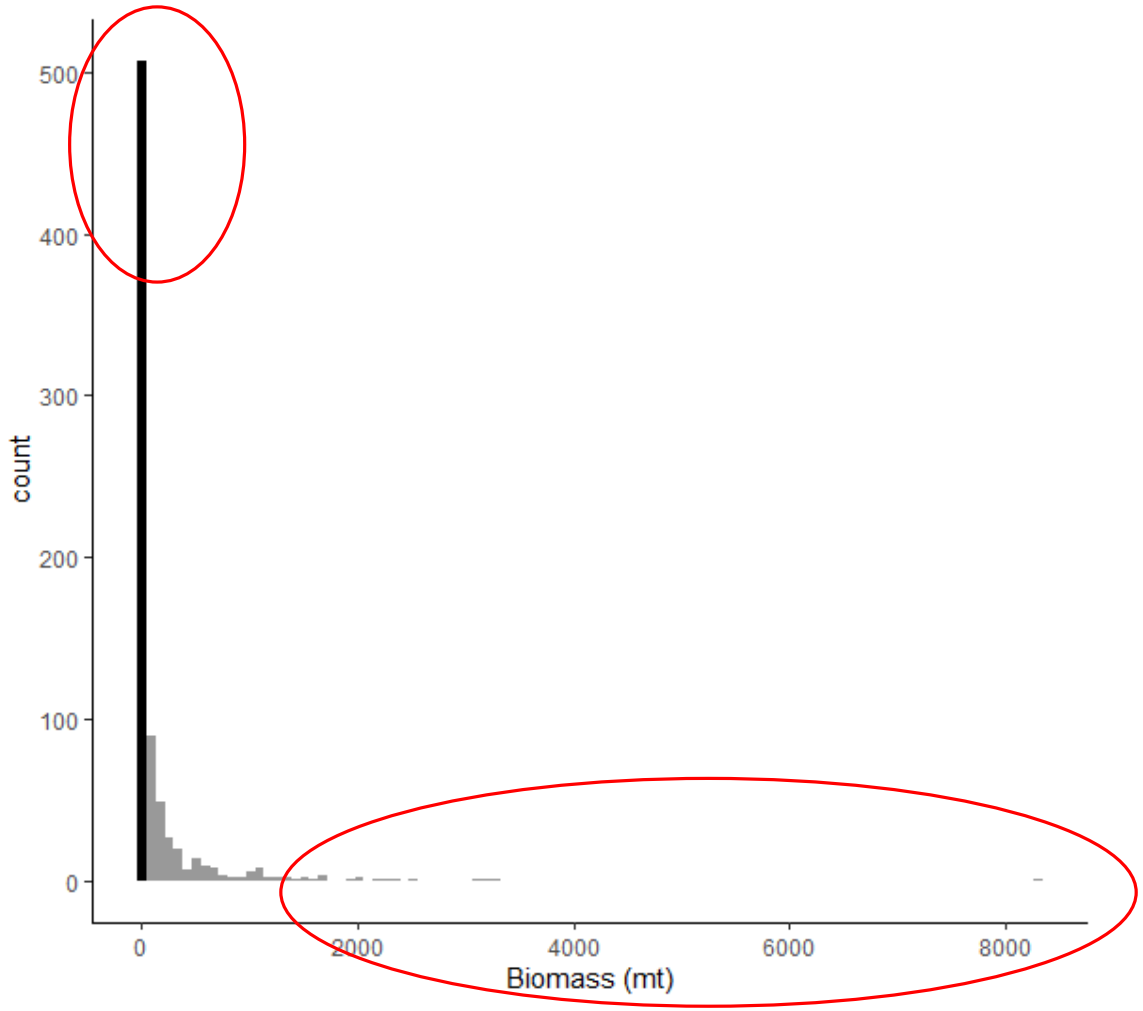
- Observation Model
  - Likelihood Model
  - Probability of Encounter
  - Positive Biomass
- Spatial/Spatio-temporal Model



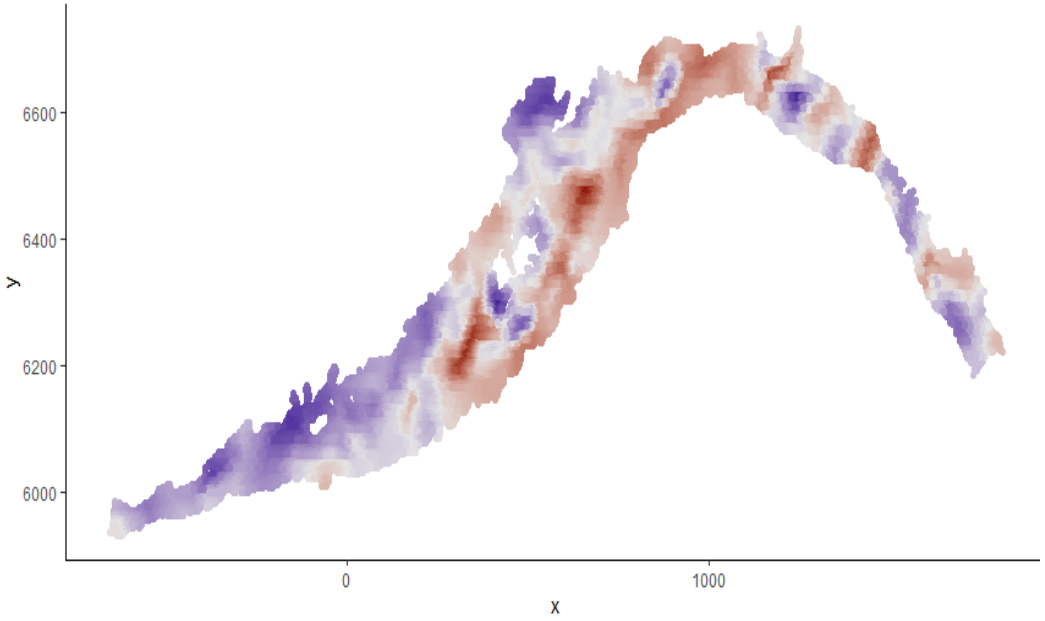
- Additional Random Effects
- Adding Covariates

VAST Decisions for Survey Indices

- Observation Model
  - Likelihood Model
  - Probability of Encounter
  - Positive Biomass
- Spatial/Spatio-temporal Model
  - Spatial/Spatio-temporal in Probability of Encounter
  - Spatial/Spatio-temporal in Positive biomass
  - Spatial Structure
    - Mesh
    - Anisotropy
- Additional Random Effects
- Adding Covariates



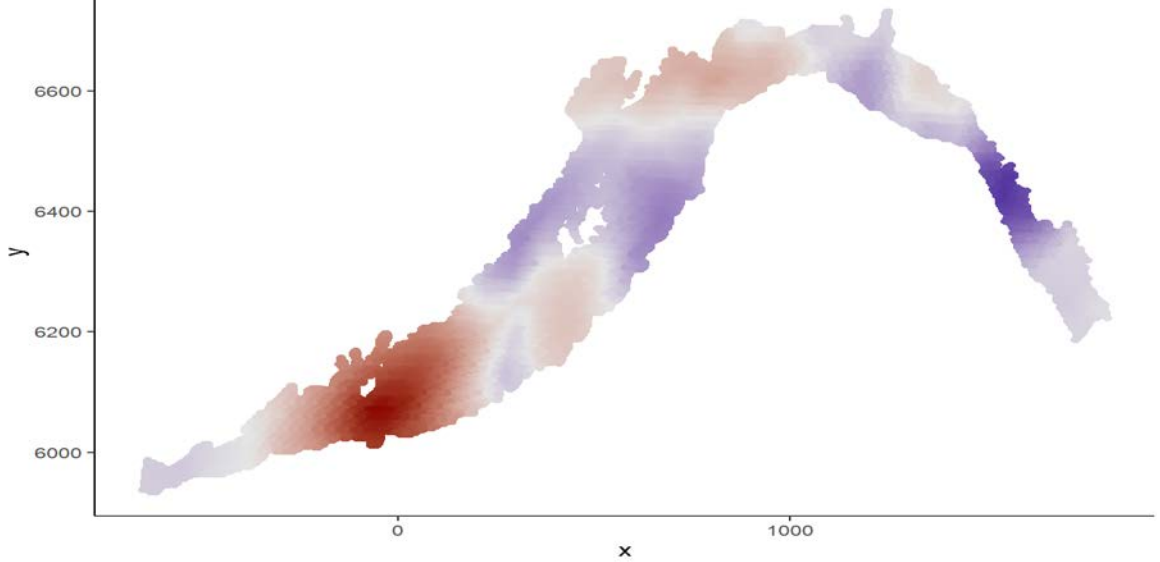
Average Spatial Effect



+

Spatio-temporal Effects

1993



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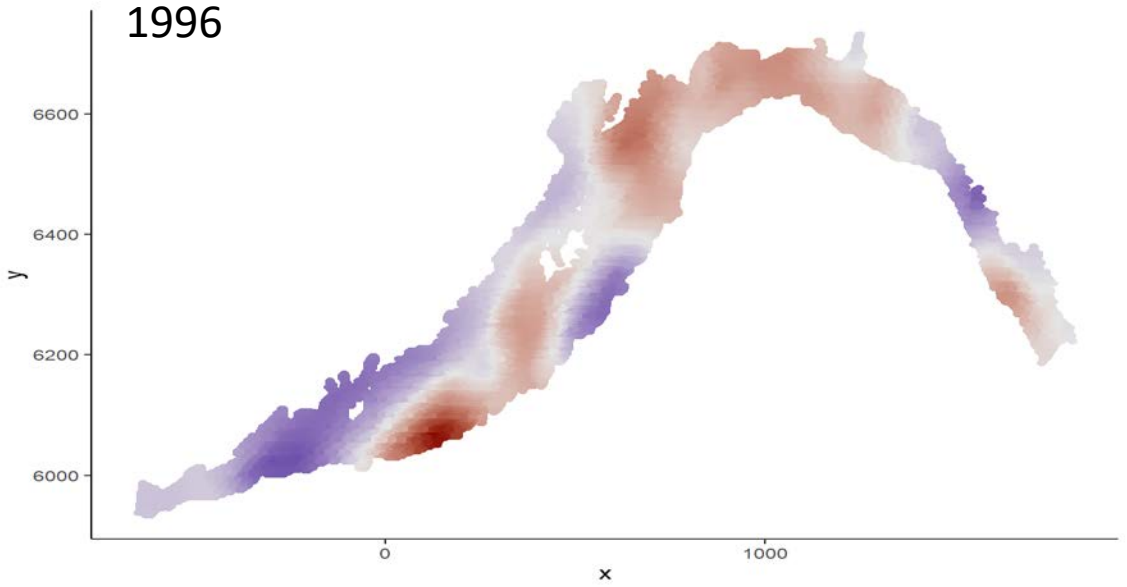
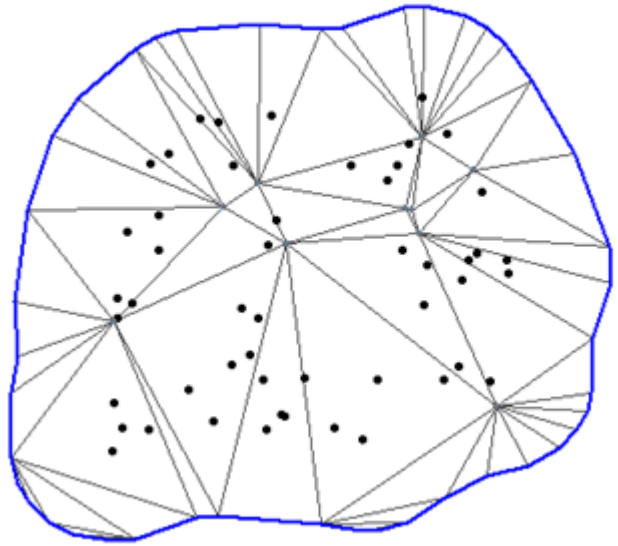
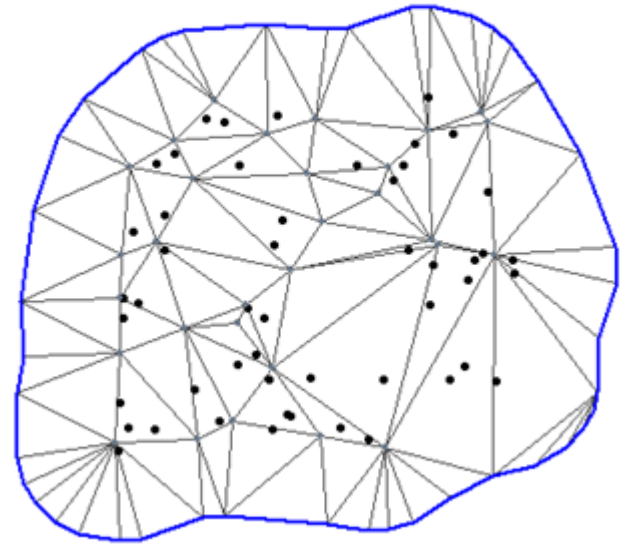


Low Resolution

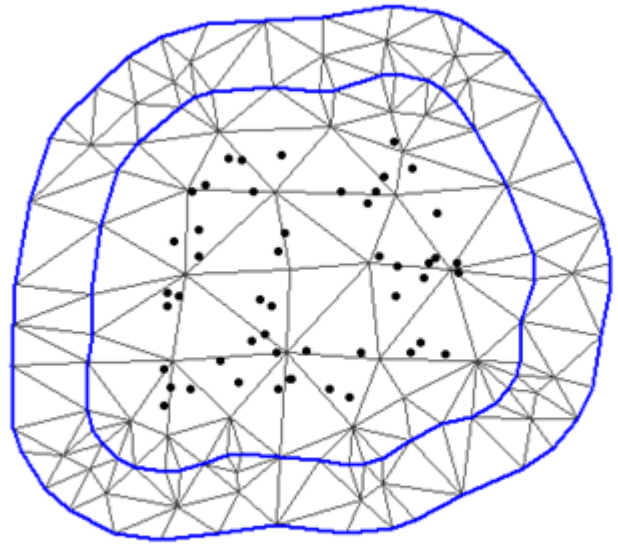


Knots = 10

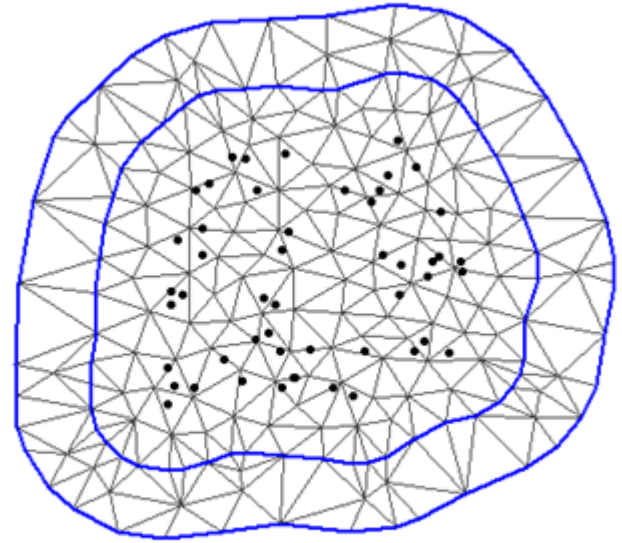
High Resolution



Knots = 30

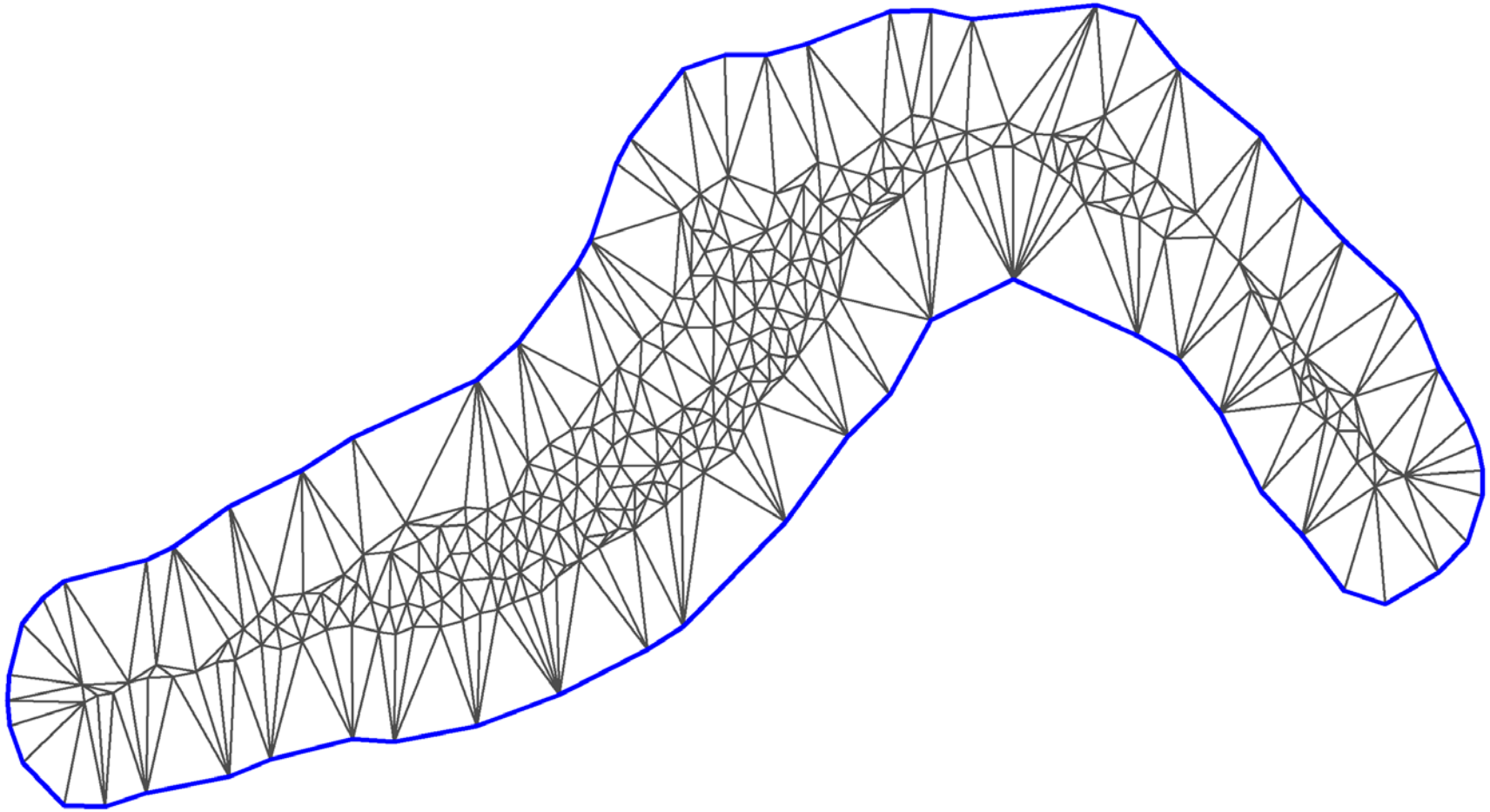


Max Edge = 0.5

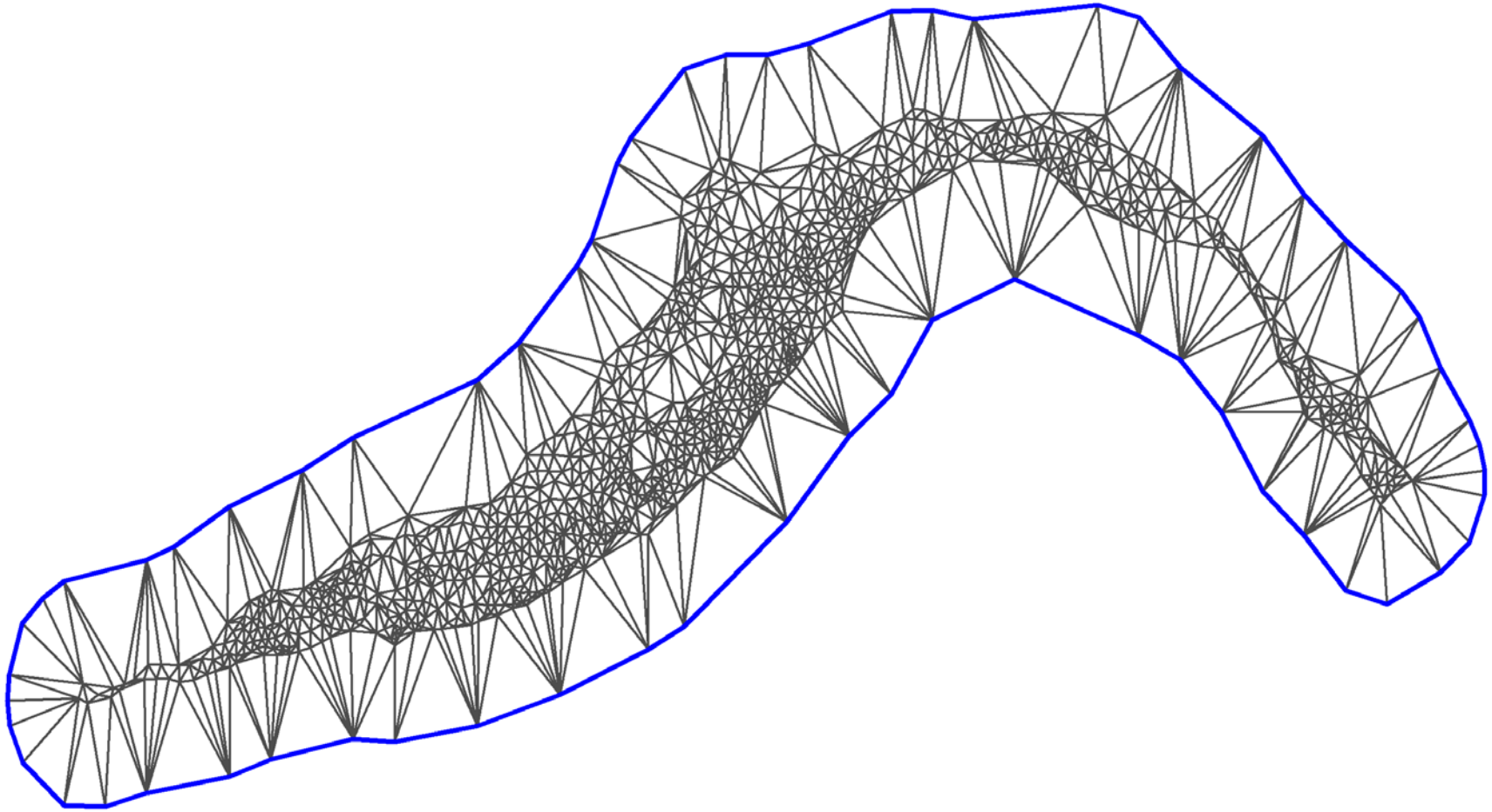


Max Edge = 0.2

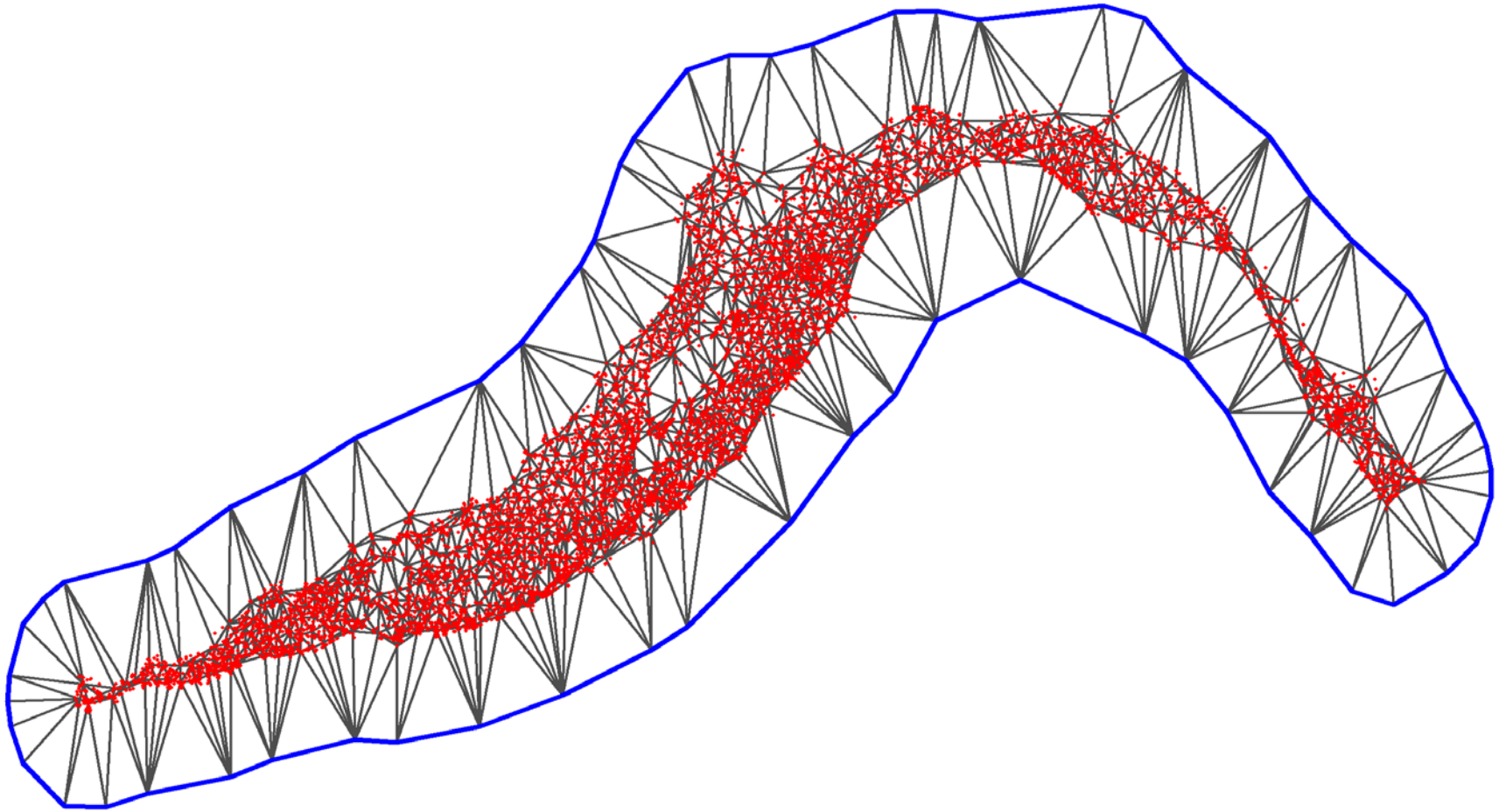
250 Knots



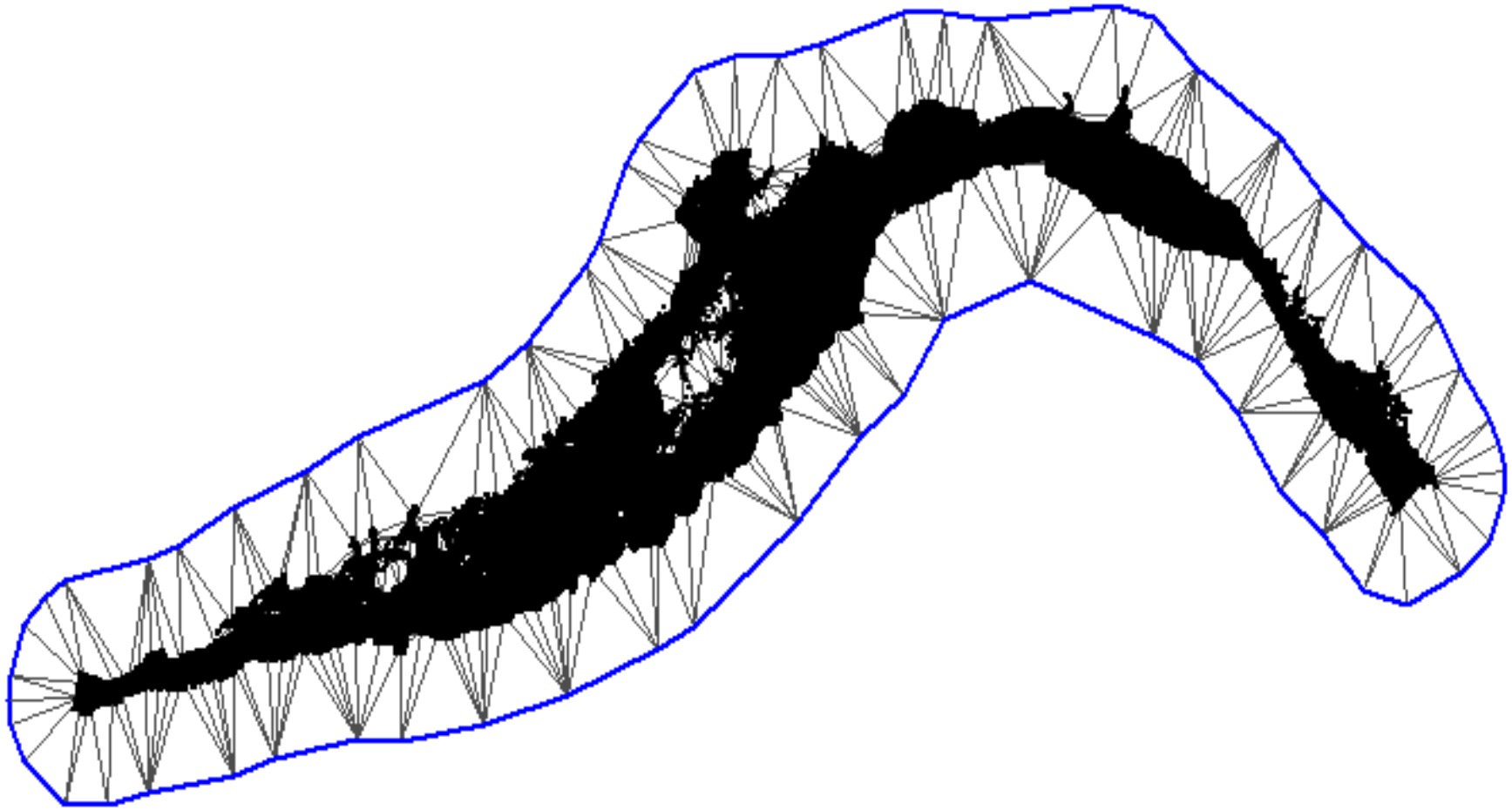
1000 Knots



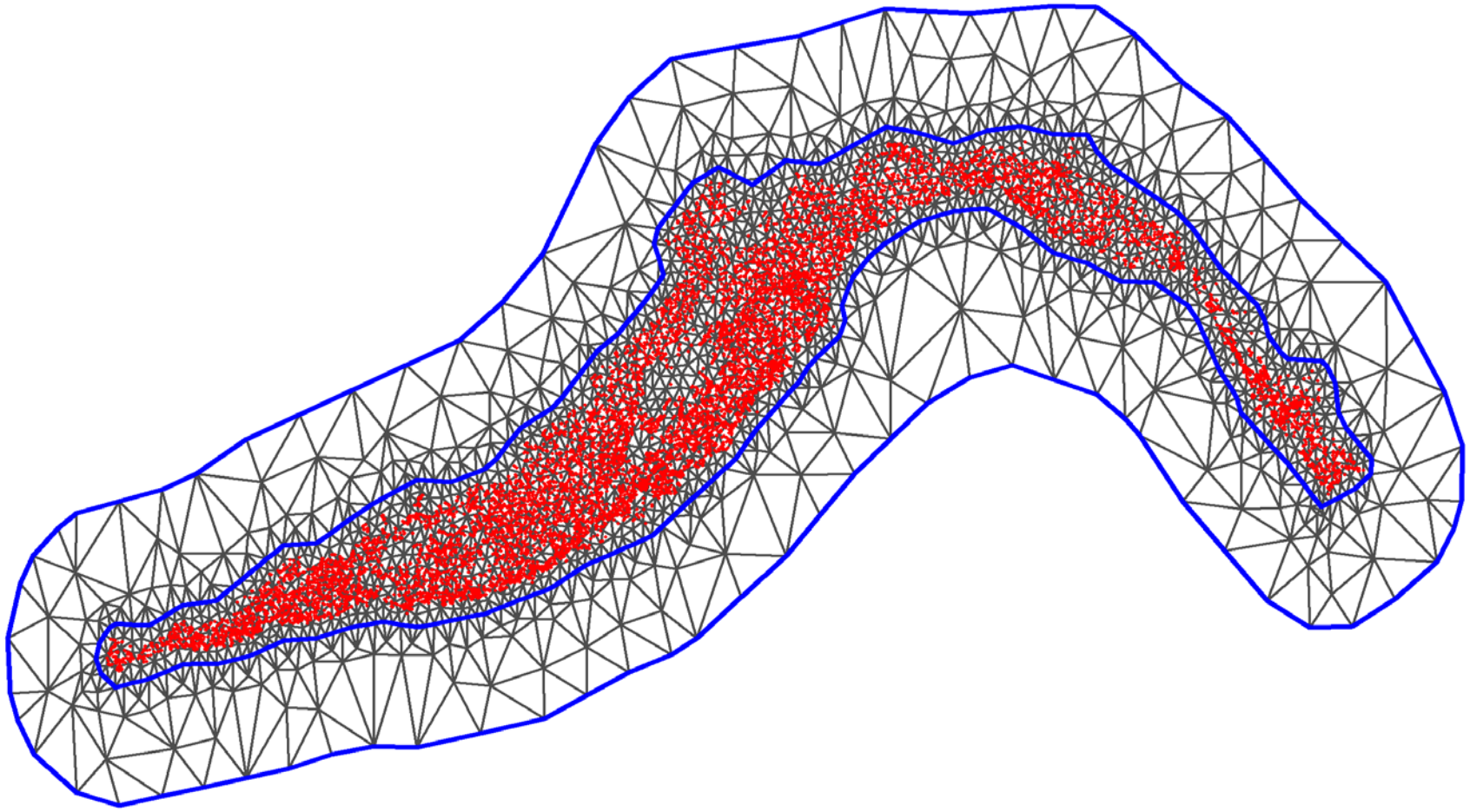
1000 Knots



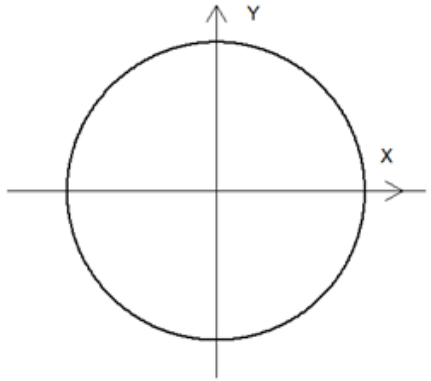
1000 Knots



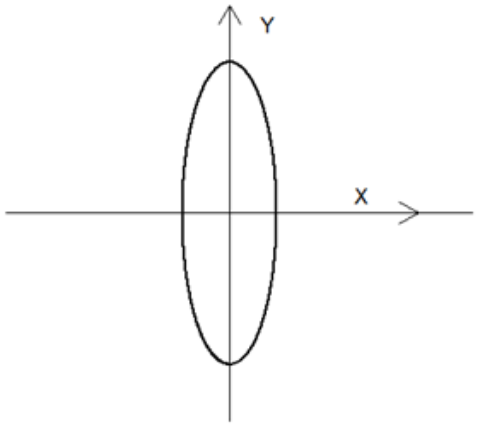
User-Defined Mesh



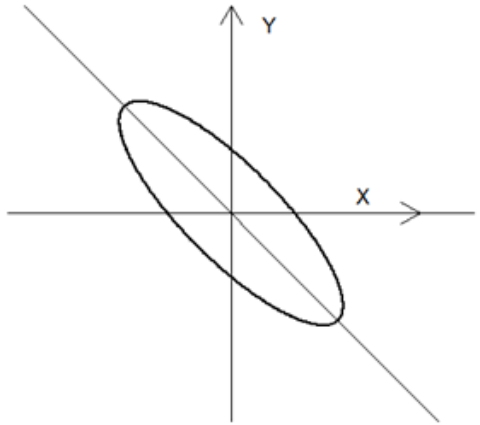
Isotropy



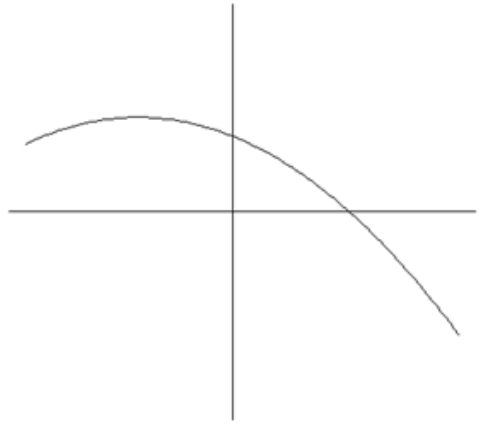
Anisotropy



Rotated Anisotropy

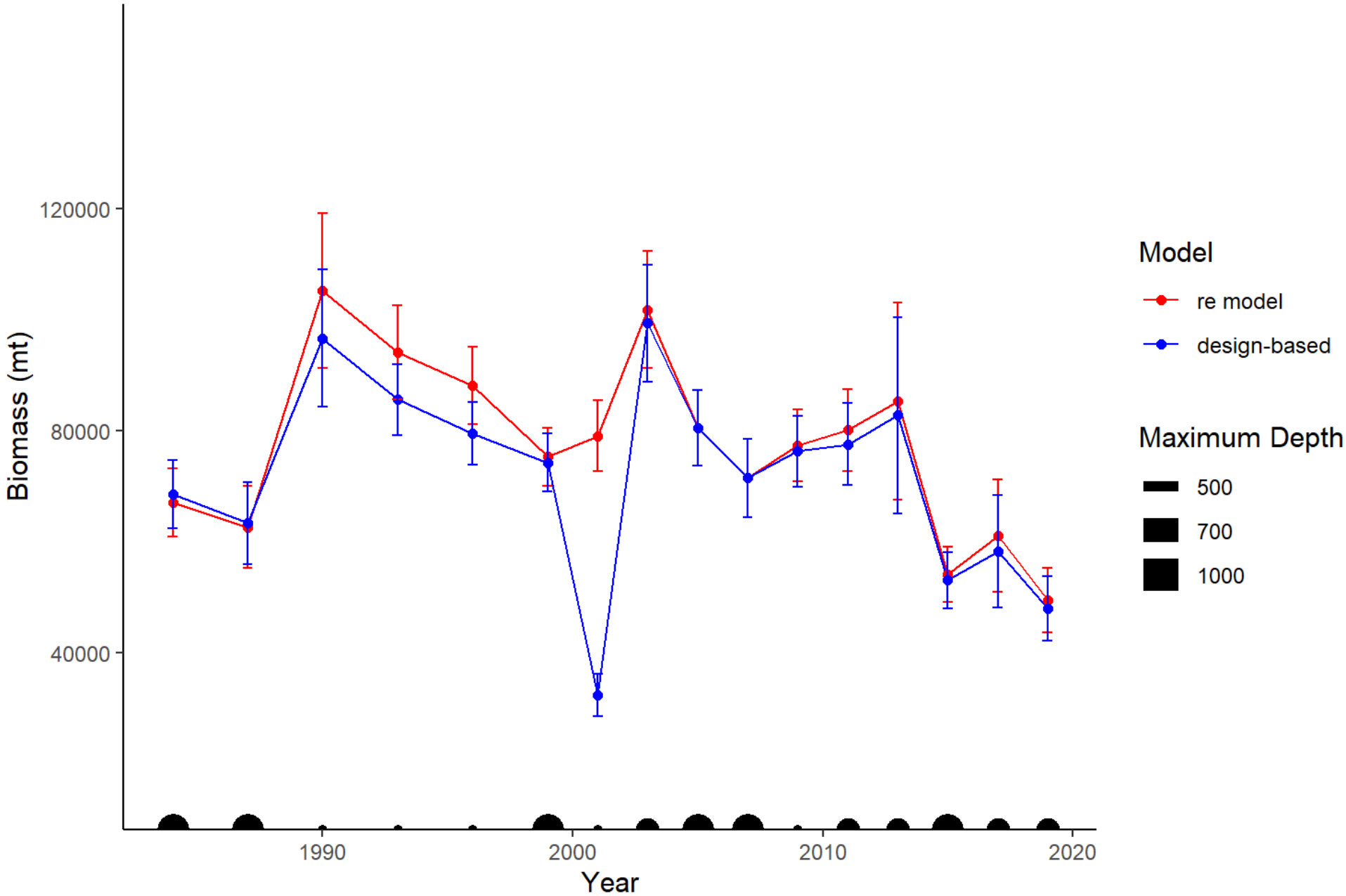


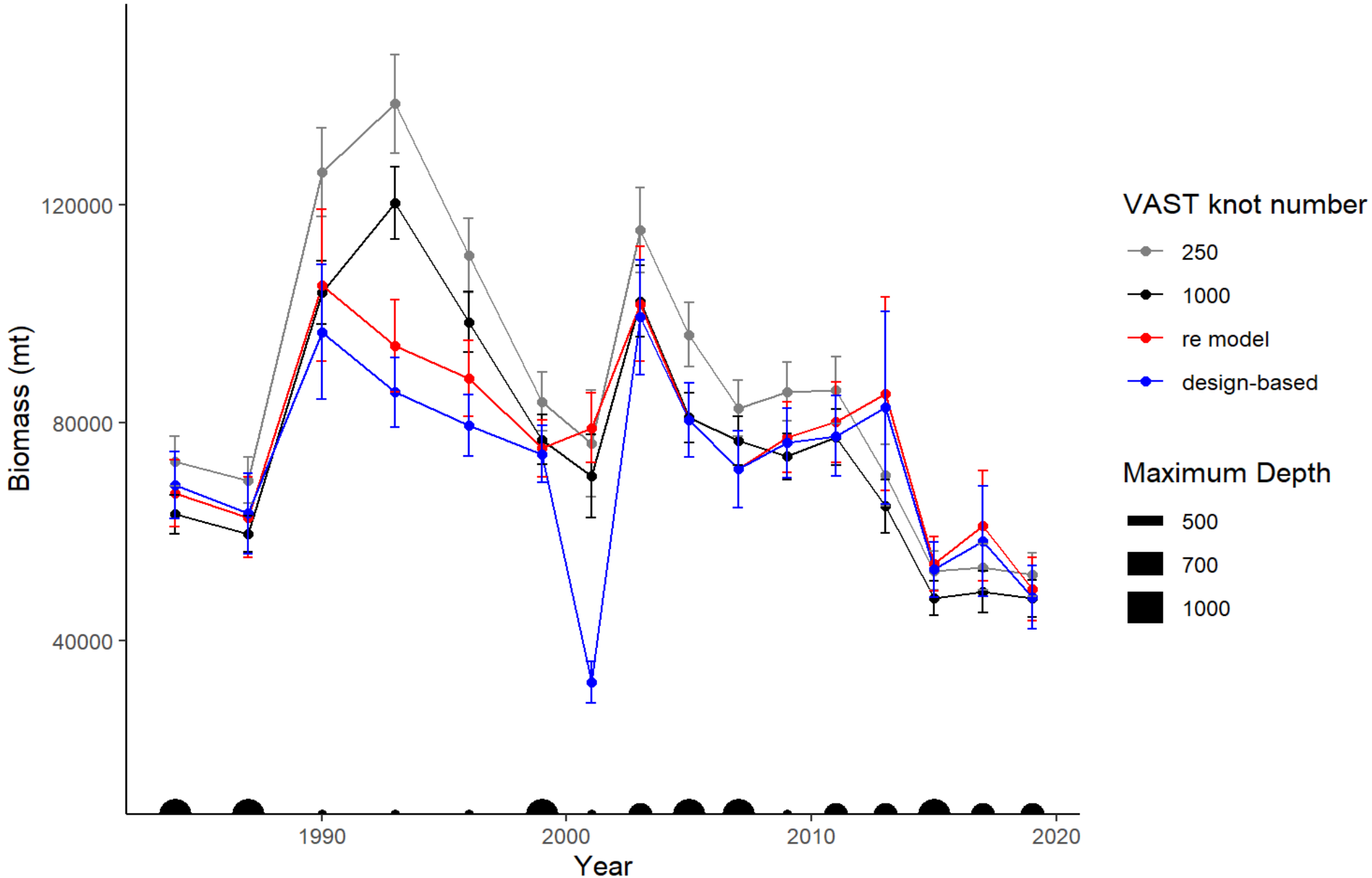
2nd-Order Anisotropy

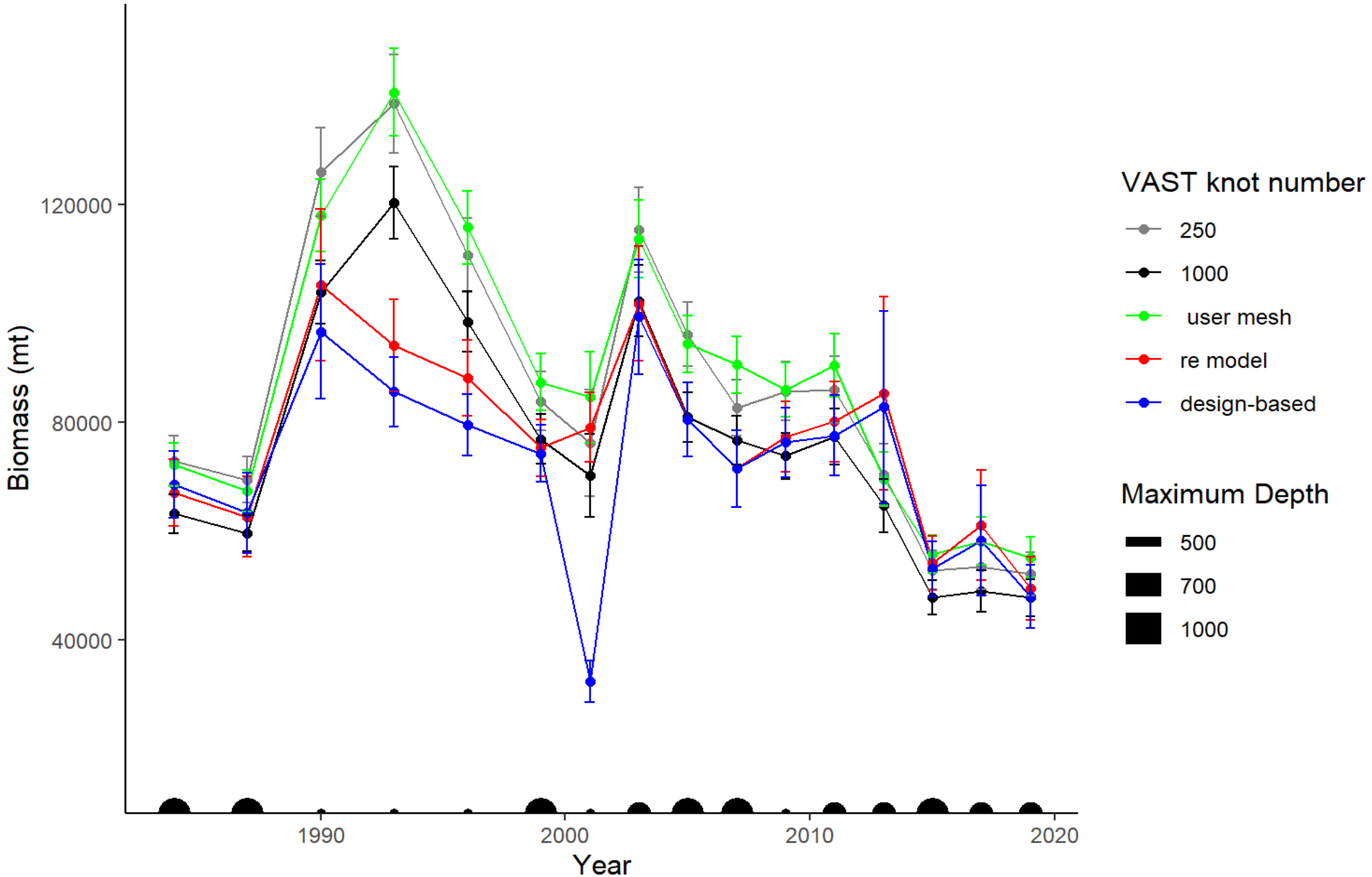


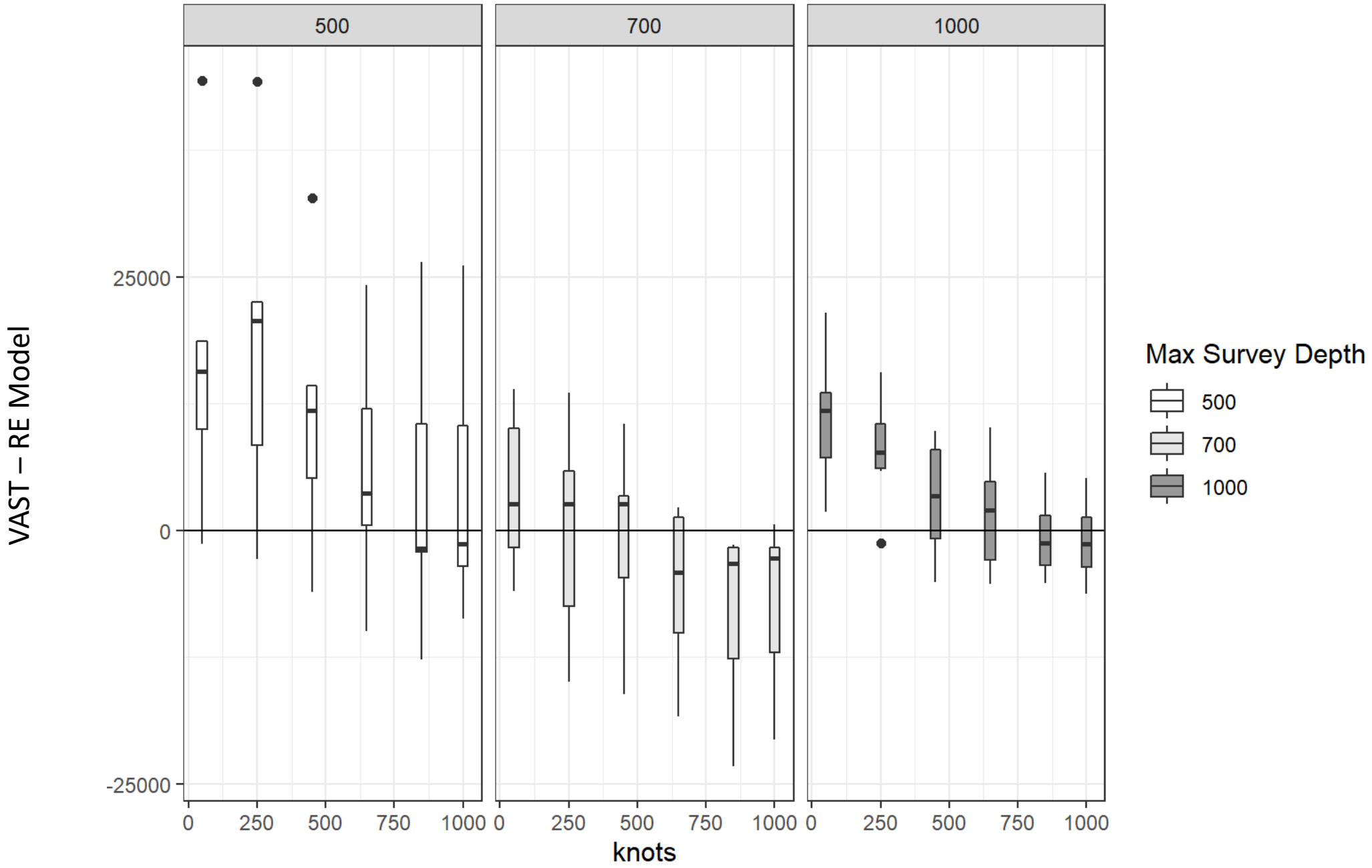
GOA Dover sole VAST results

- Models:
  - Design-based
  - RE model
  - VAST using knots:
    - 250
    - 1000
  - VAST with user defined mesh


120000
80000
40000
Biomass (mt)
1990
2000
2010
2020
Year
Model
re model
design-based
Maximum Depth
500
700
1000

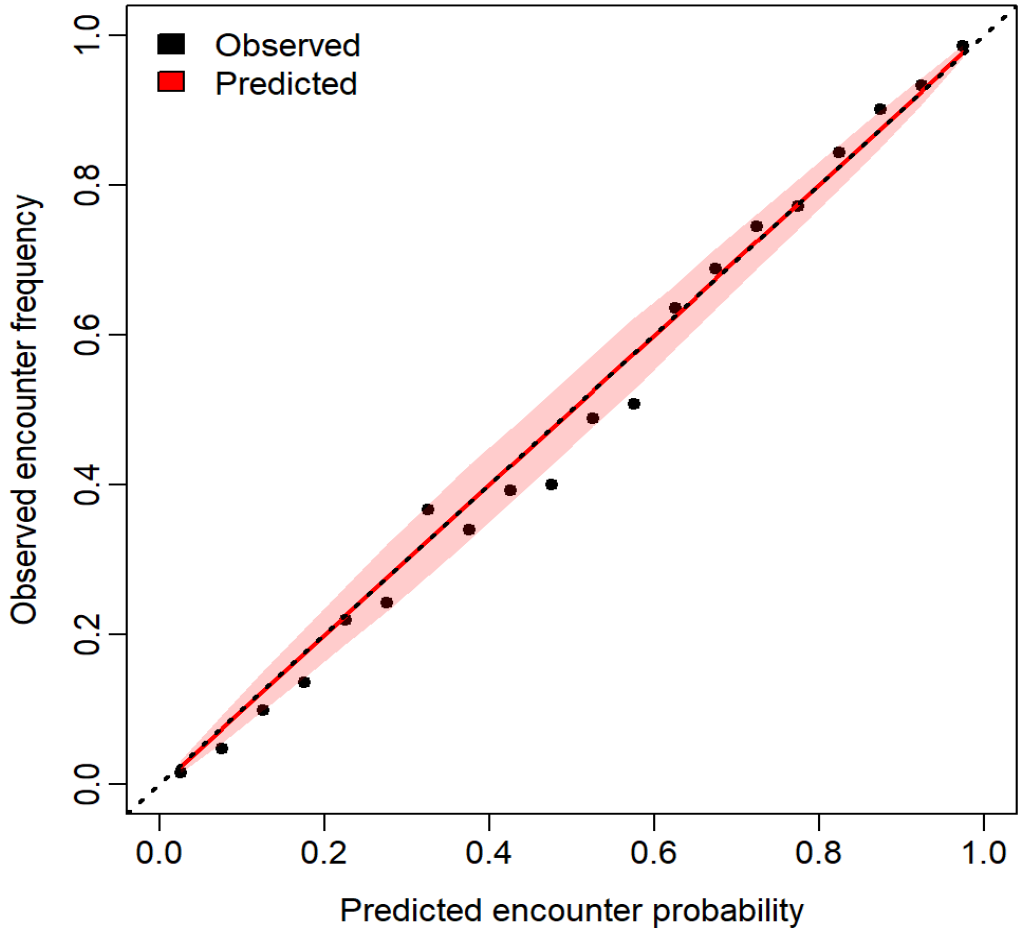

Biomass (mt)
120000
80000
40000
1990
2000
2010
2020
Year
VAST knot number
250
1000
re model
design-based
Maximum Depth
500
700
1000


Biomass (mt)
120000
80000
40000
1990
2000
2010
2020
Year
VAST knot number
250
1000
user mesh
re model
design-based
Maximum Depth
500
700
1000

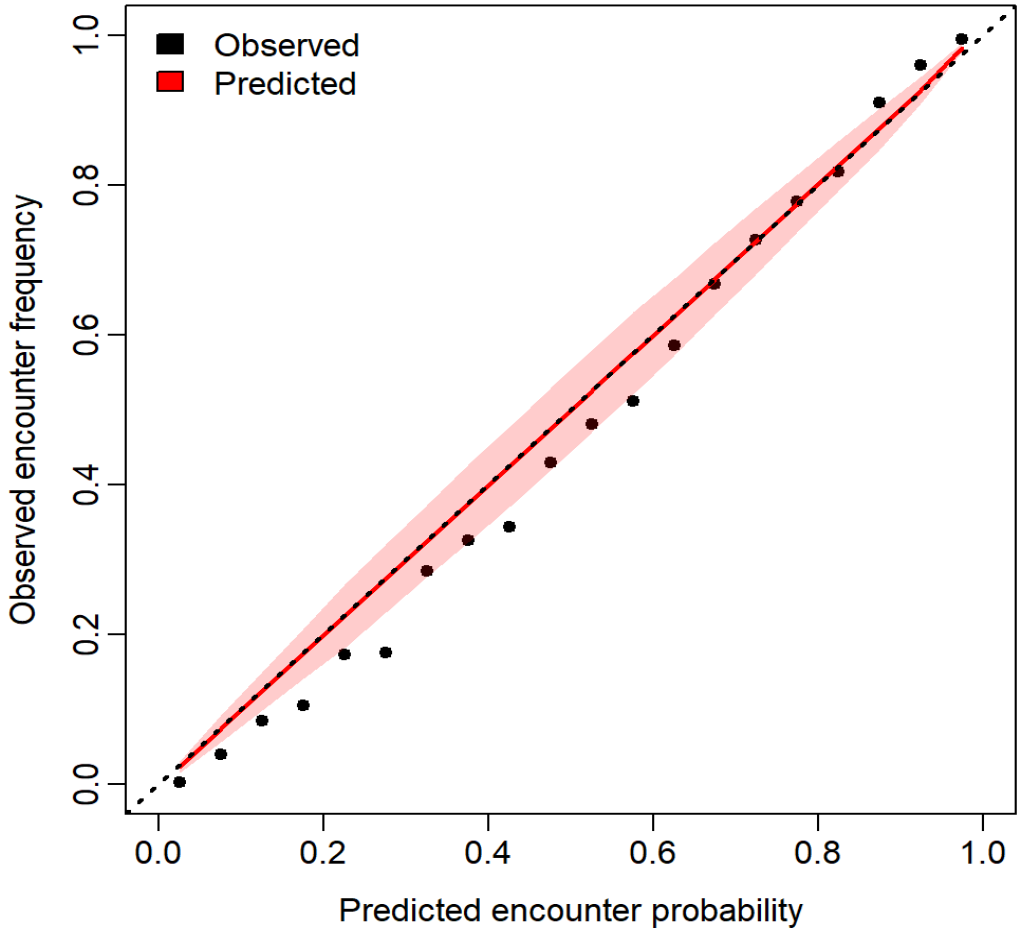

500
700
1000
25000
0
-25000
0
250
500
750
1000
knots
VAST – RE Model
Max Survey Depth
500
700
1000

Model Validation – Probability of Encounter

250 Knots

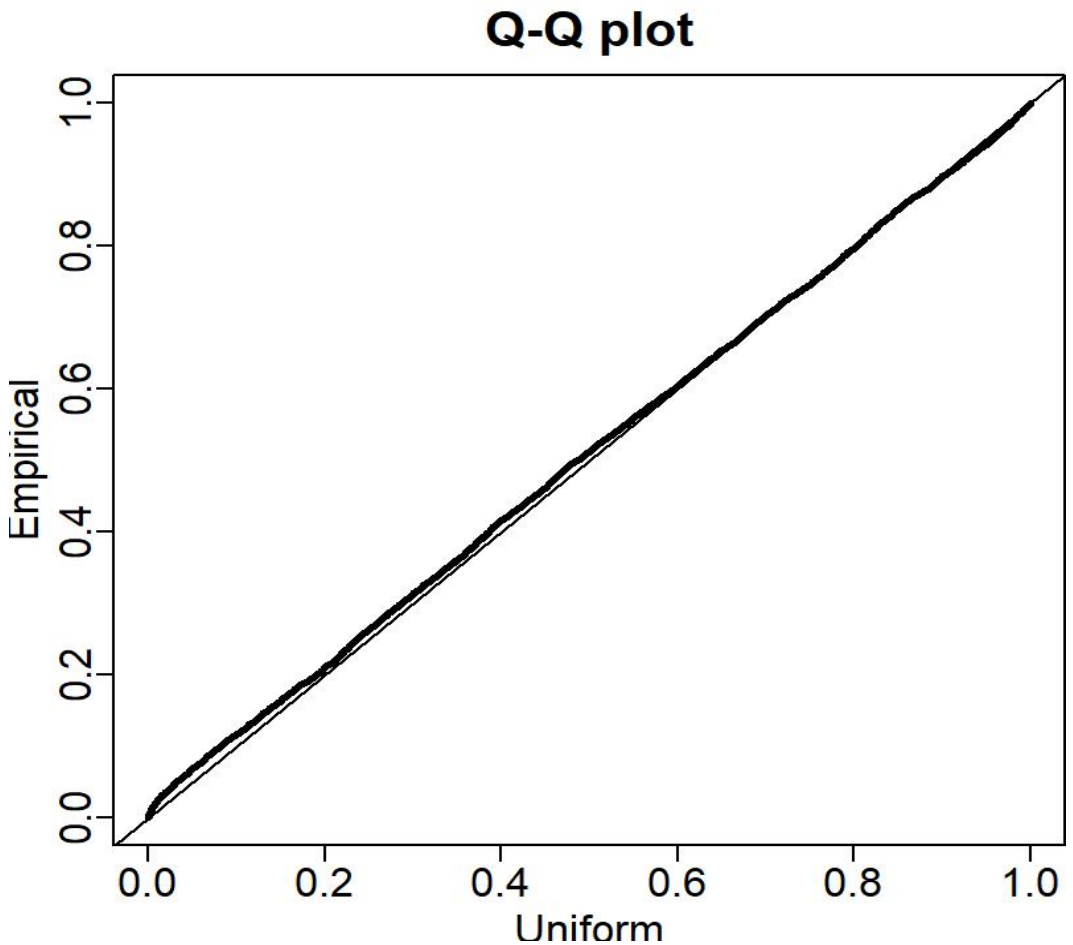


1000 Knots

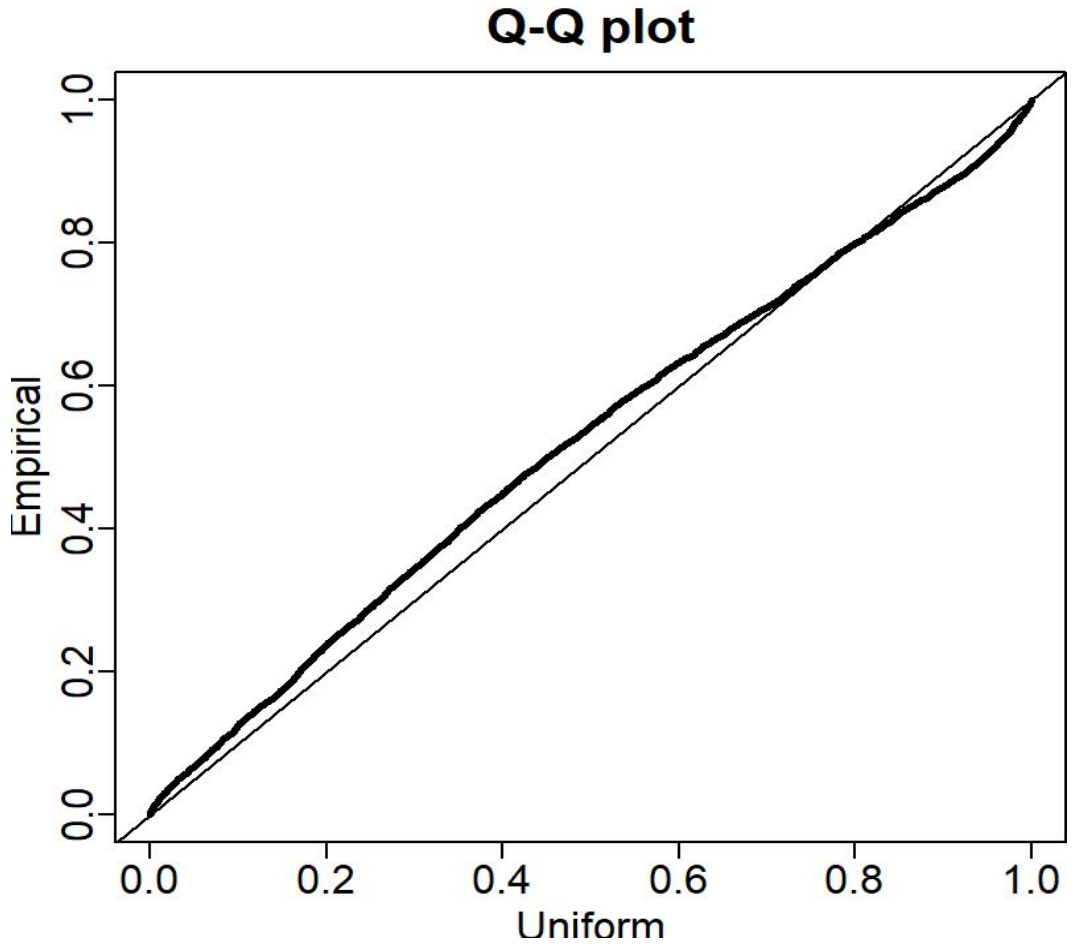


Model Validation – Probability of Encounter

250 Knots

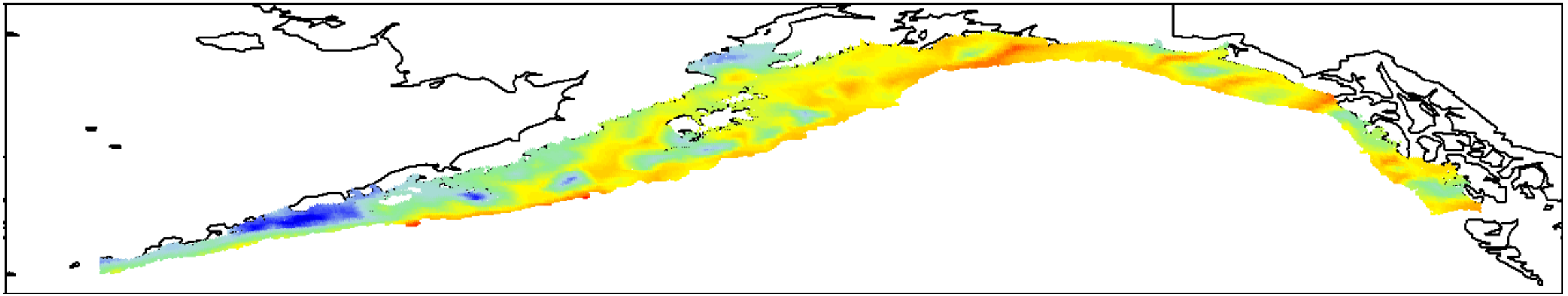


1000 Knots

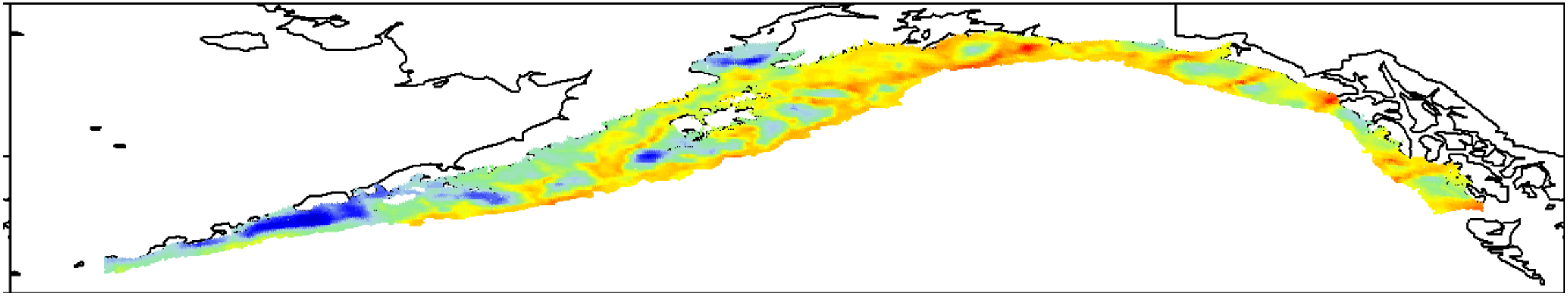


1993 Biomass Density

250 Knots

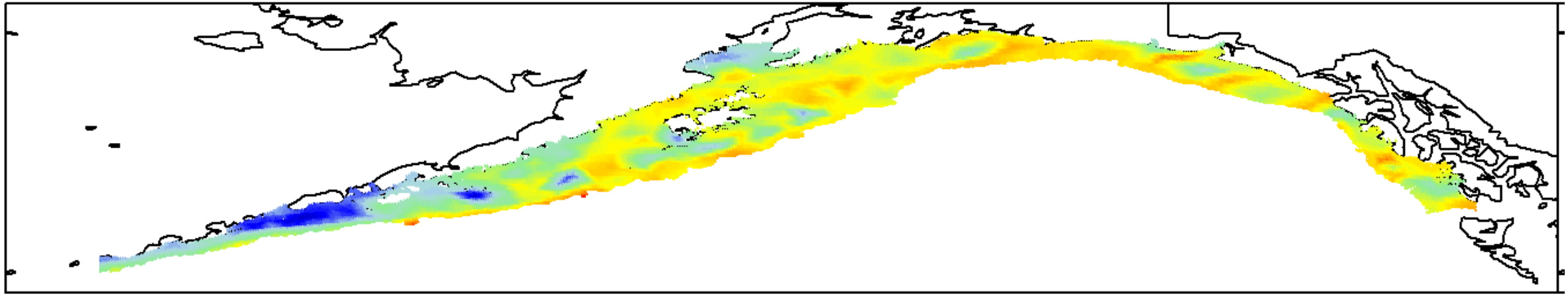


1000 Knots

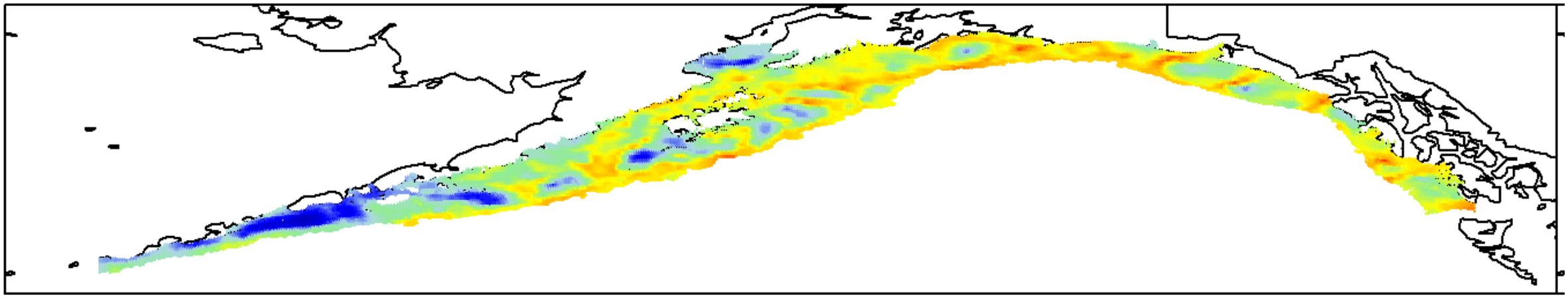


2005 Biomass Density

250 Knots



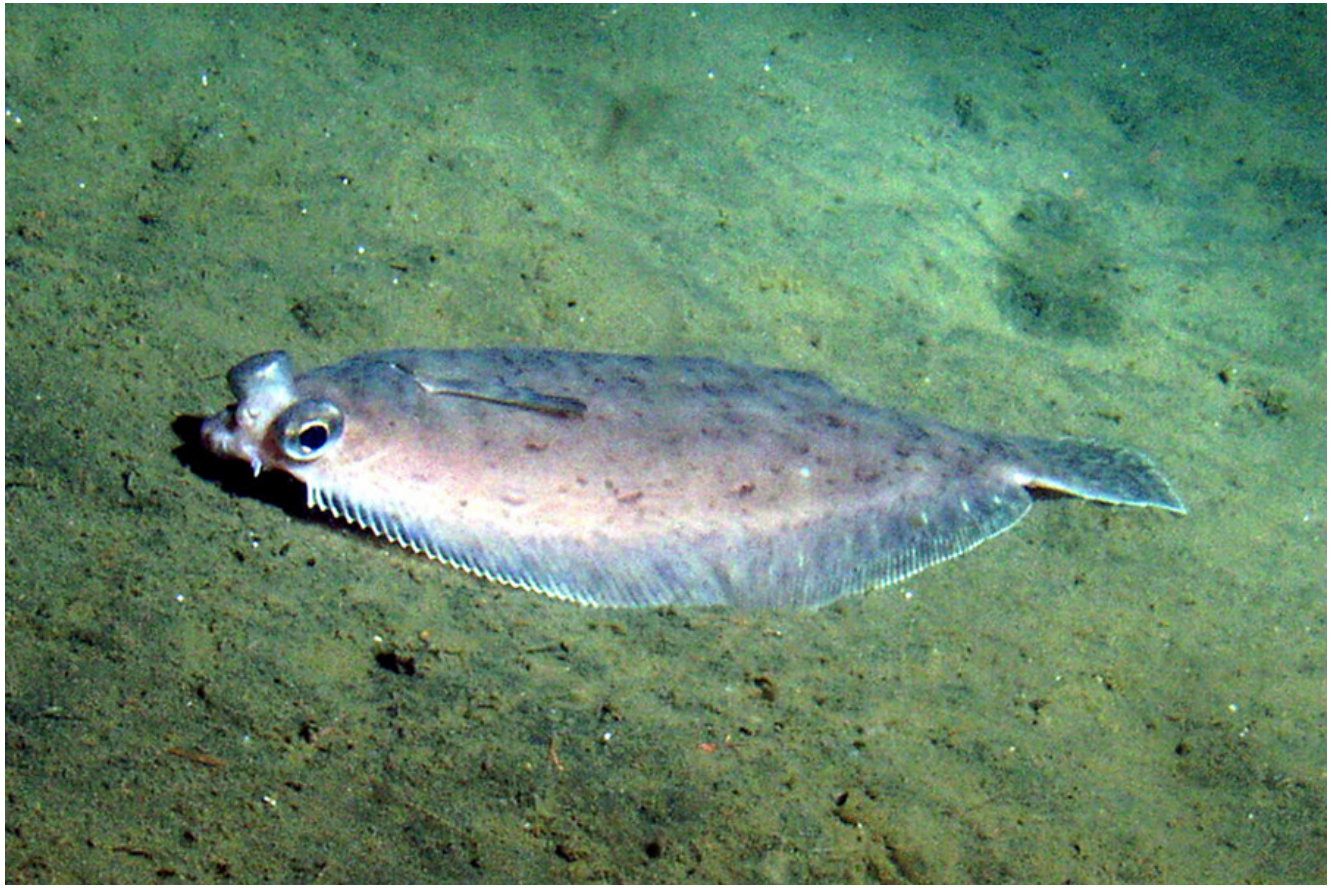
1000 Knots



Recommendations

- Sensitivity to mesh structure
  - Boundaries
  - Knots
- Sensitivity to anisotropy
  - Separate models for Western/Central and Eastern GOA
  - Add Covariates
- Explore VAST Observation model settings

Thank You!



JISAO

NOAA