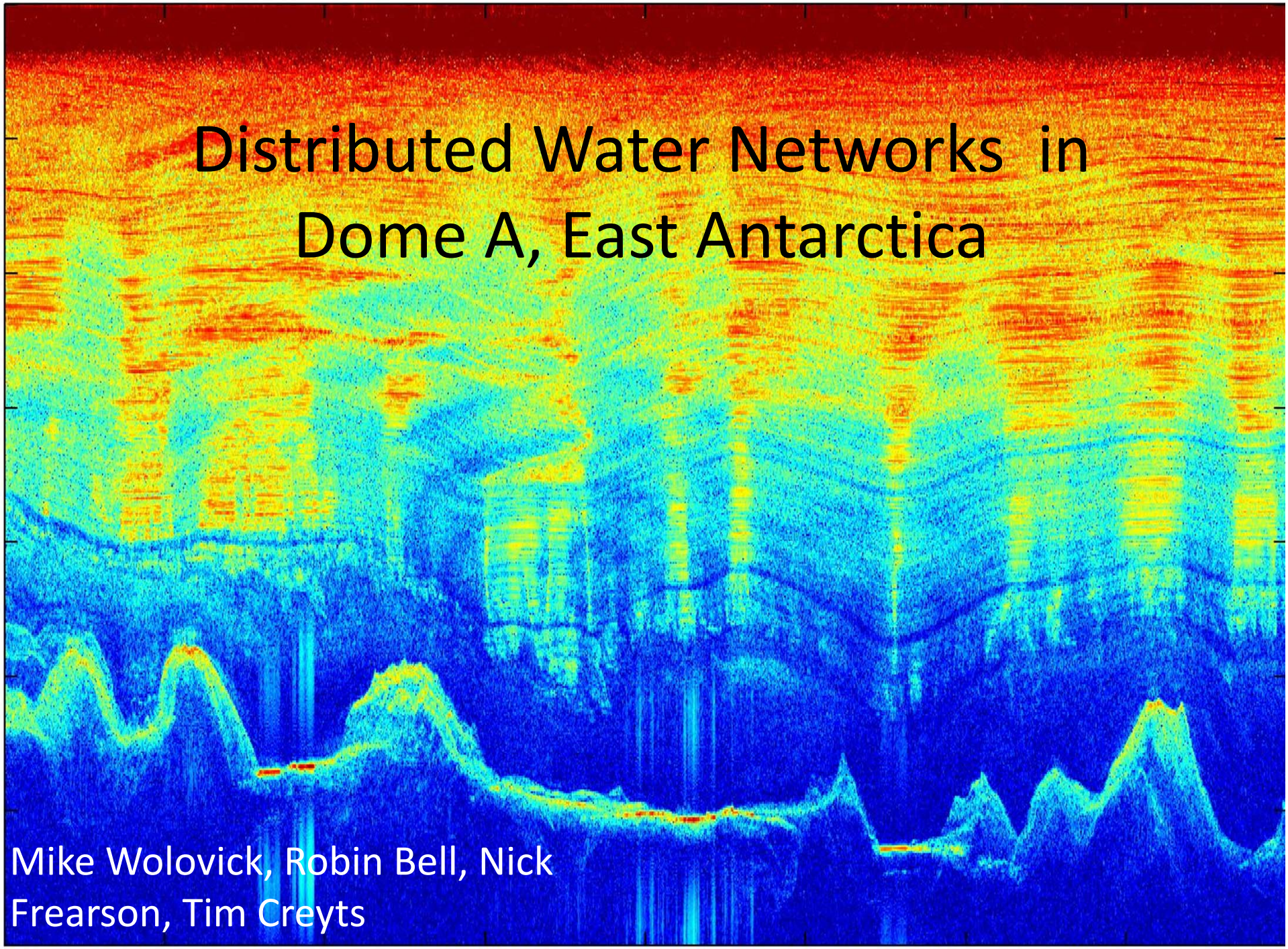
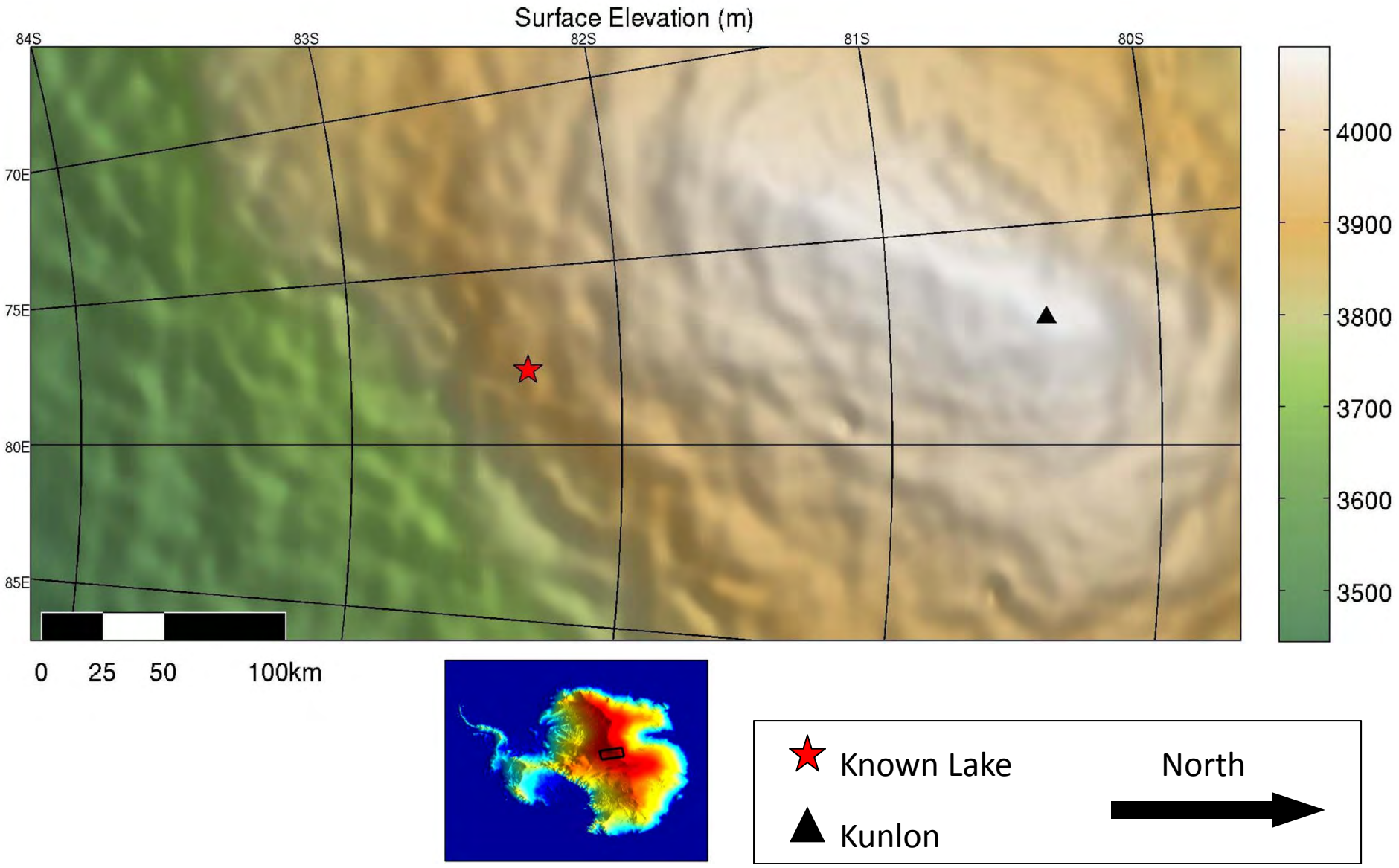


Distributed Water Networks in Dome A, East Antarctica

Mike Wolovick, Robin Bell, Nick Frearson, Tim Creyts

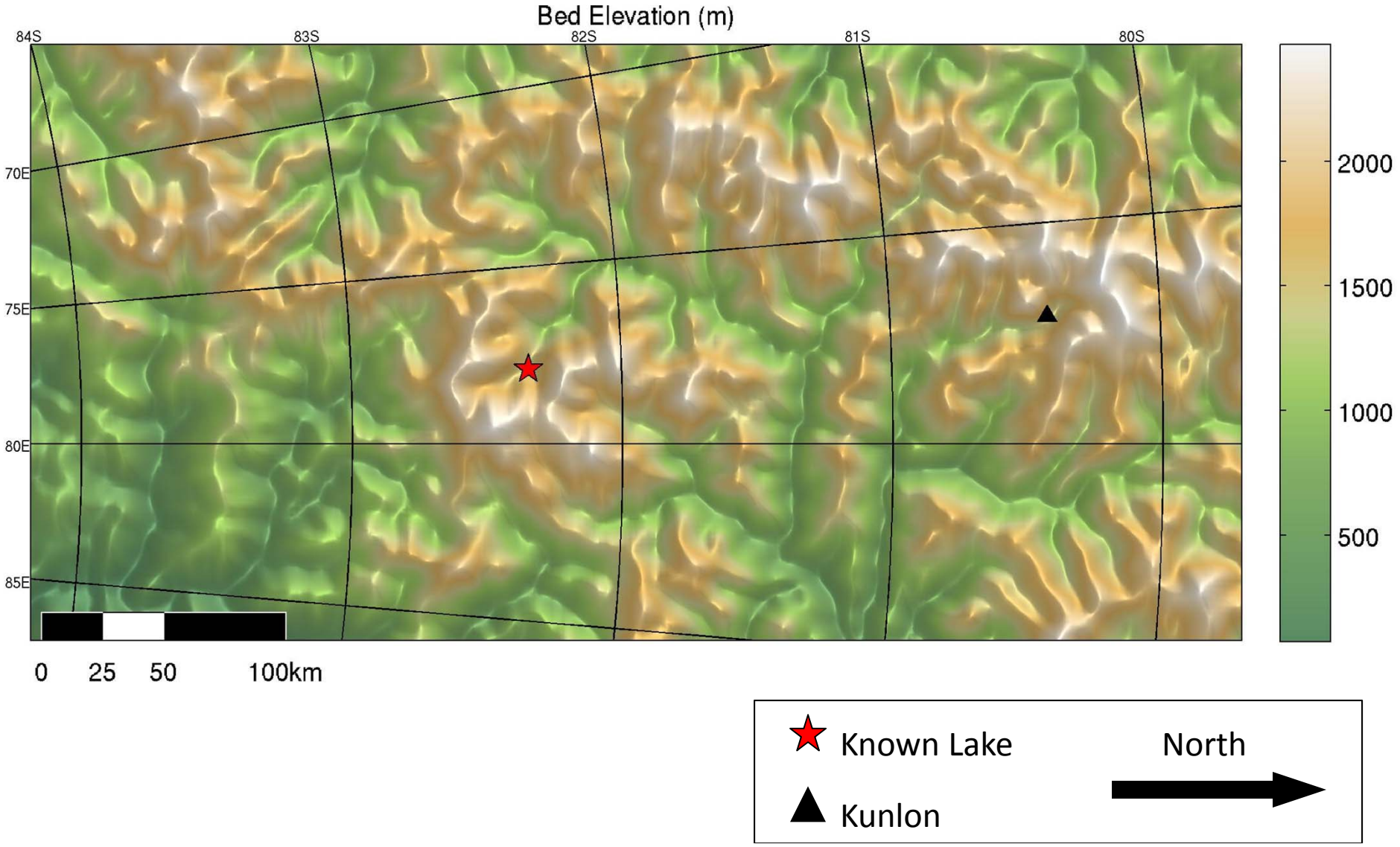
Introduction

Setting- Ice Surface



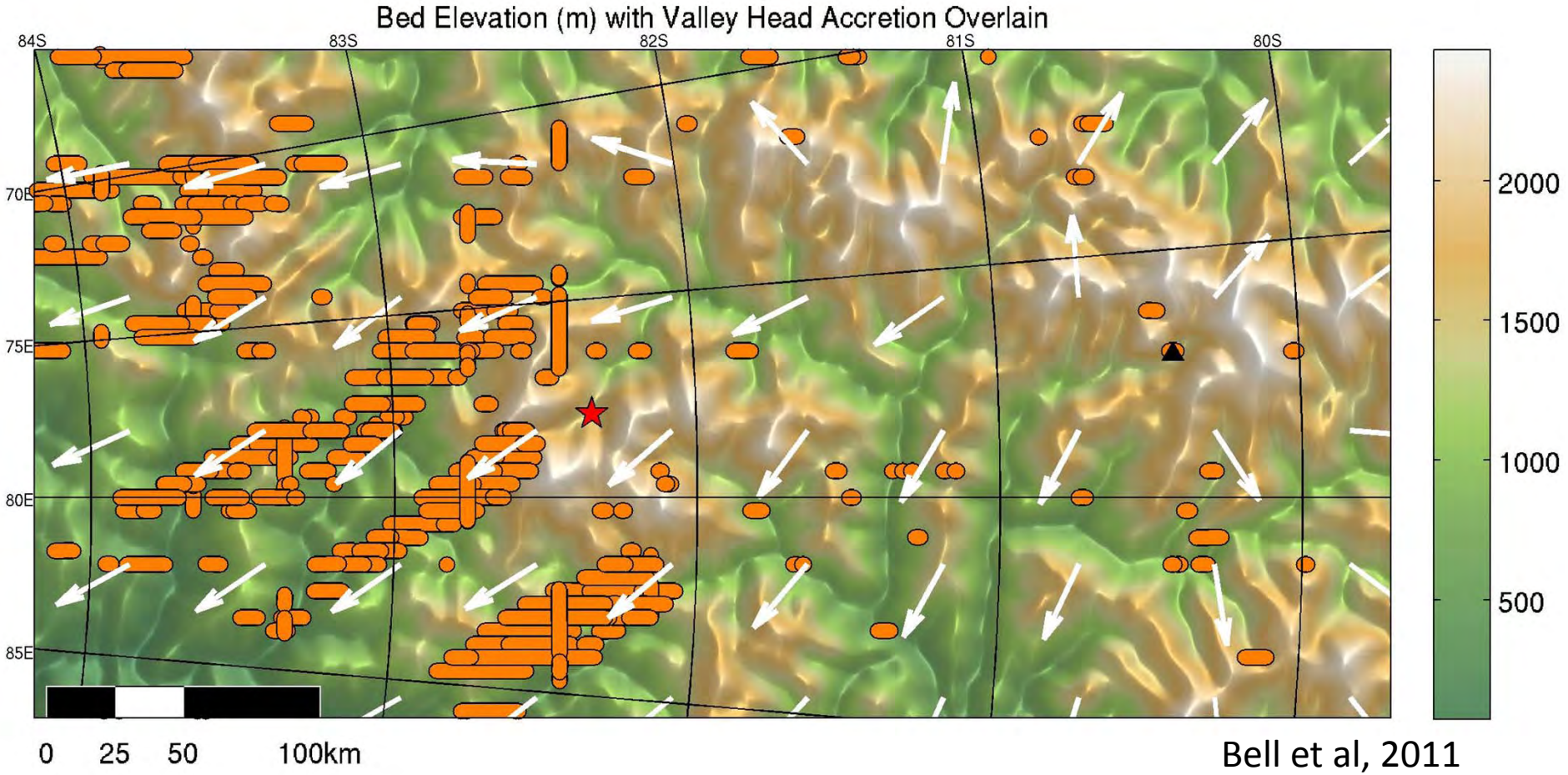
Introduction

Setting- Bed Elevation



Introduction

Setting- Accretion Plumes



Bell et al, 2011

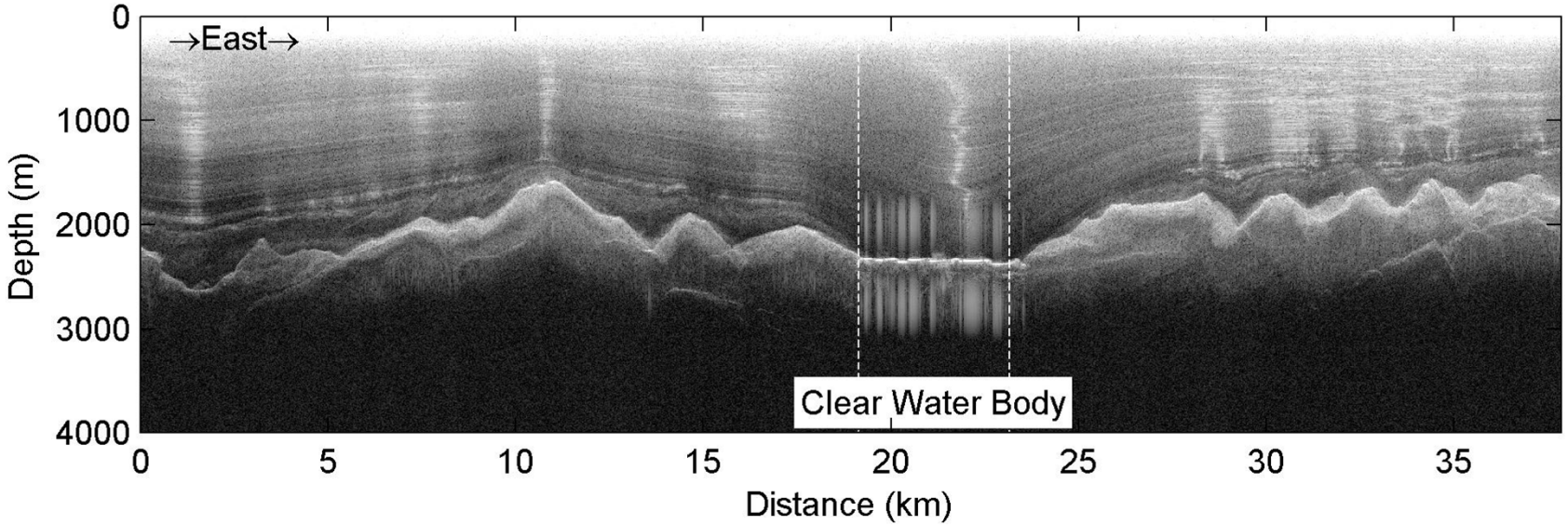
Mark I Eyeball

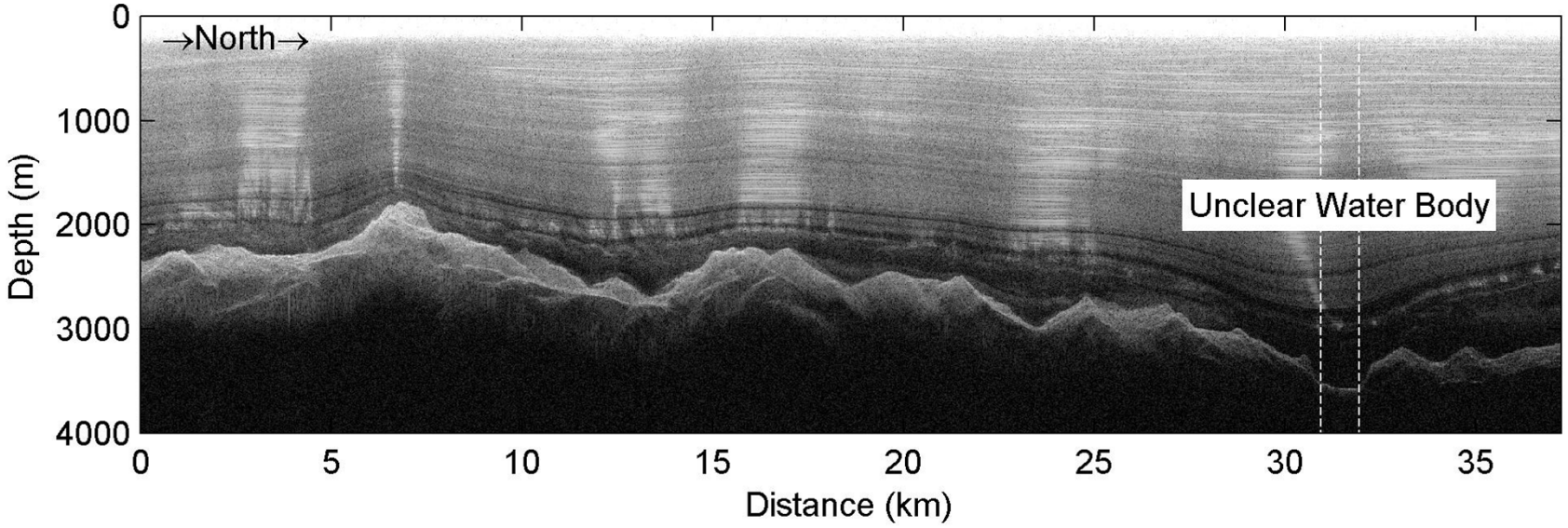
Criteria

- Brightness relative to reflectors of similar depth
- Flatness
- In local topographic minimum
- Vertically thin
- Receiver ringing (especially below 3000-3500m)

Mark I Eyeball

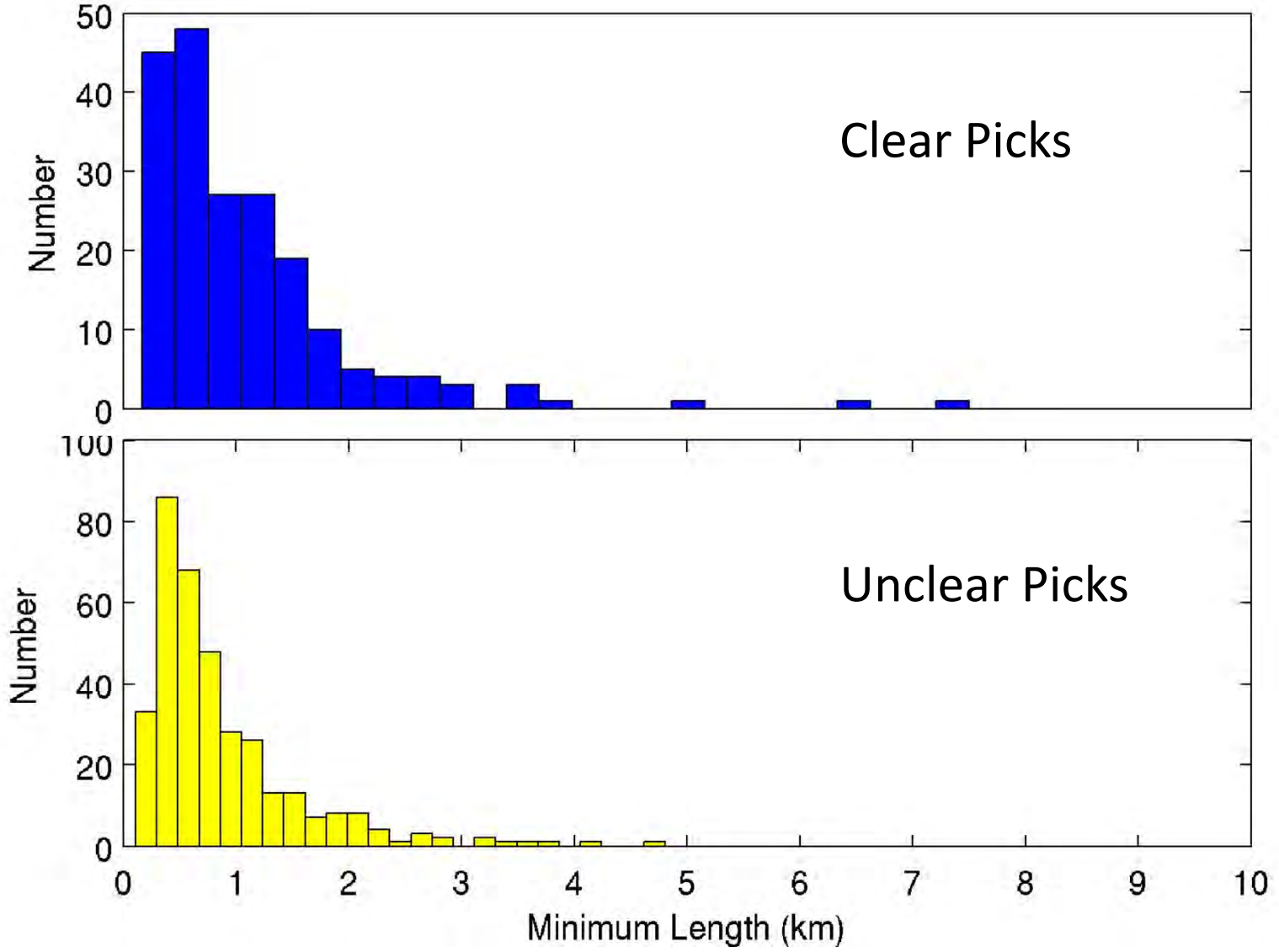
Examples





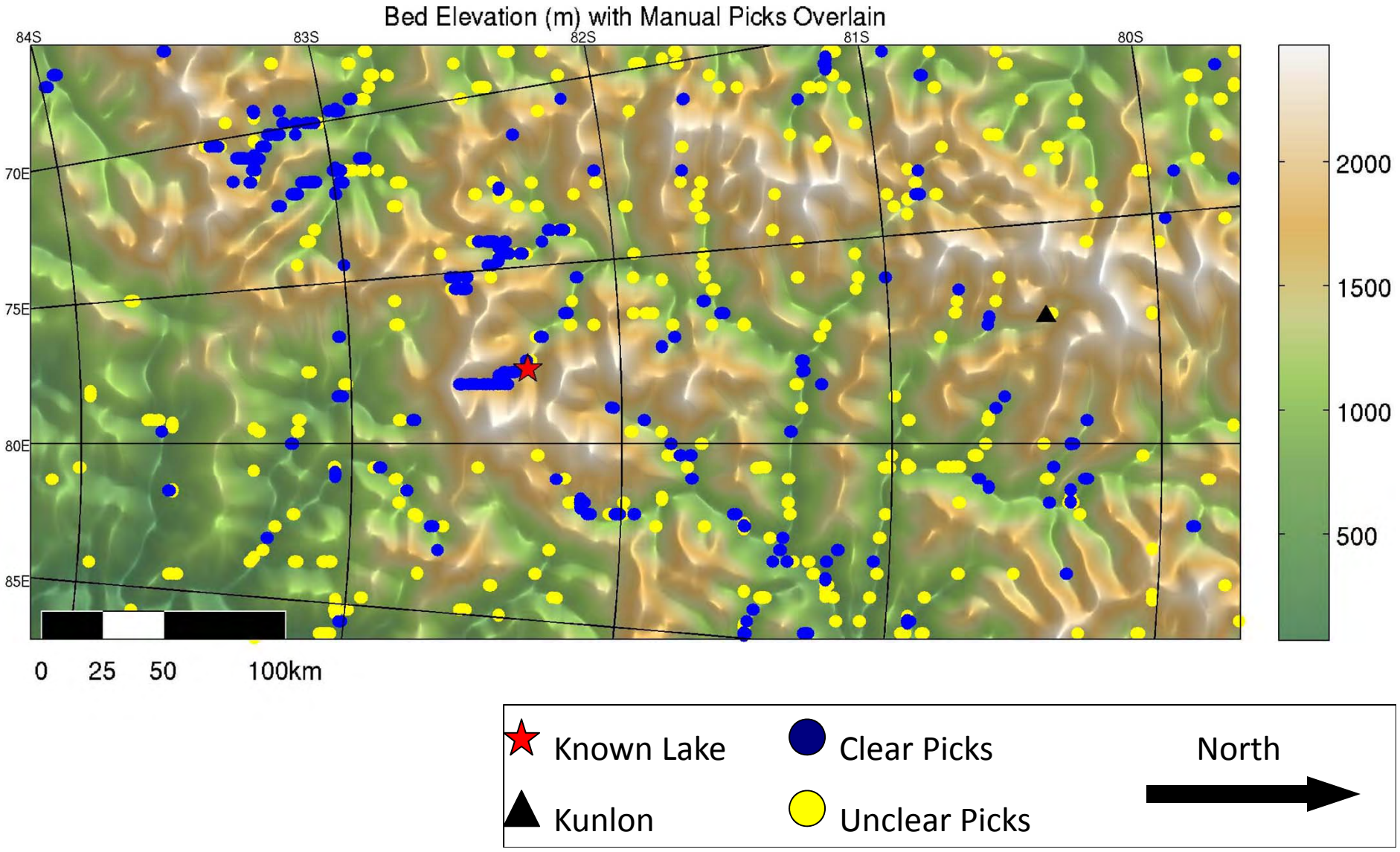
Mark I Eyeball

Size Distribution of Picked Water Bodies



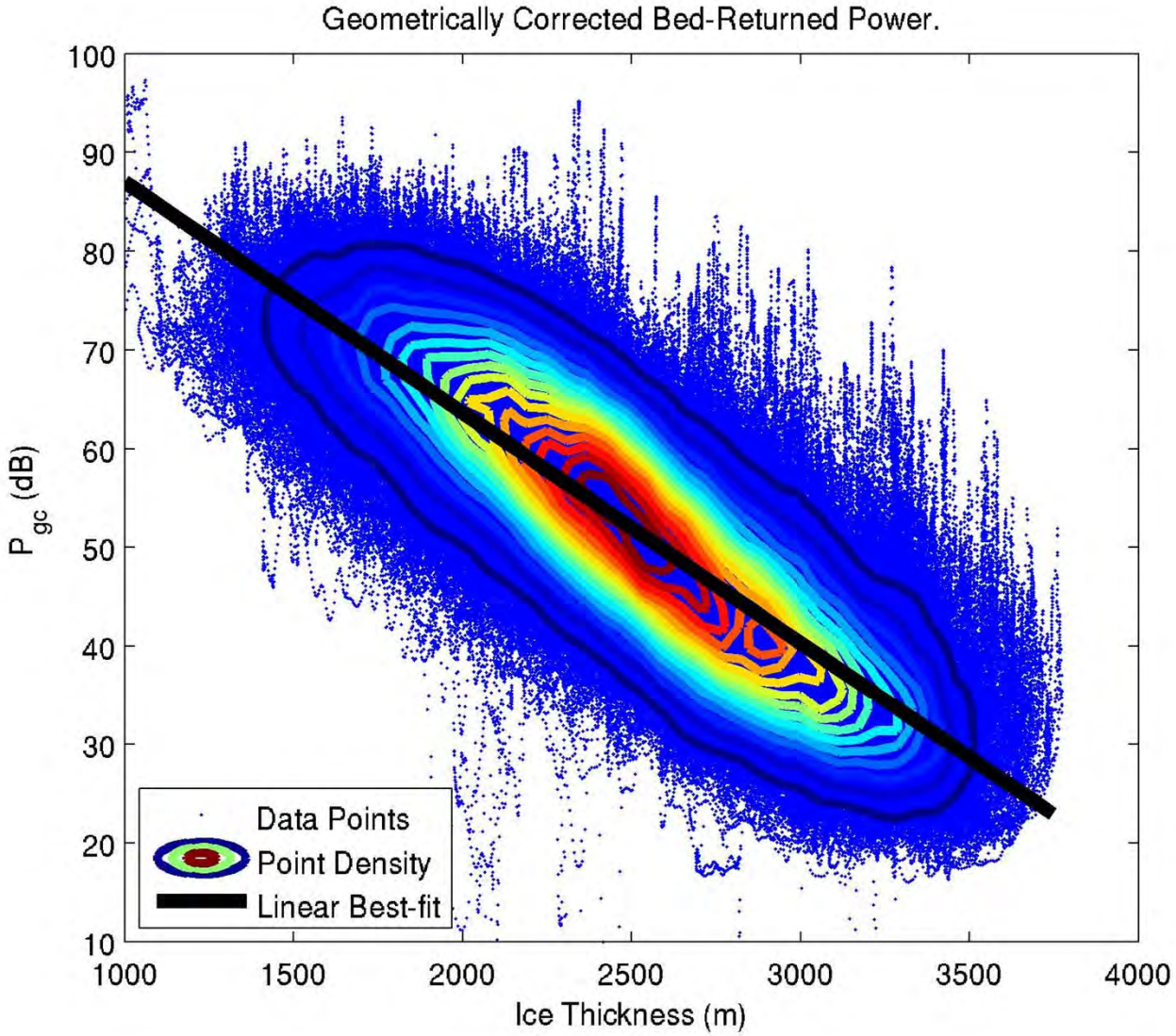
Mark I Eyeball

Picking Results



Reflectivity Anomalies

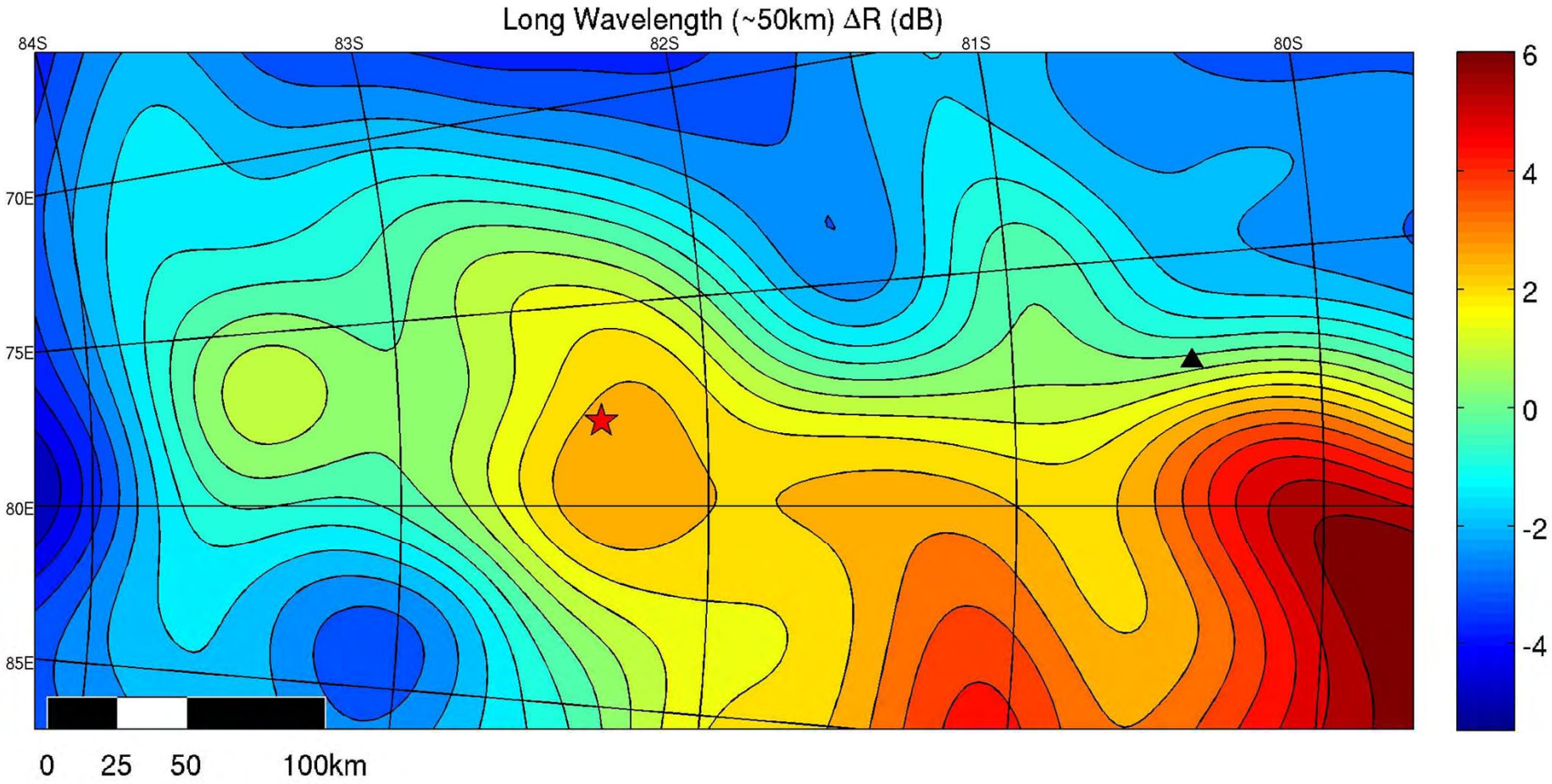
Geometrically corrected bed returned power



Best-fit slope: 11.67 dB/km (one way)

Reflectivity Anomalies

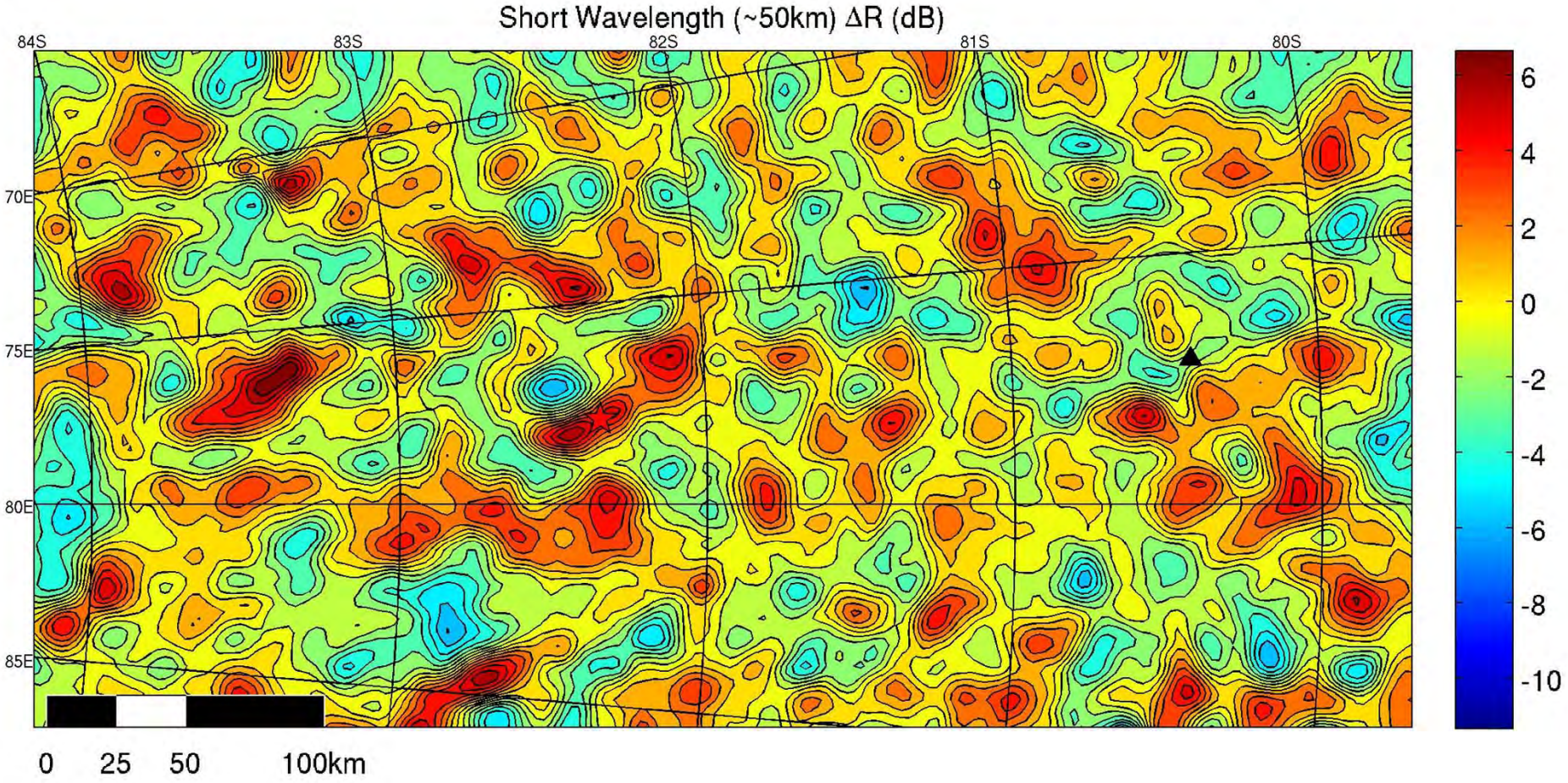
Long-Wavelength Signal



Gaussian Distance Weighting
(σ=25km, min wavelength ~50km)

Reflectivity Anomalies

Short-Wavelength Residual

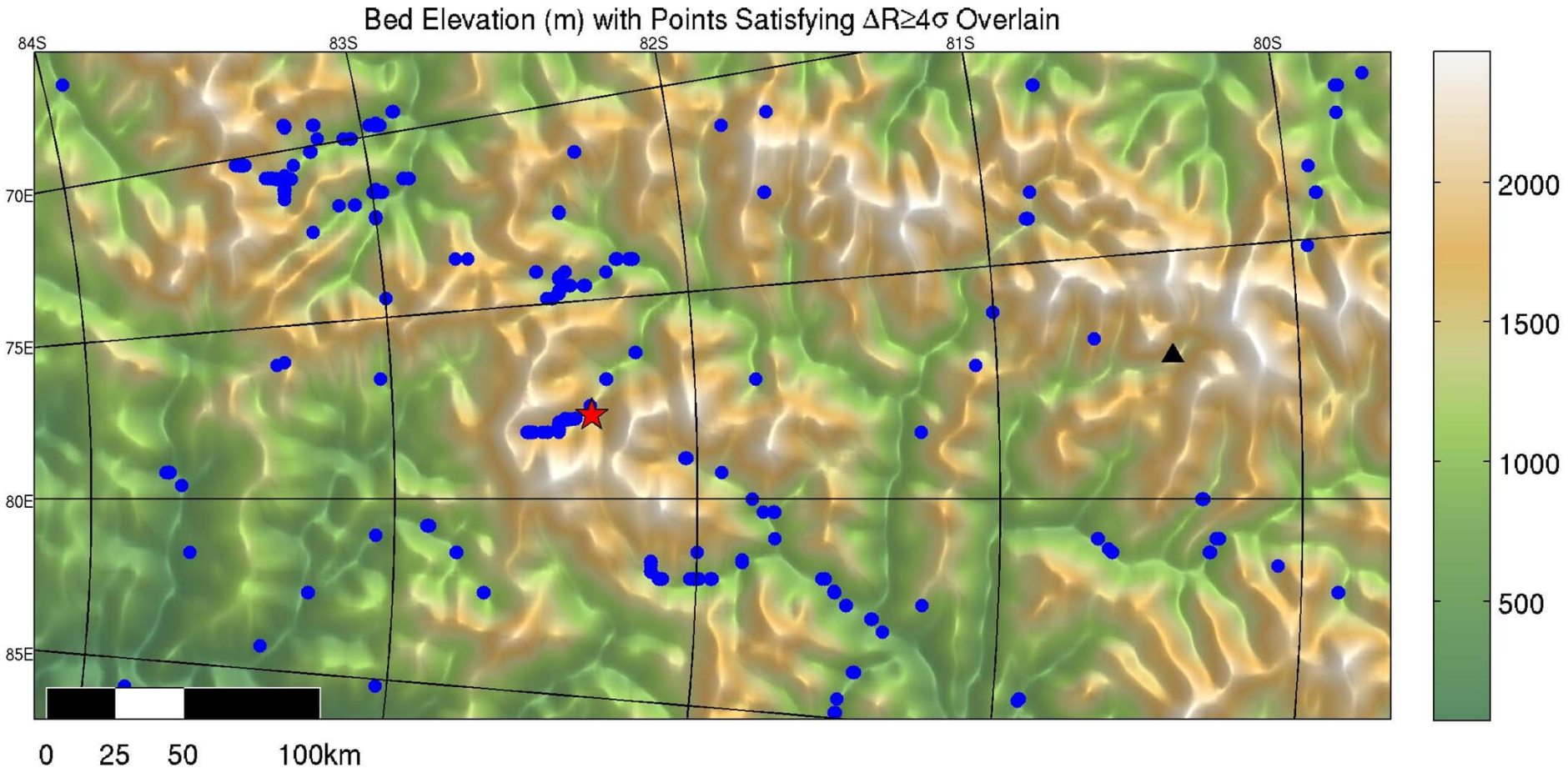


Wavelengths ~ [5km, 50km]

But most water bodies are smaller than this!

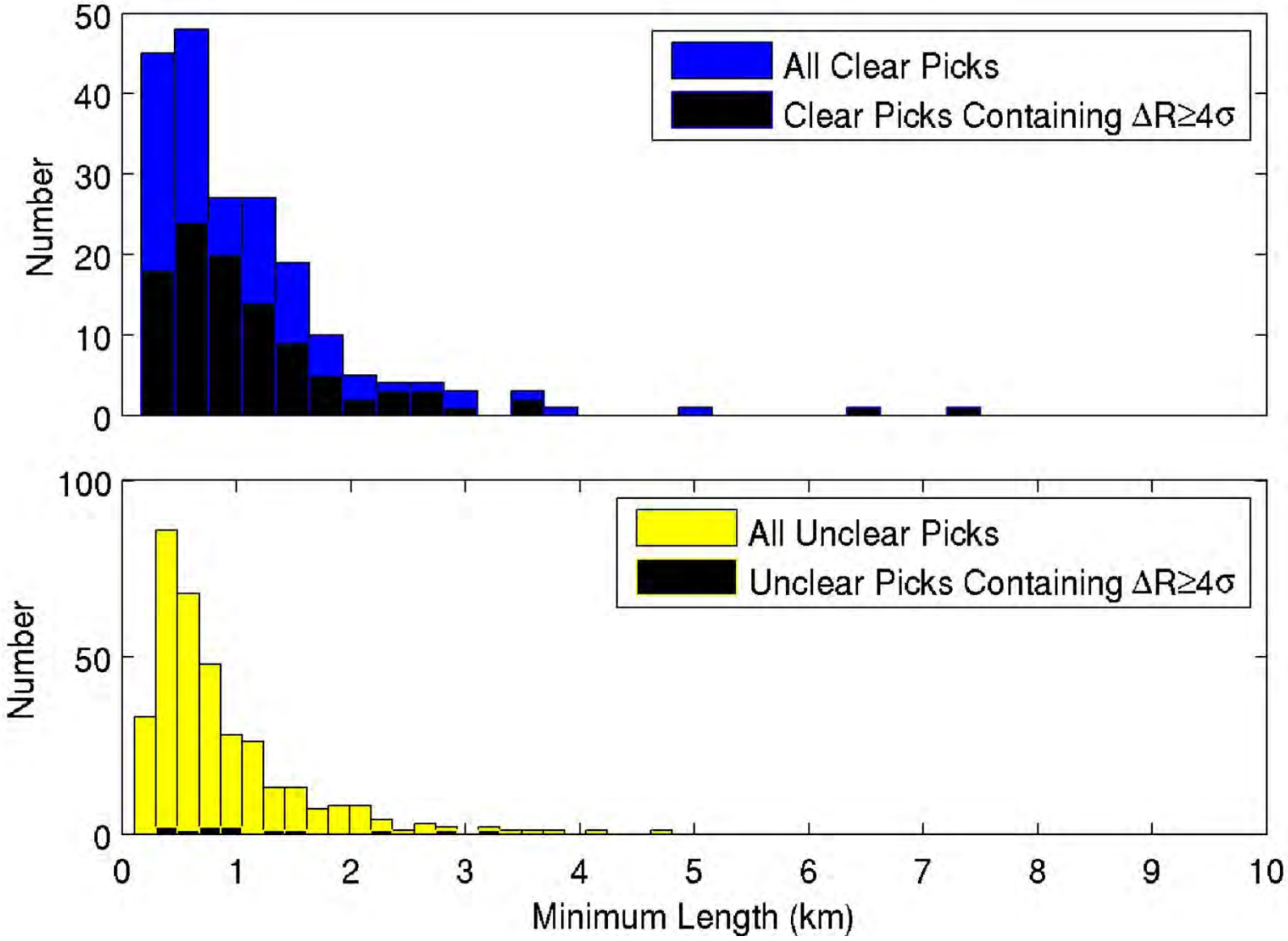
Reflectivity Anomalies

Individual Bright Points (4σ=+26 dB)



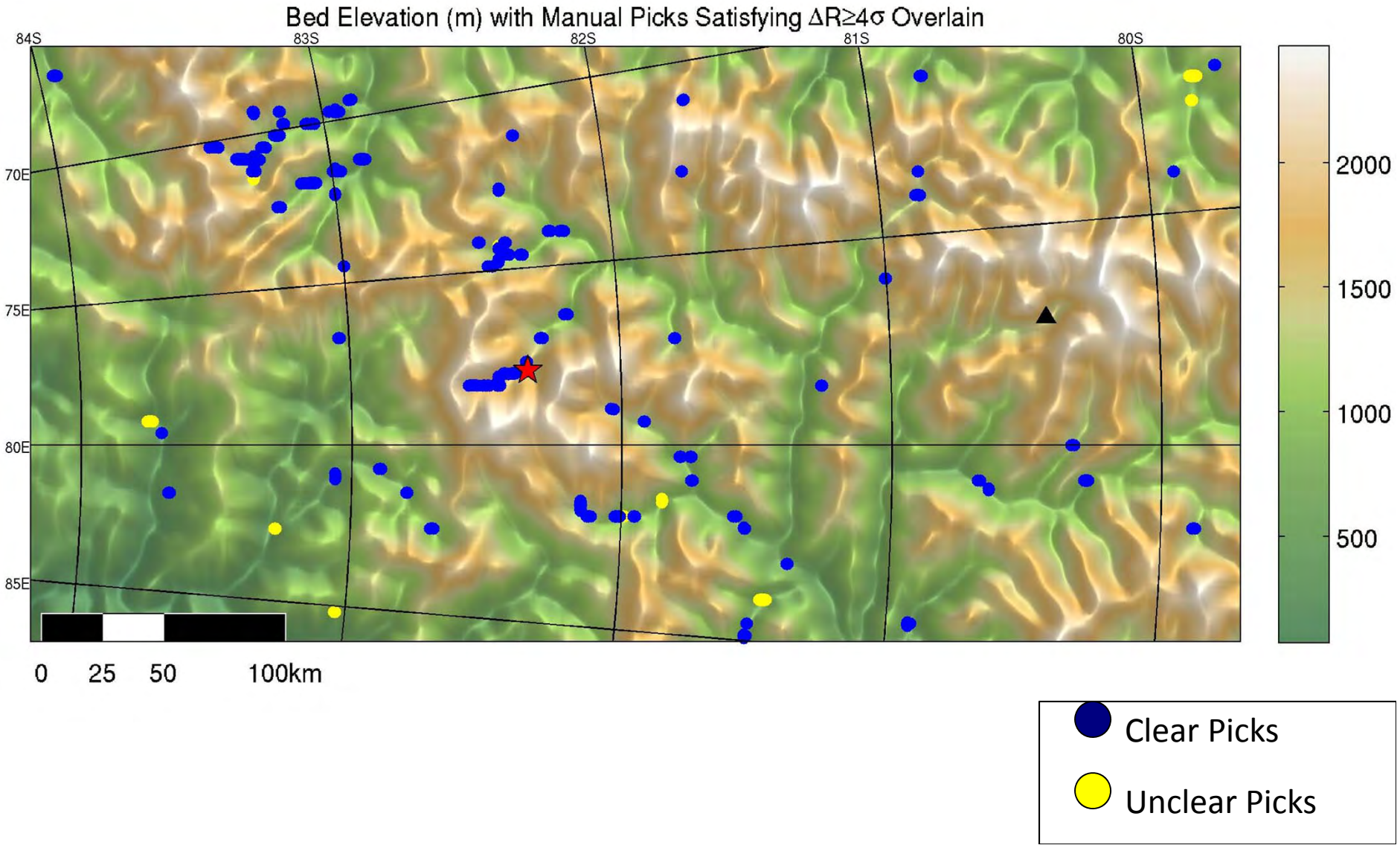
Coincident Points

Size Distribution of Coincident Points

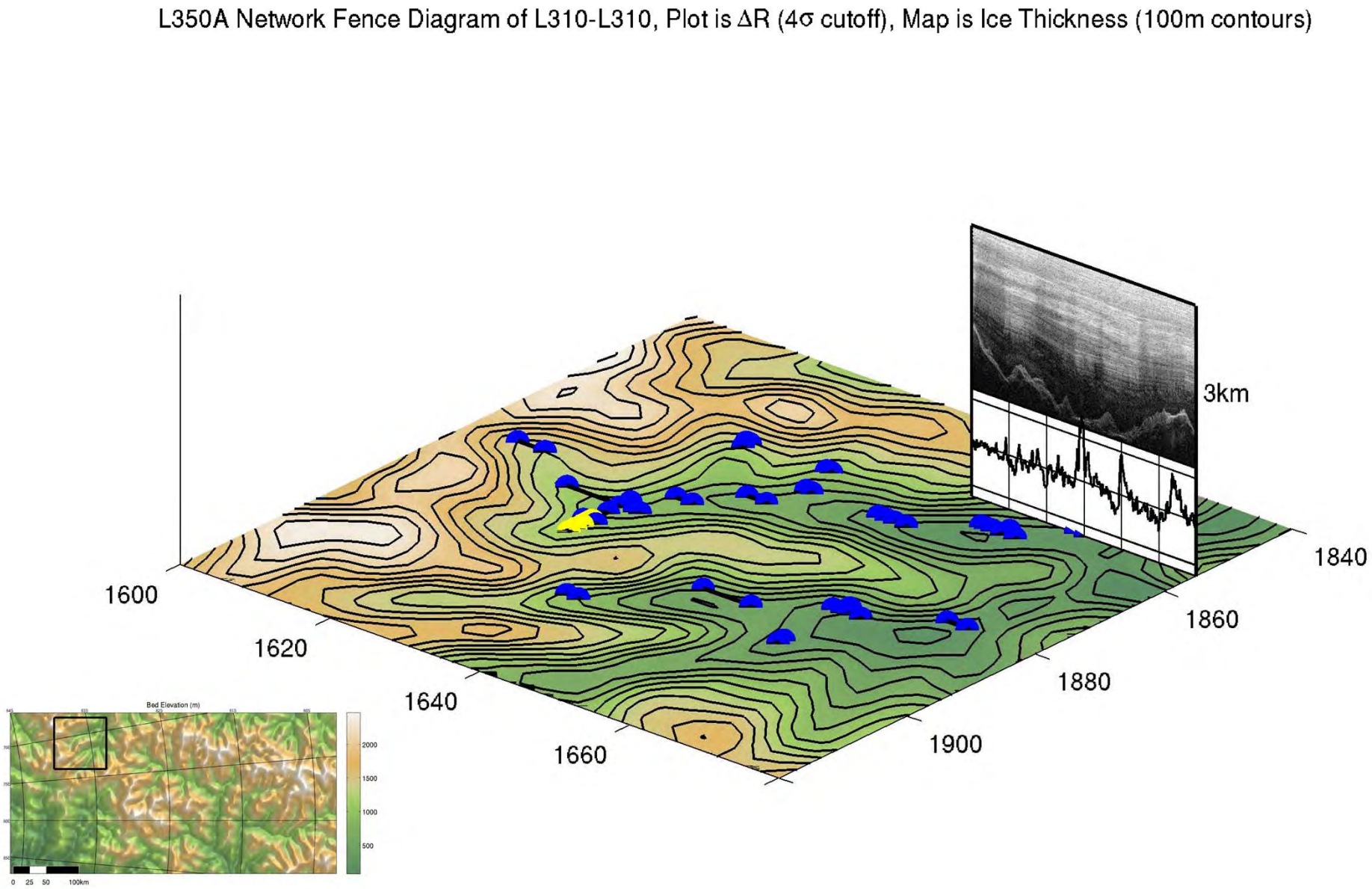


Coincident Points

Areas of Agreement Between Both Methods



Discussion: Water Network Detail



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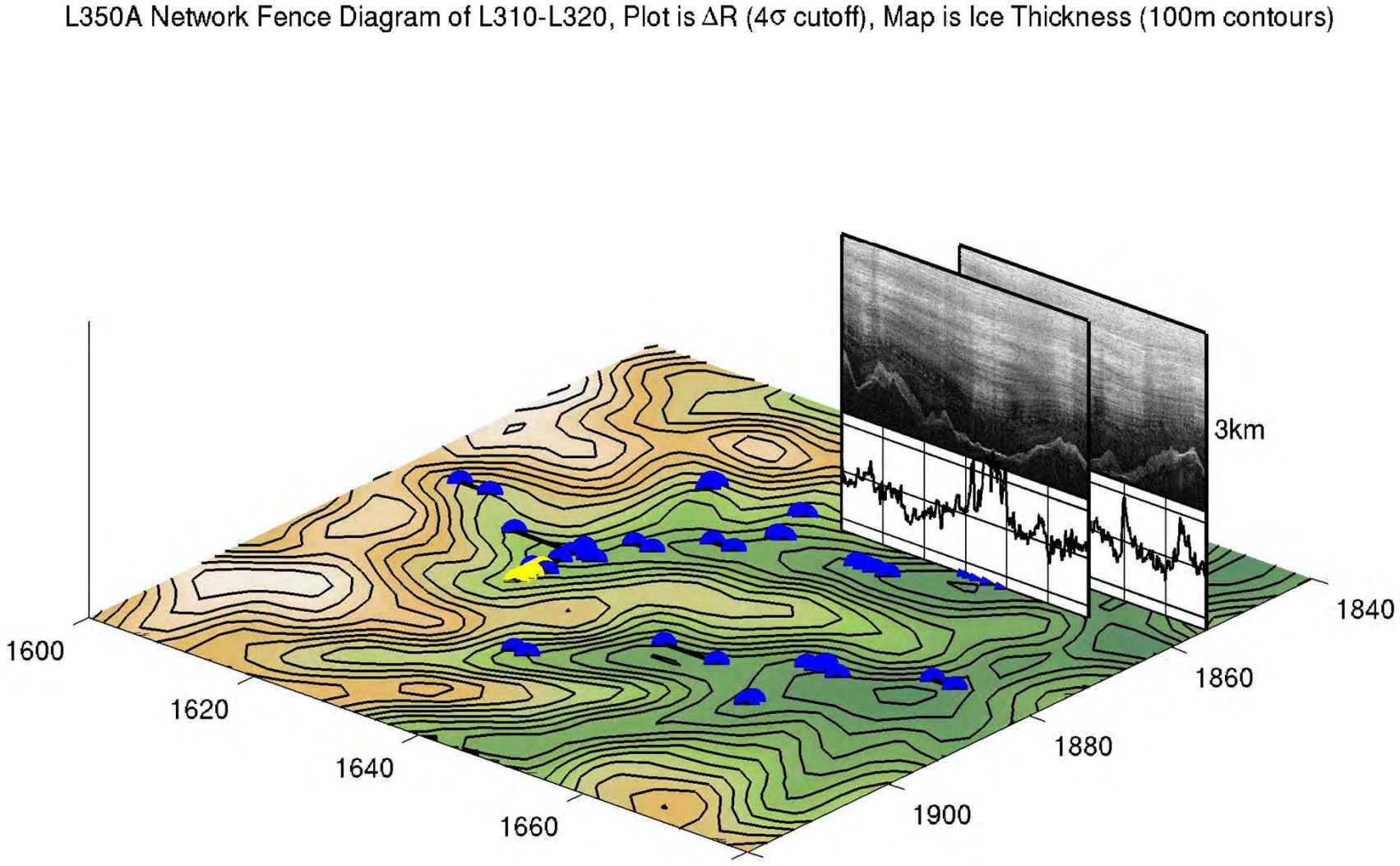
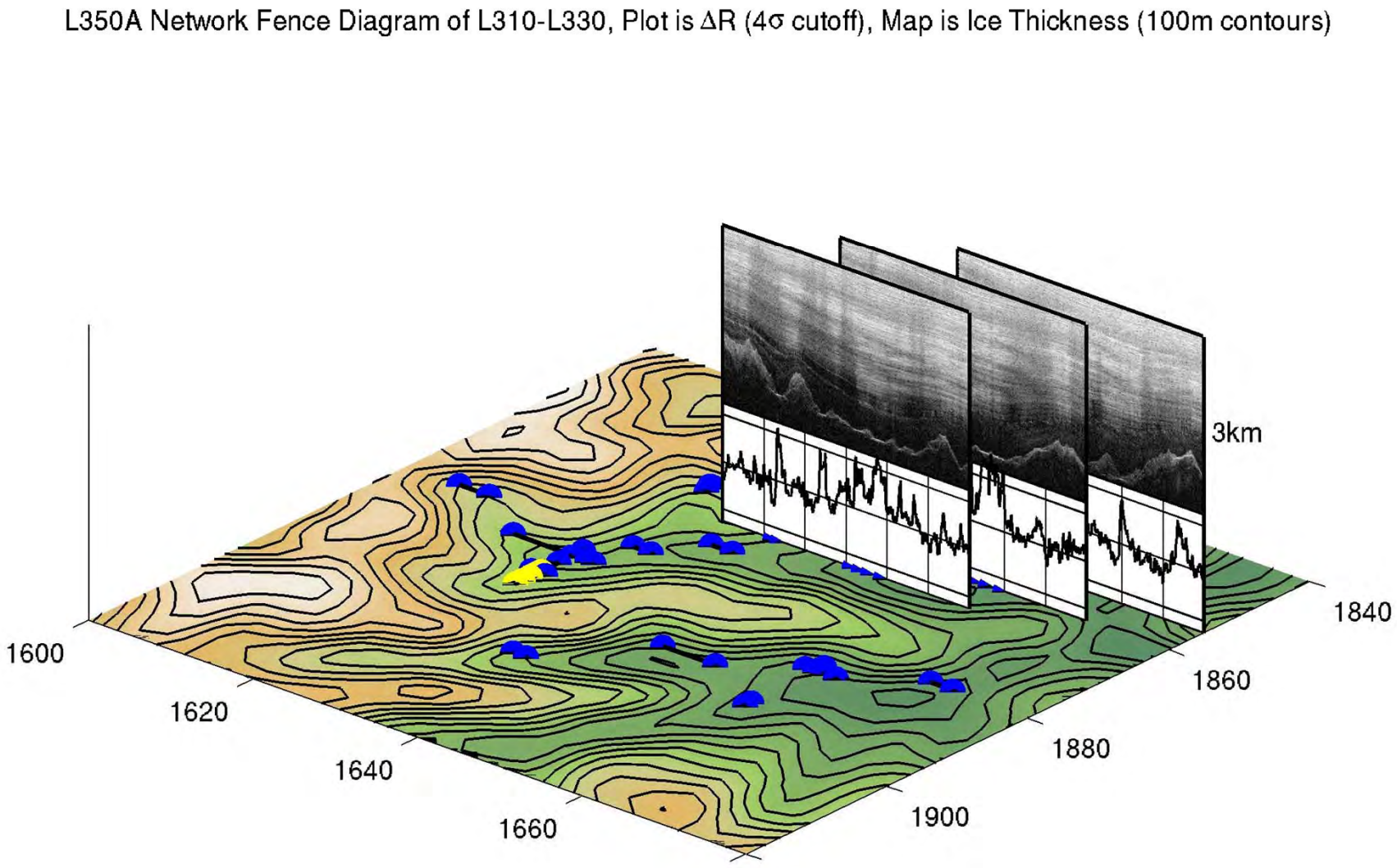
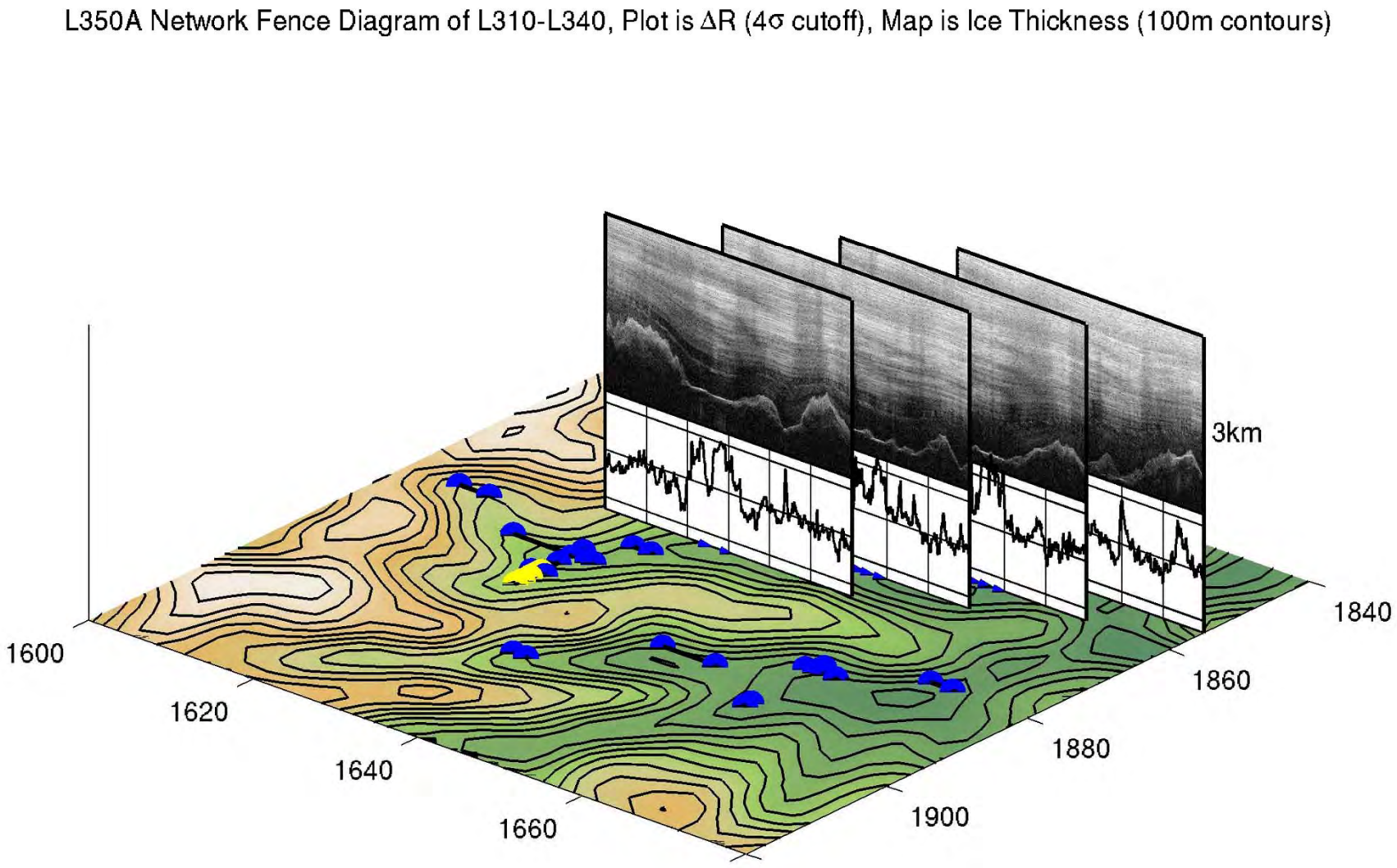


Discussion: Water Network Detail



Discussion: Water Network Detail



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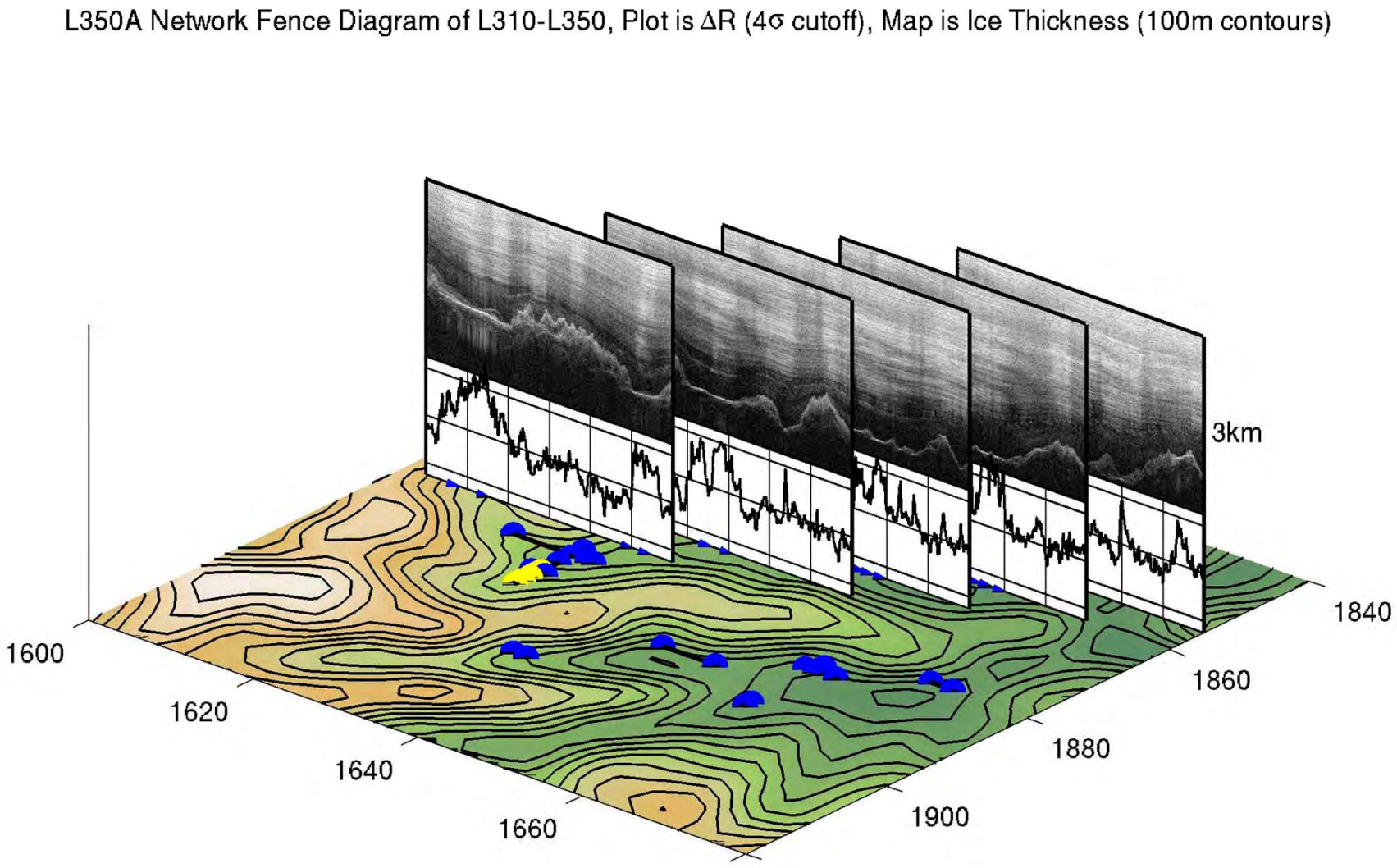
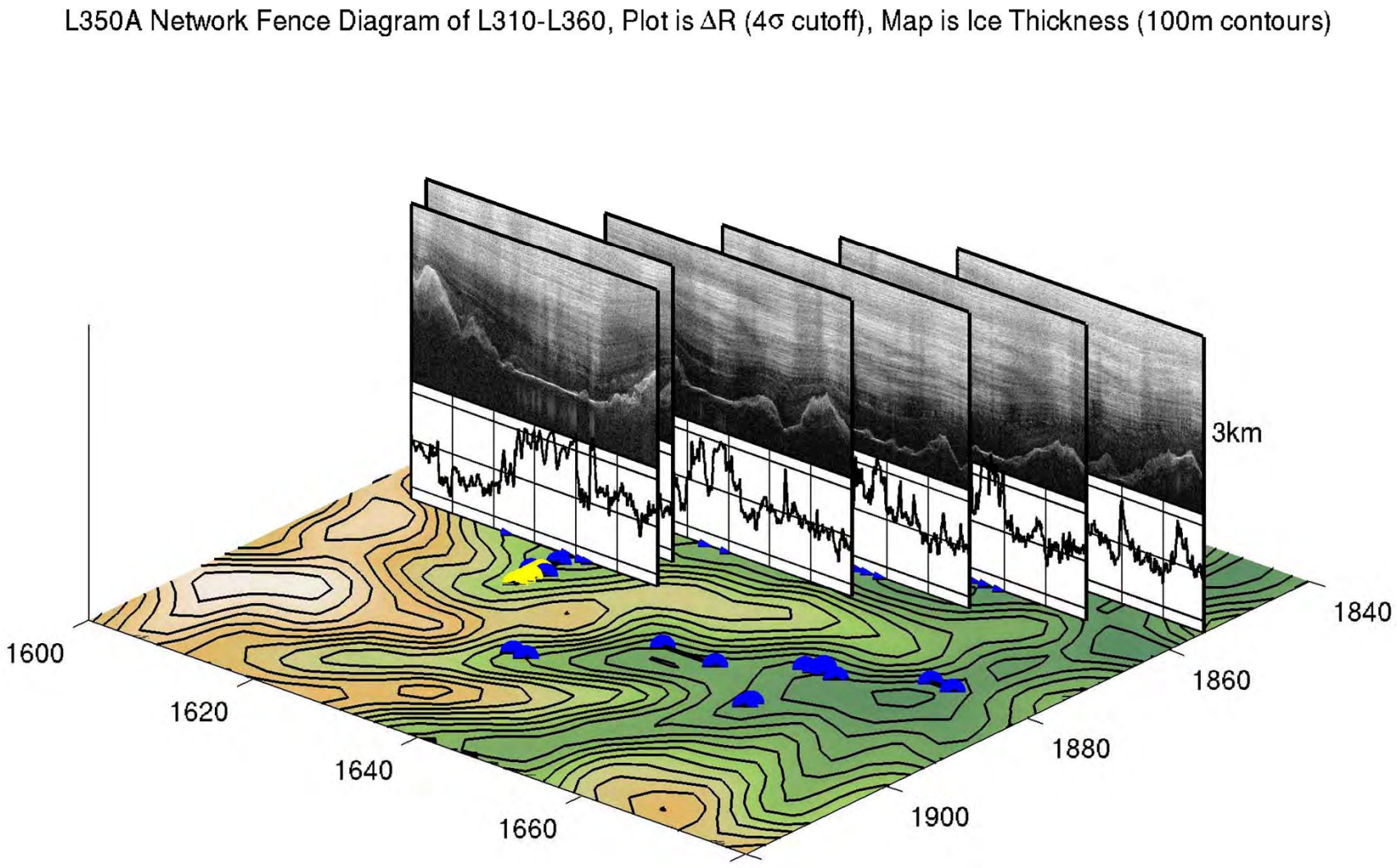
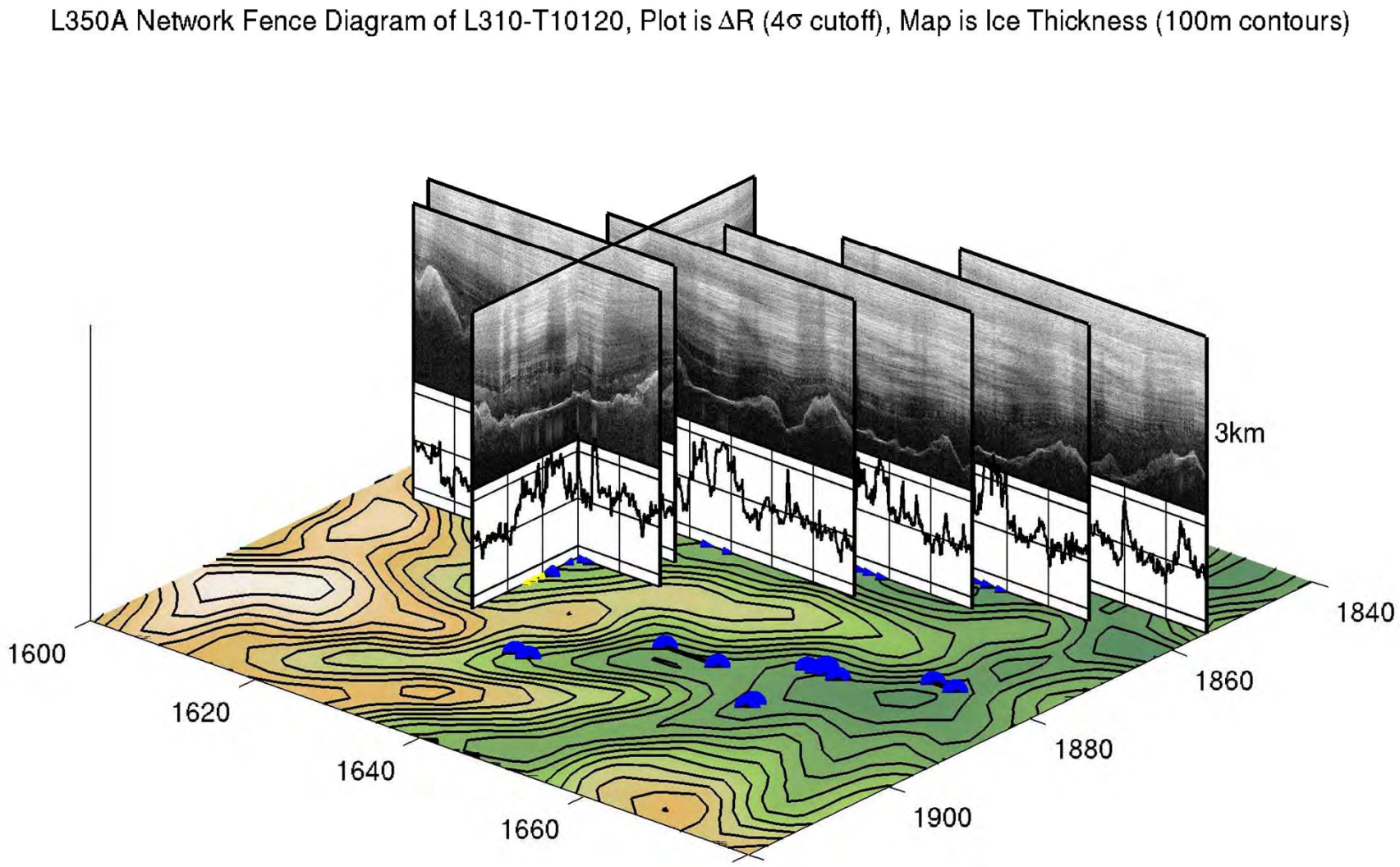


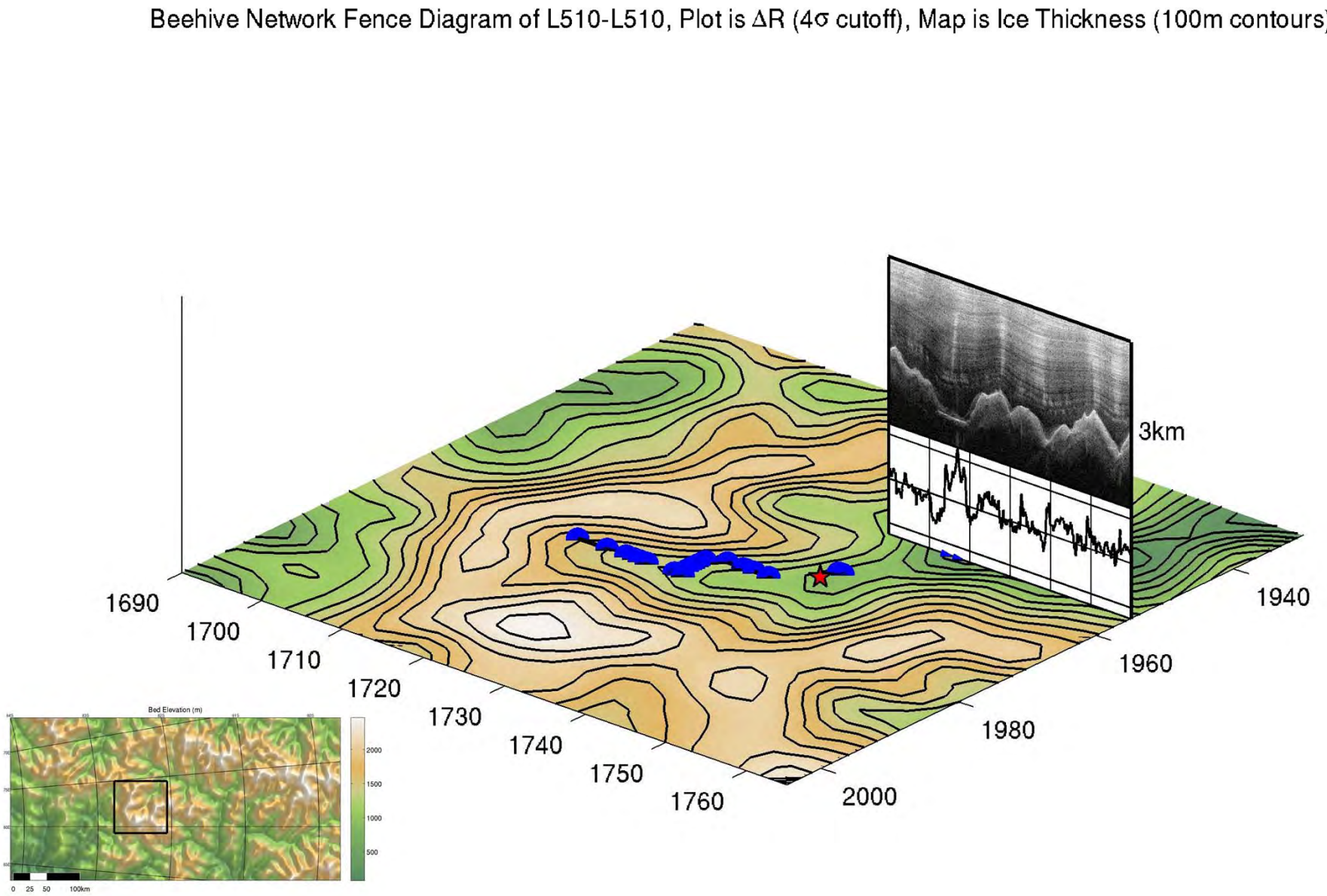
Discussion: Water Network Detail



Discussion: Water Network Detail



Discussion: Water Network Detail



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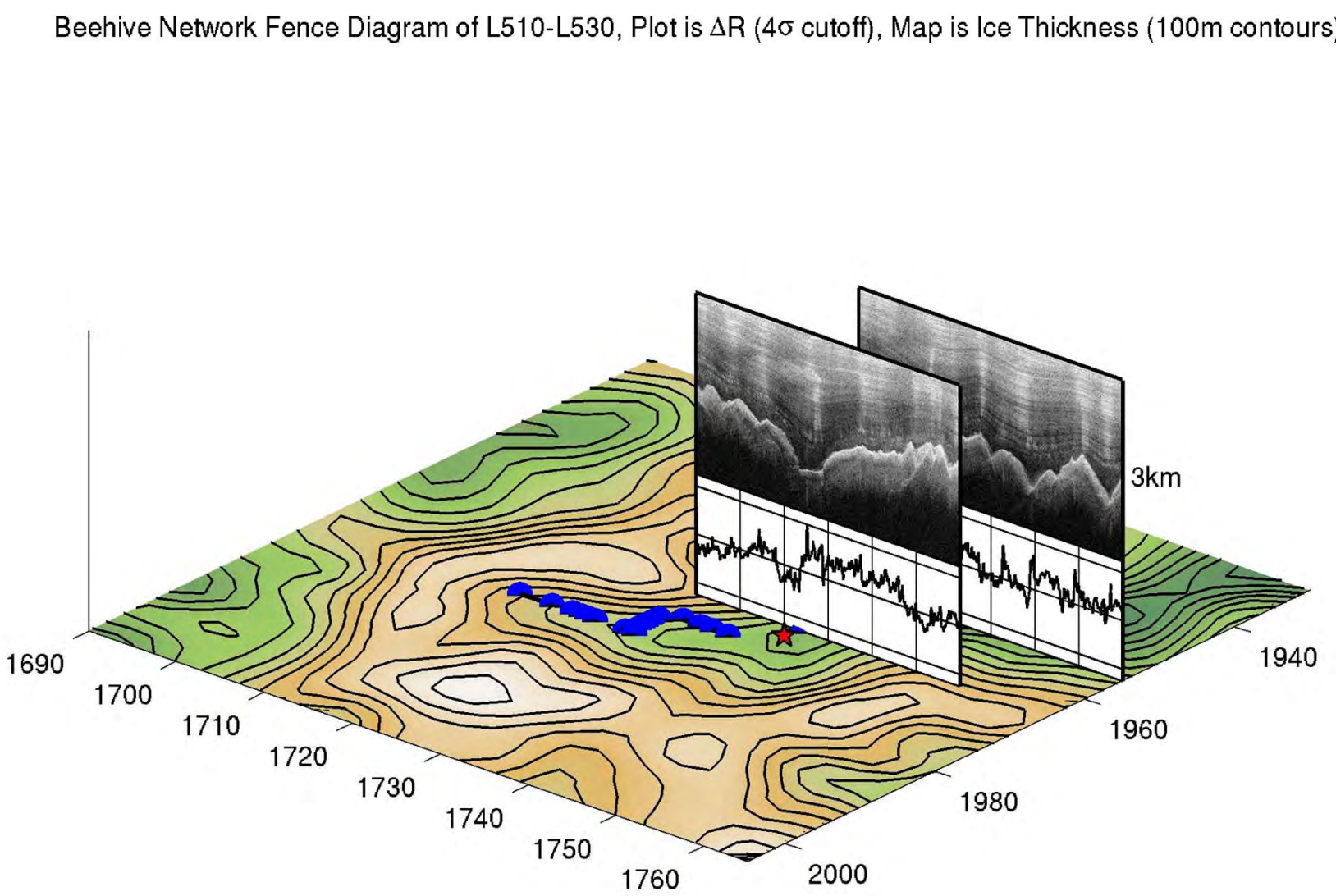

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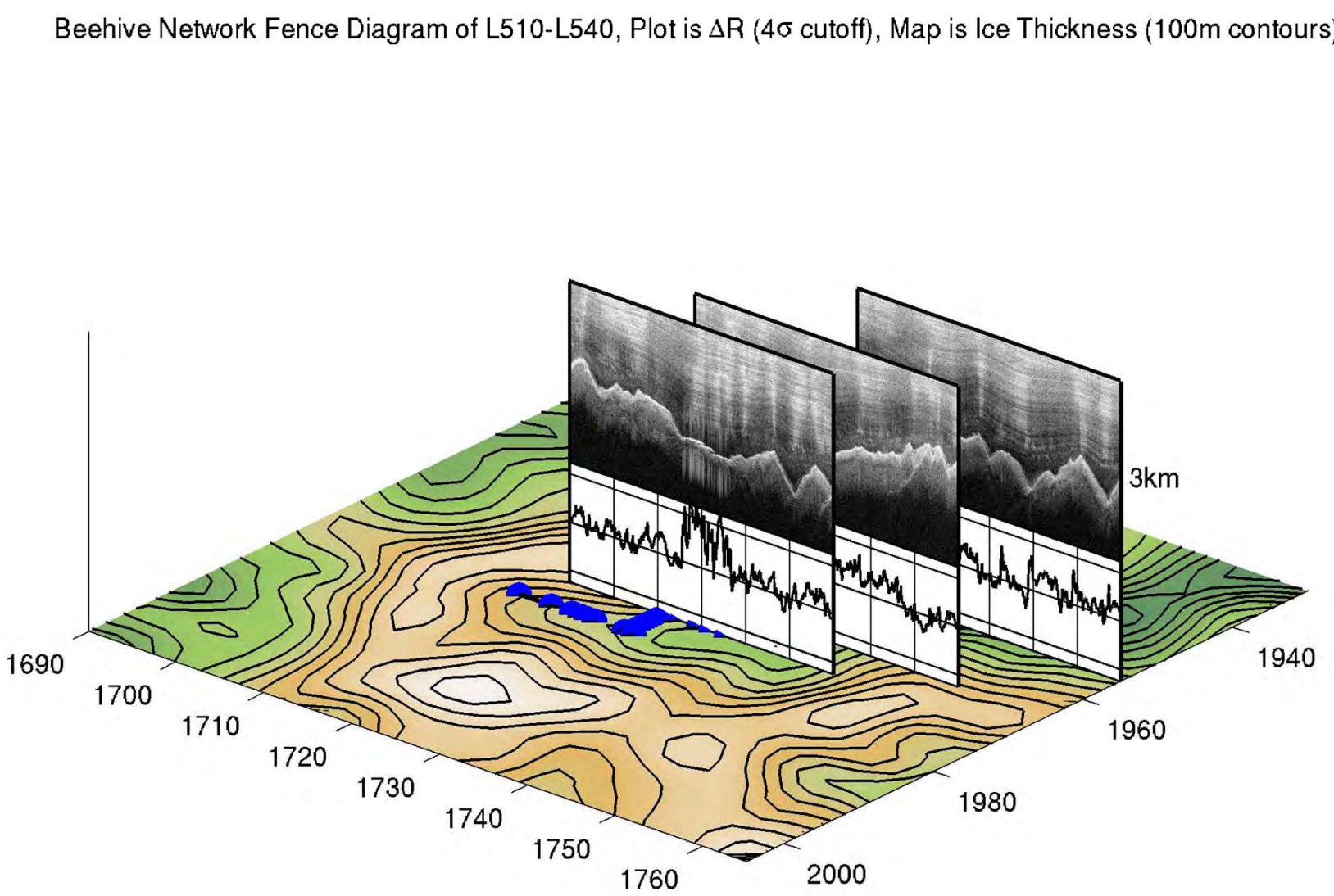

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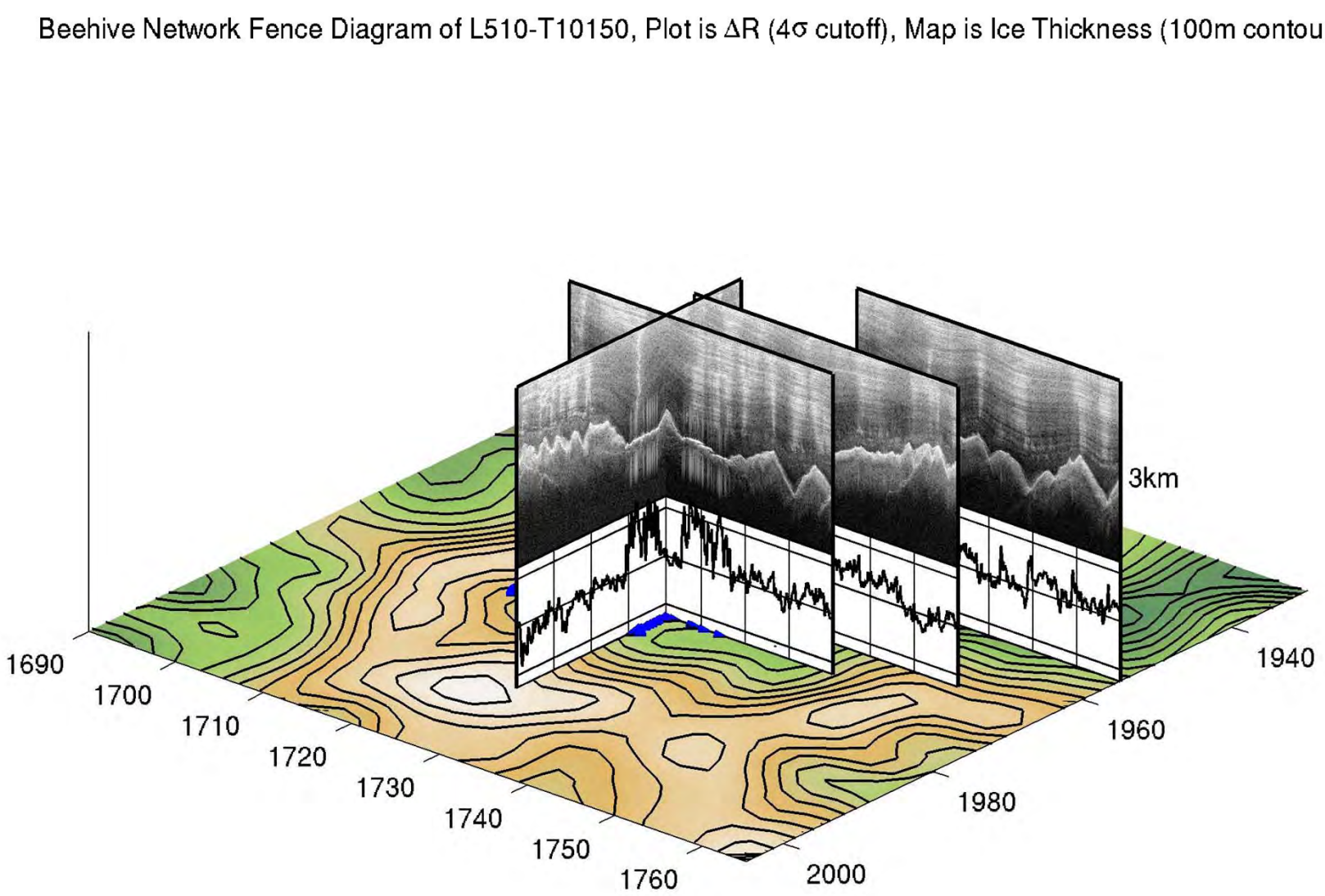
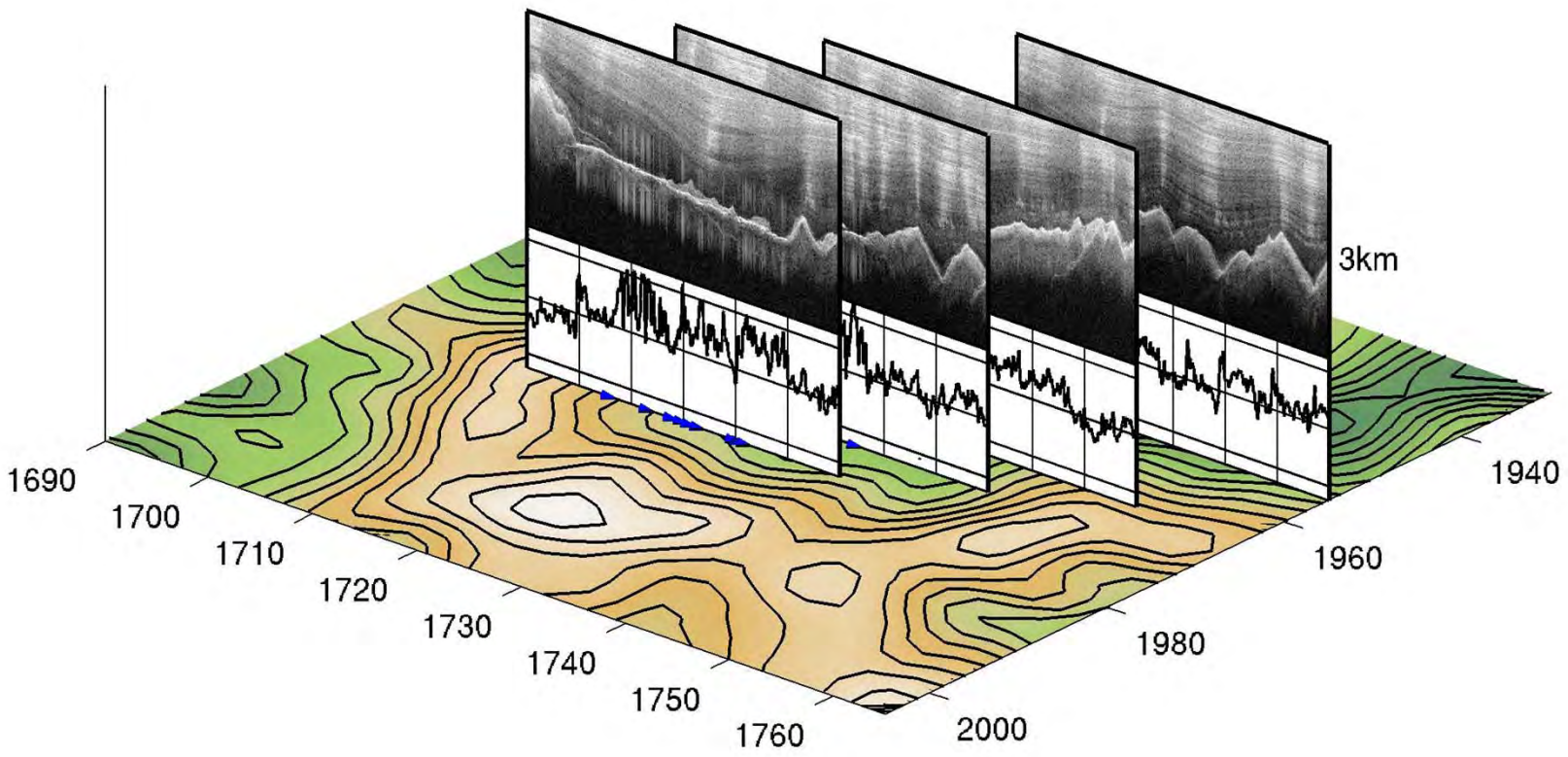


Discussion: Water Network Detail

Beehive Network Fence Diagram of L510-L550, Plot is ΔR (4σ cutoff), Map is Ice Thickness (100m contours)



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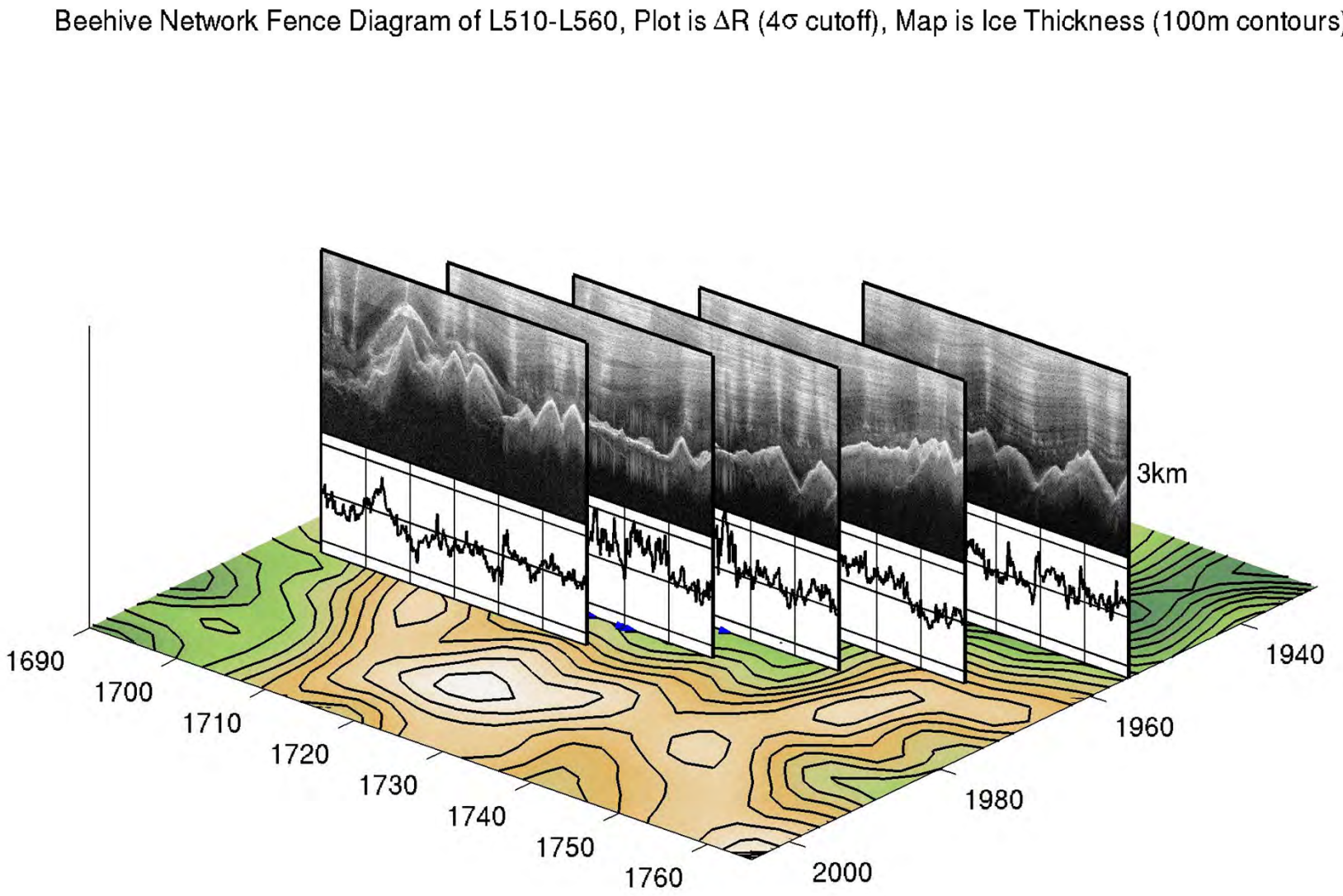

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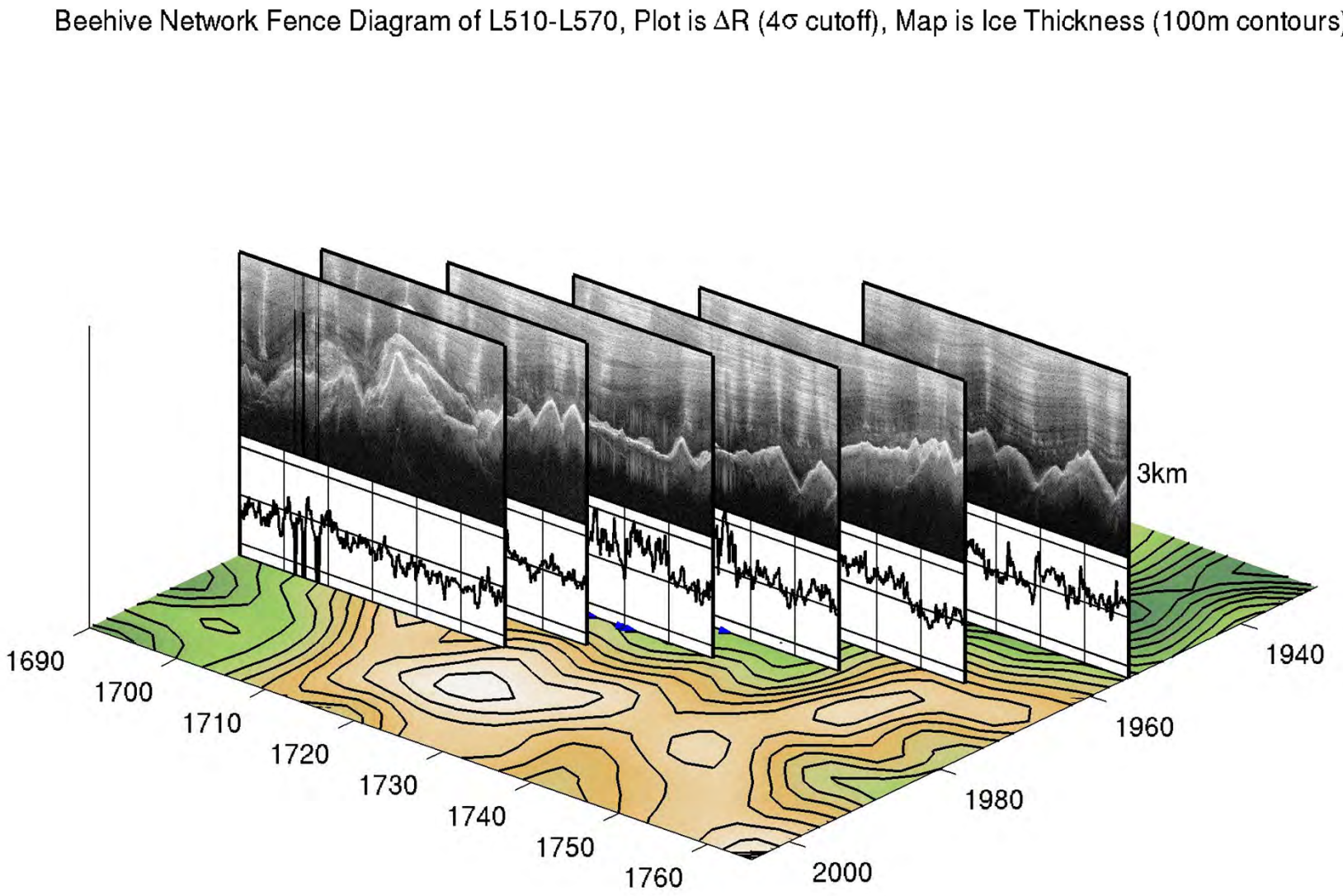
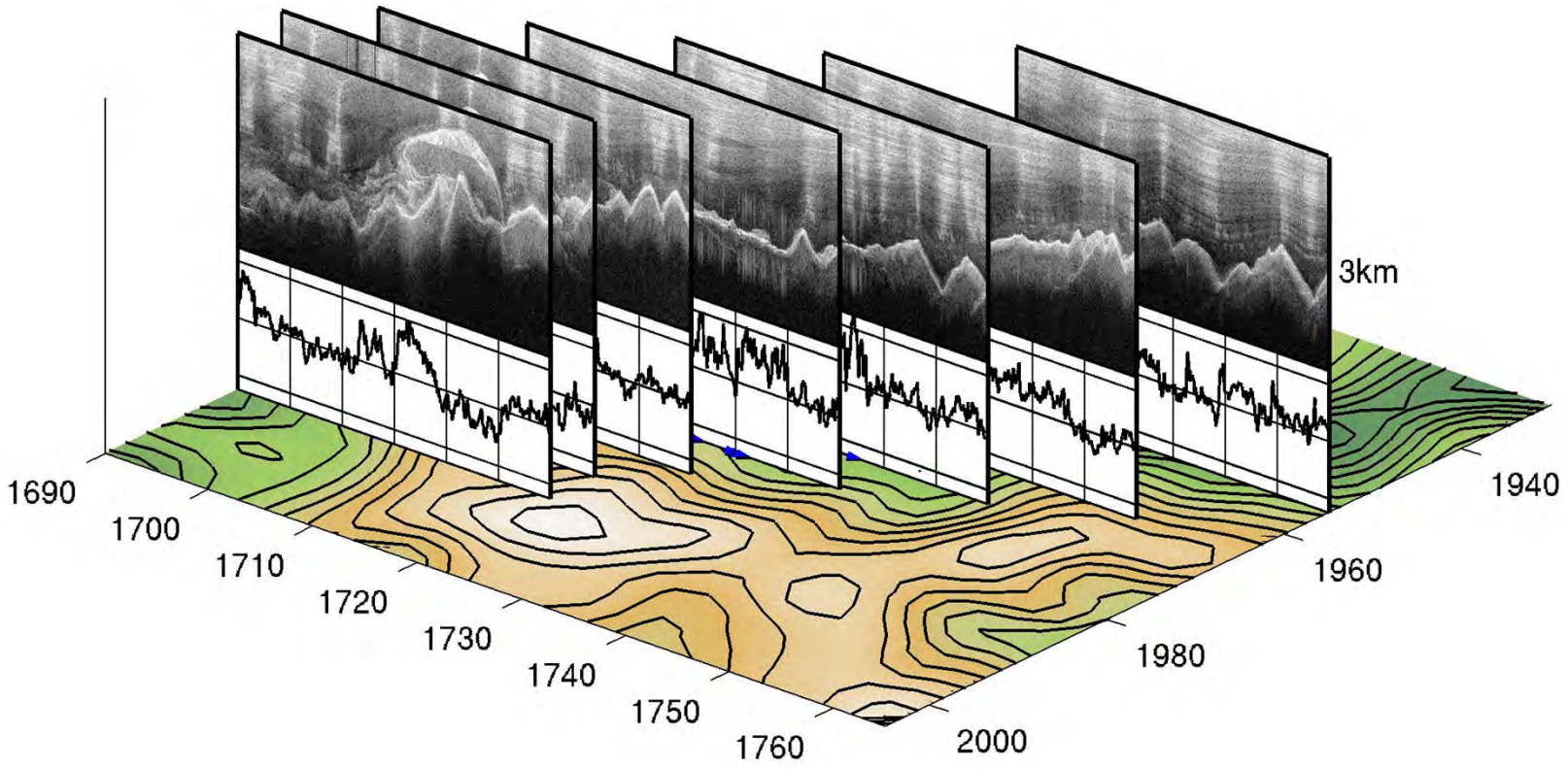
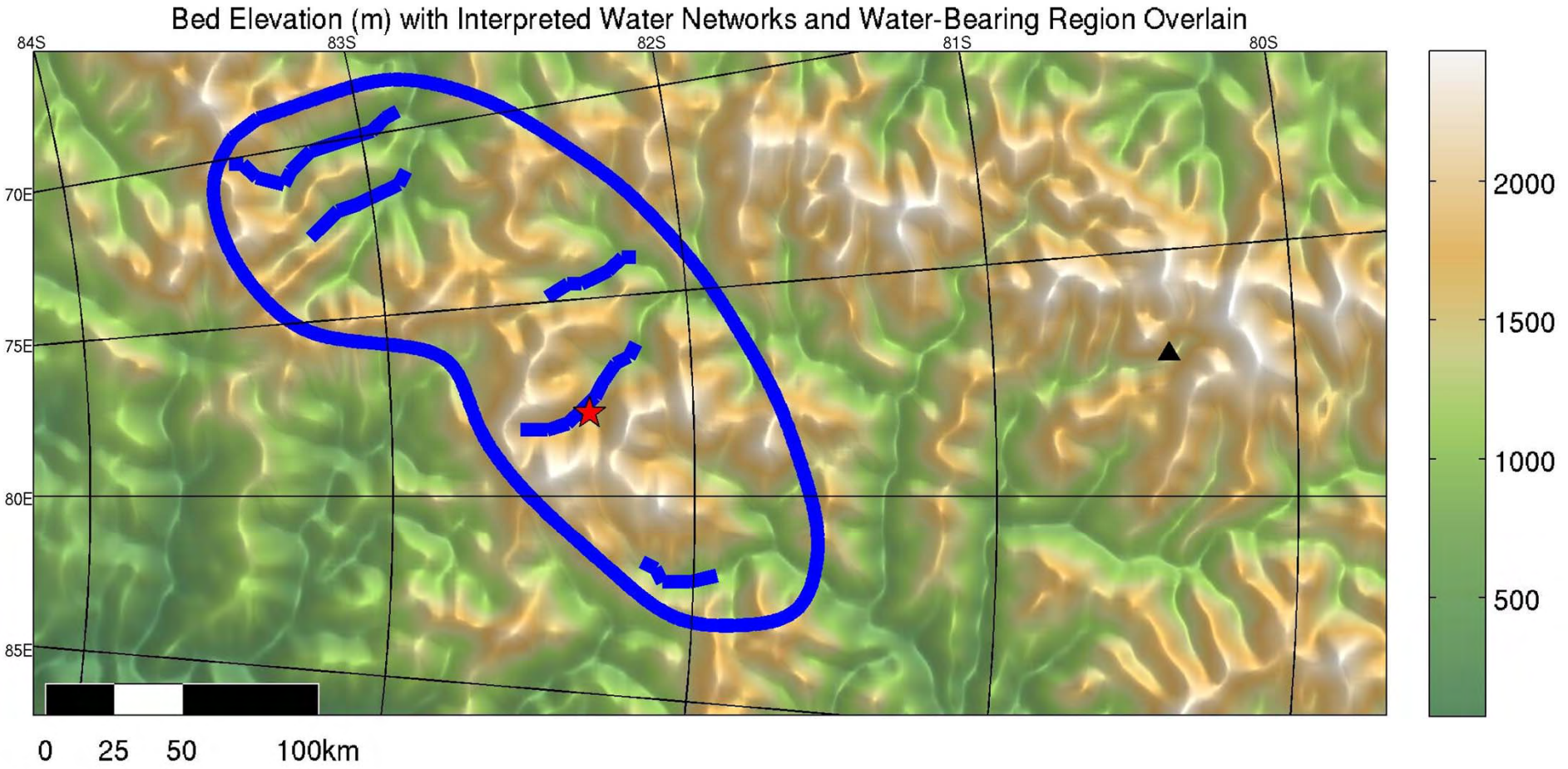


Discussion: Water Network Detail

Beehive Network Fence Diagram of L510-L580, Plot is ΔR (4σ cutoff), Map is Ice Thickness (100m contours)



Conclusion


Bed Elevation (m) with Interpreted Water Networks and Water-Bearing Region Overlain
84S
83S
82S
81S
80S
70E
75E
80E
85E
0
25
50
100km
2000
1500
1000
500

Acknowledgements

Hakim Abdi, Adrienne Block, Hugh Corr, Indrani Das, Fausto Ferraccioli, Carol Finn, Tom Jordan, Kathryn Rose, Perry Spector, Kirsty Tinto

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