PTWS-WG1
Workshop
Vanuatu, 15 May 2024

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National SCIENCE Challenges
RESILIENCE TO NATURE'S CHALLENGES
Kia manawaroa – Ngā Ākina o Te Ao Tūroa

Te Whakaahuatanga Tere o ngā
R-CET
Rū Whenua me ngā Parawhenua

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Mmax and MCE from Seismicity and Scaling

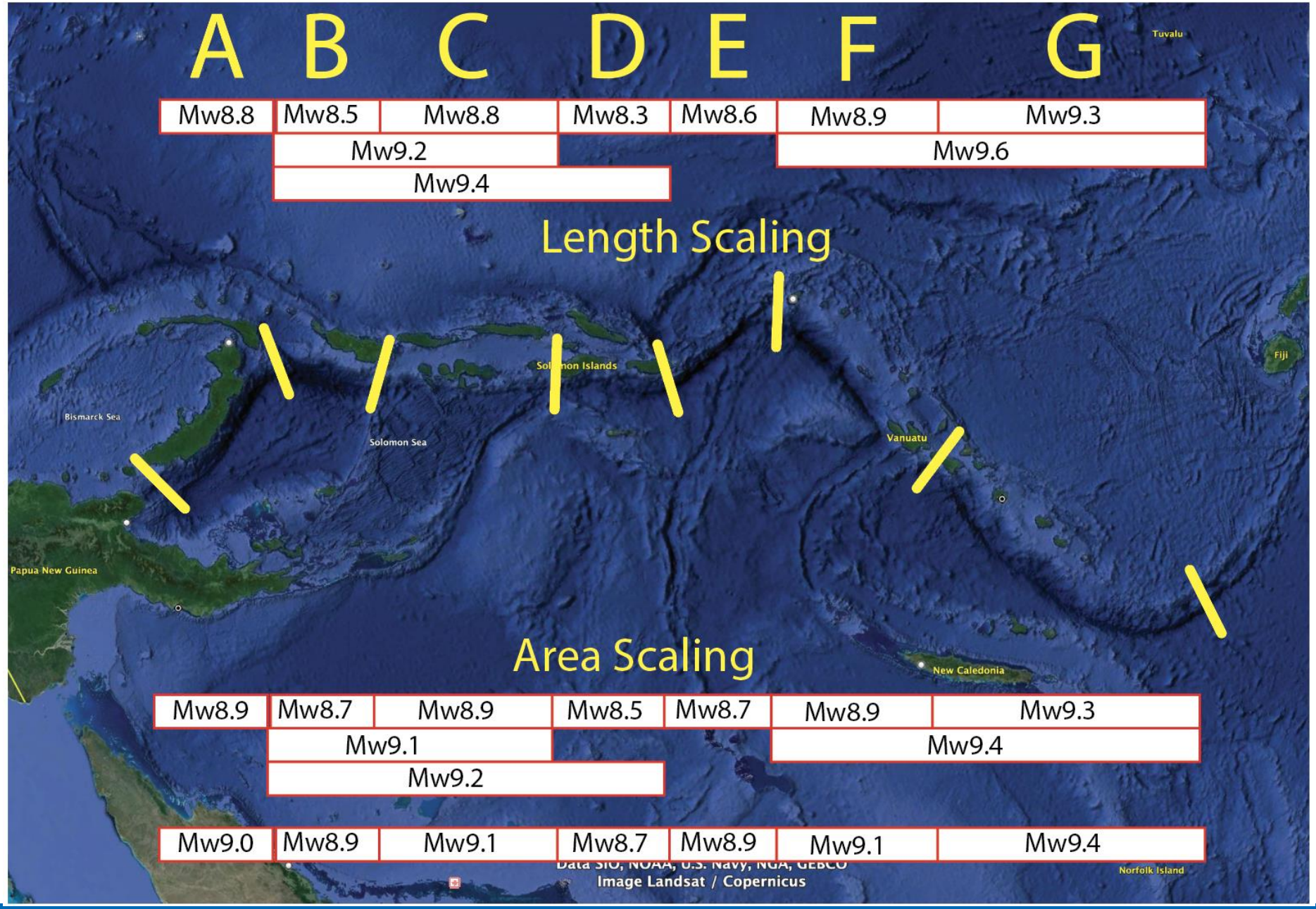
Bill Fry, New Zealand
Chair WG2

Approaches considered

Geometry and scaling – simplest and probably most robust

Strain-budget constrained catalogue fitting – intermediate confidence requiring well-sampled catalogue

Physics-based earthquake cycle modeling – low confidence and ongoing work -- but, high-sensitivity to effects of geometry → solid upper bound on MMax



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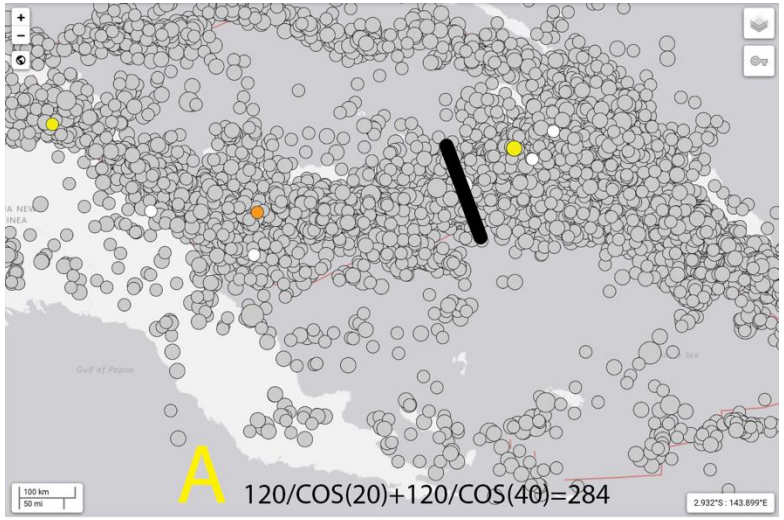
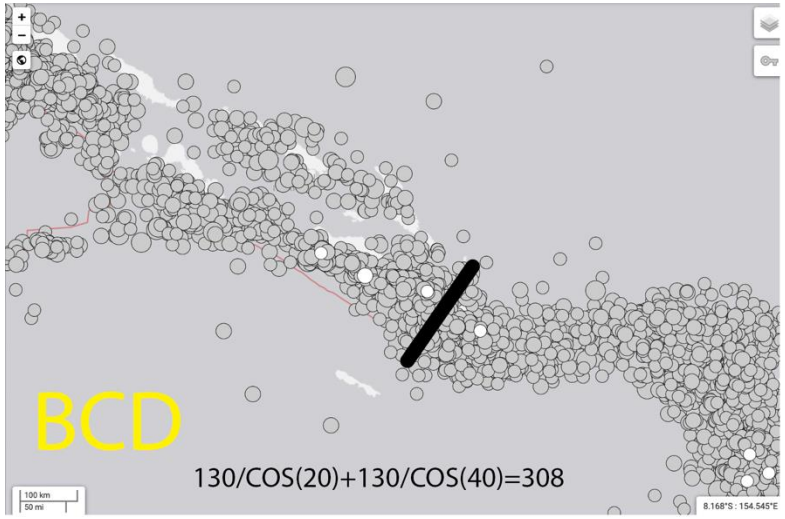
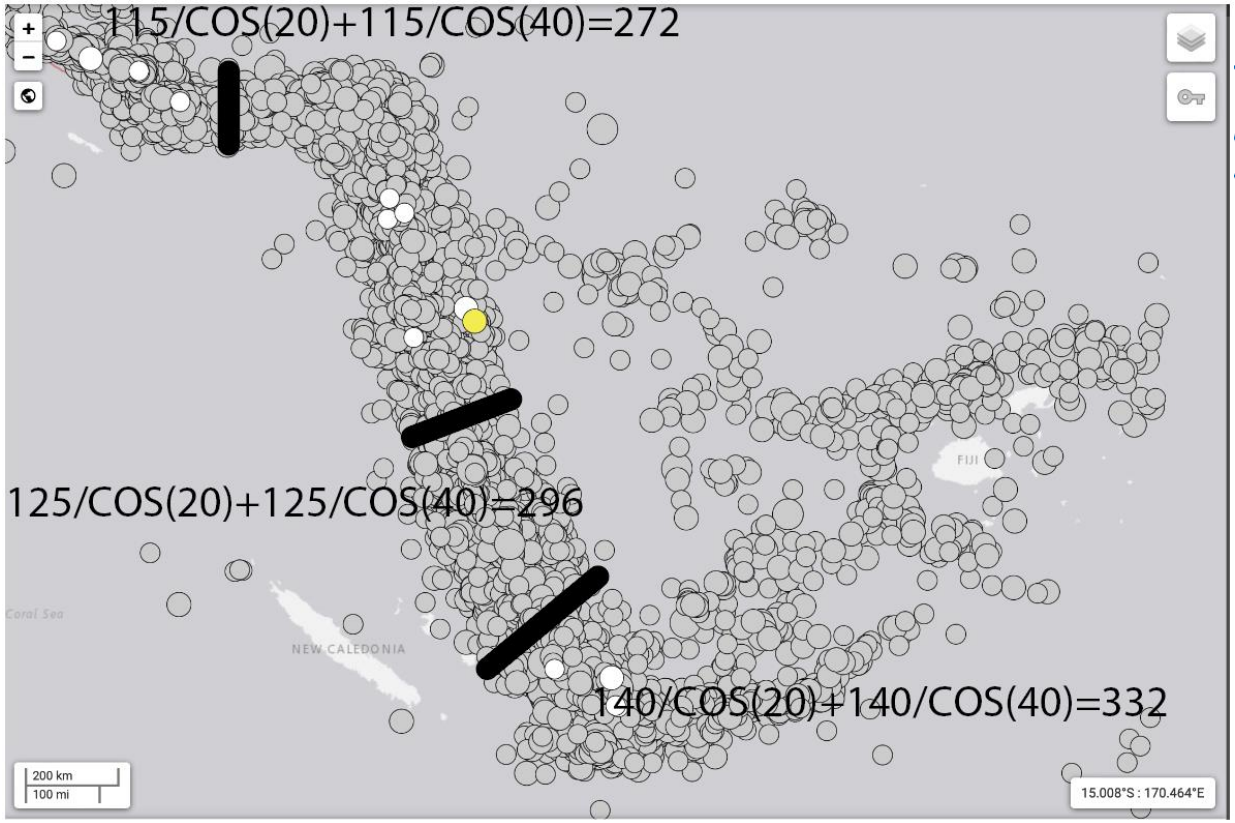
Segmentation and Scaling

For iteration!

Seismogenic width







9.06390326	A
8.90389849	B
9.08652284	C
8.73614551	D
8.88177577	E
9.12600563	F
9.40236891	G

M4-5 for last 50 years.

Average Dips approximate propDB US

Strasser Mmax(A)

Discussion points

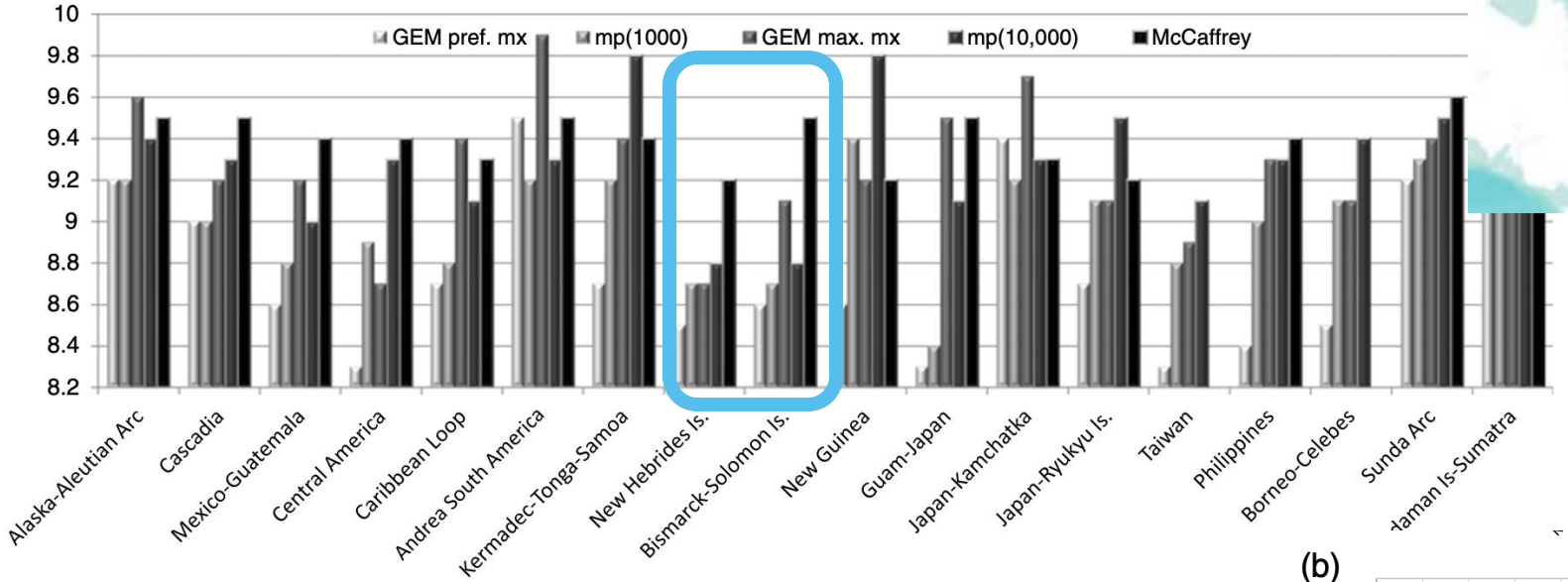
Is segmentation okay?

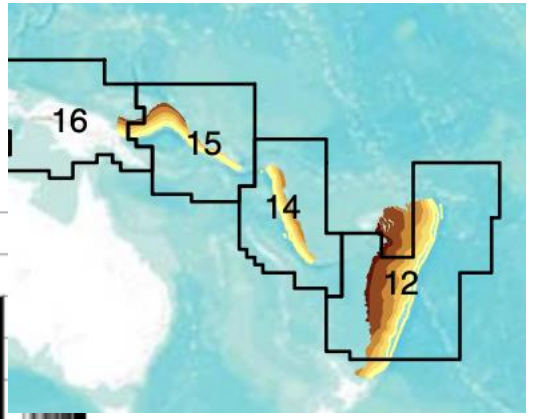
Are multi-segment interpretations okay?

What scaling laws are preferred?

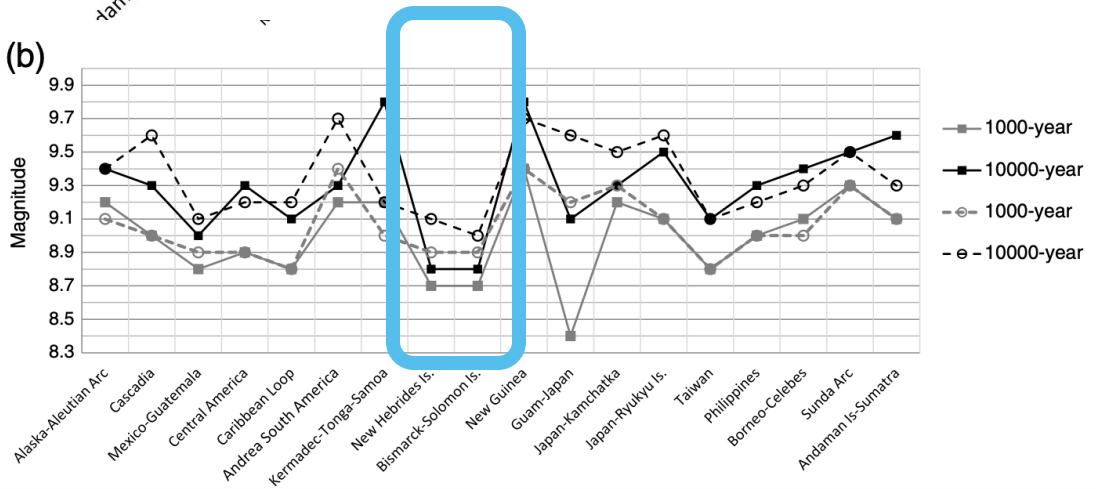
If necessary, how can we improve fault width estimations?

Stochastic source analysis





Fitting GR with recorded seismicity and geodetic plate rates

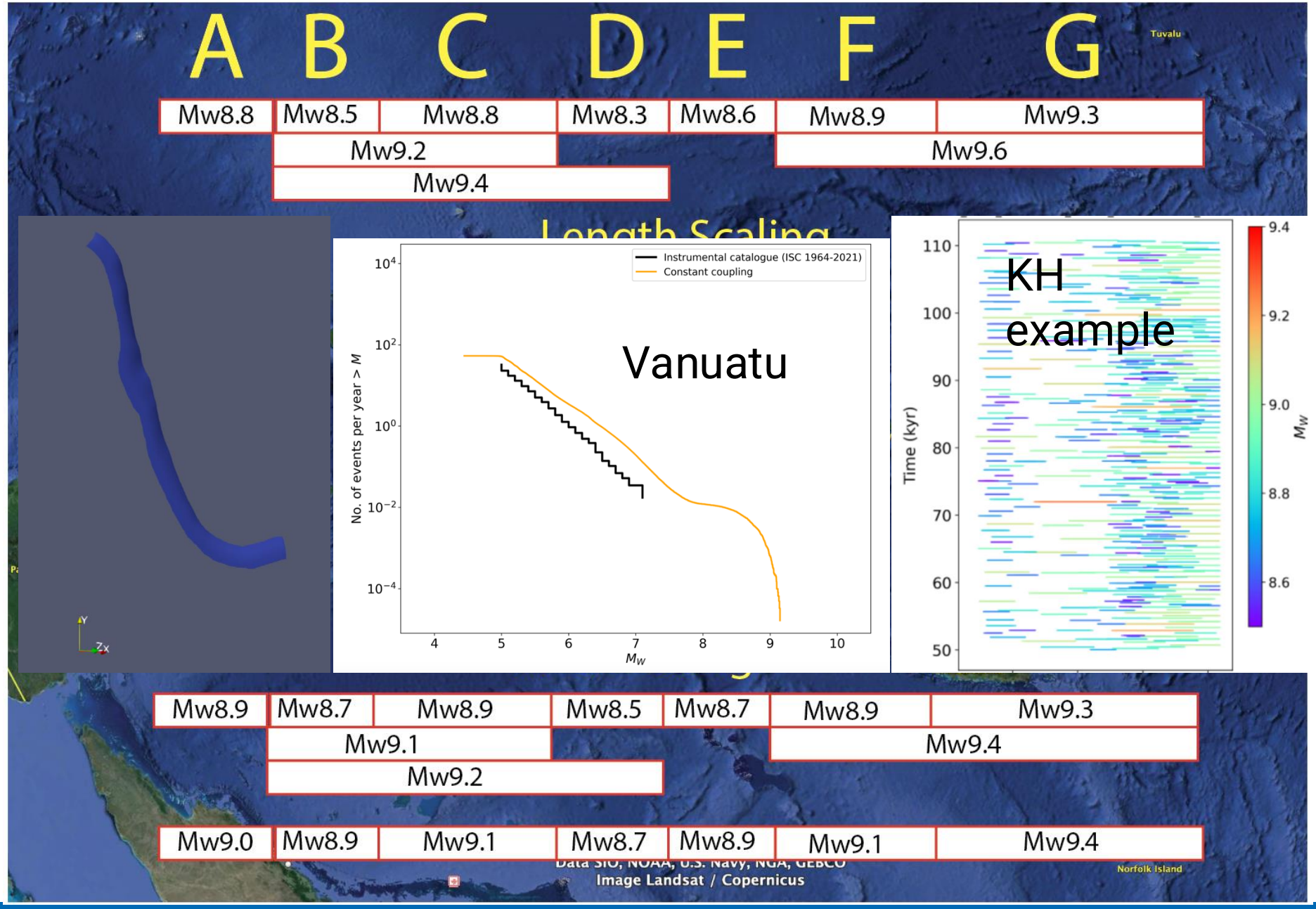


Rong et al., 2014, includes Berryman et al., 2013; and McCaffrey 2008

Discussion points

Comparison of statistical approaches.

MCE 8.6 Vanuatu and 9.1 New Britain/Bismark



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Preliminary RSQSim models

- We use constant coupling of 0.49 -> happy to improve with other estimates.
- These results will be updated with increased complexity of at least heterogeneous stresses.
- They can reasonably be taken as an estimate of Mmax~M9.2 with the approach.
- Adding complexities tends to create more GR MFD and lowers the rates of largest events.

Discussion points

Still WIP.

What is a better coupling coefficient than 0.49 for Vanuatu? Can we vary this spatially?

We are currently only using one Euler pole for Vanuatu section – meaning probably overestimating Mmax slightly because of rake variation along southernmost portion.

Improvements will likely not increase Mmax → this method suggests M9.2 for the Vanuatu portion driven primarily by fault geometry

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Thank you very much for your kind attention.