Photo: Global News

SURGE MODEL INTERCOMPARISON
PRELIMINARY RESULTS

Natacha B. Bernier, O. Huizy, P. Wang, N. Mori, M. Hemer and SurgeMIP collaborators

WHAT IS SURGEMIP?

ELSEVIER

Weather and Climate Extremes
Volume 45, September 2024, 100689

Storm surges and extreme sea levels: Review, establishment of model intercomparison and coordination of surge climate projection efforts (SurgeMIP).

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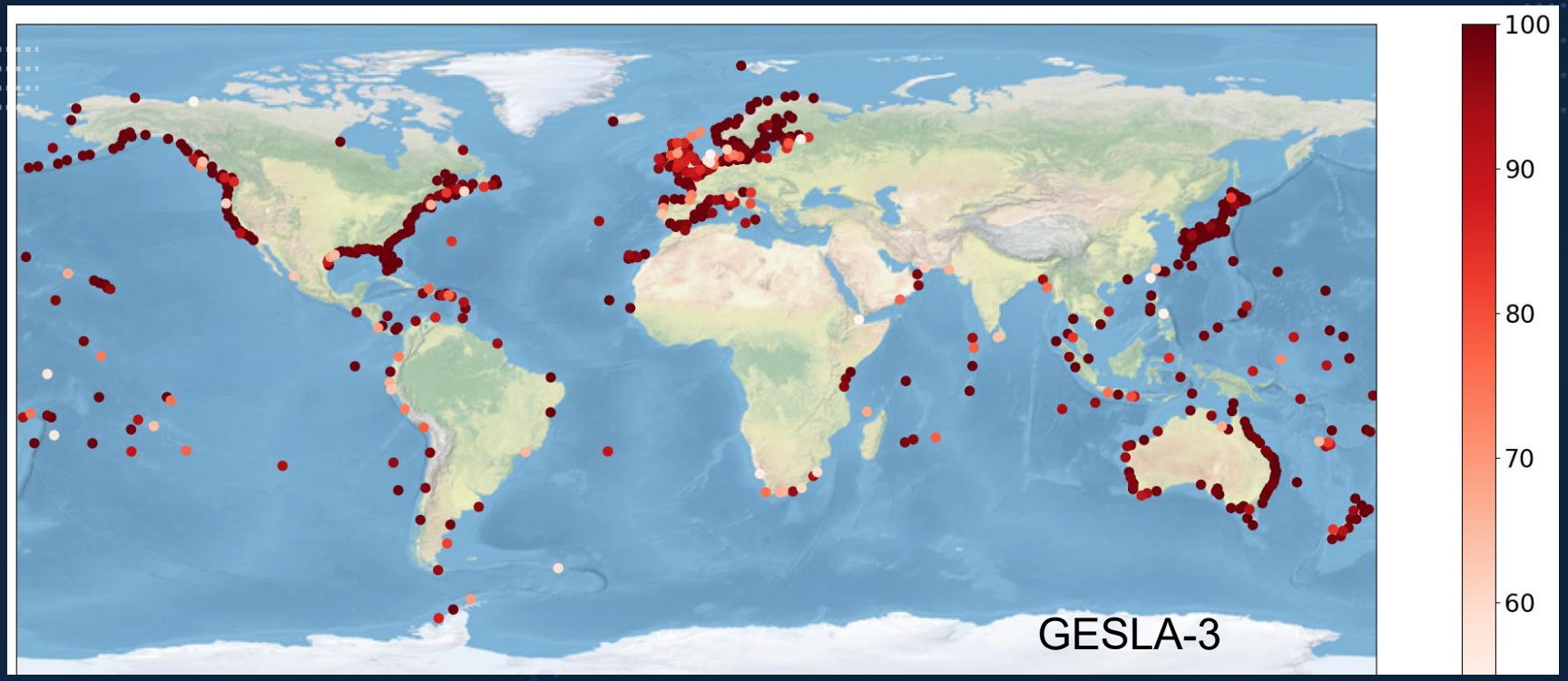
a)Document contemporary storm surge modelling/prediction efforts (initially at global scale),
- b)Compare performance of contemporary storm surge modelling systems under standardized forcing conditions (as possible), data handling, and evaluation metrics,
- c)Compare existing historical storm surge hindcasts, recognizing inhomogeneity of forcing parameters,
- d)Build a community-based ensemble of storm surge systems, for both operational prediction, and climate projection scale applications,
- e)Produce and assemble projection of a community-based ensemble of storm surge heights at global scale for IPCC AR7.

MOTIVATION

- **Public and private sectors require more accurate forecasts with longer lead times worldwide (e.g., for activation of emergency measures including evacuations).**
- **CIFI bring much needed information to those in need, but they are costly, and reaching all in need is too slow.**
- **Need to reach more (all) faster? – Global sea level systems can now be shared via WMO.**
- **Can we contribute to the UN Early Warning For All Initiative through the provision of numerical guidance that is skillful in all ocean basins?**
- **Can we produce informative and actionable data at the community level worldwide?**



INTERCOMPARISON:

2013-2018

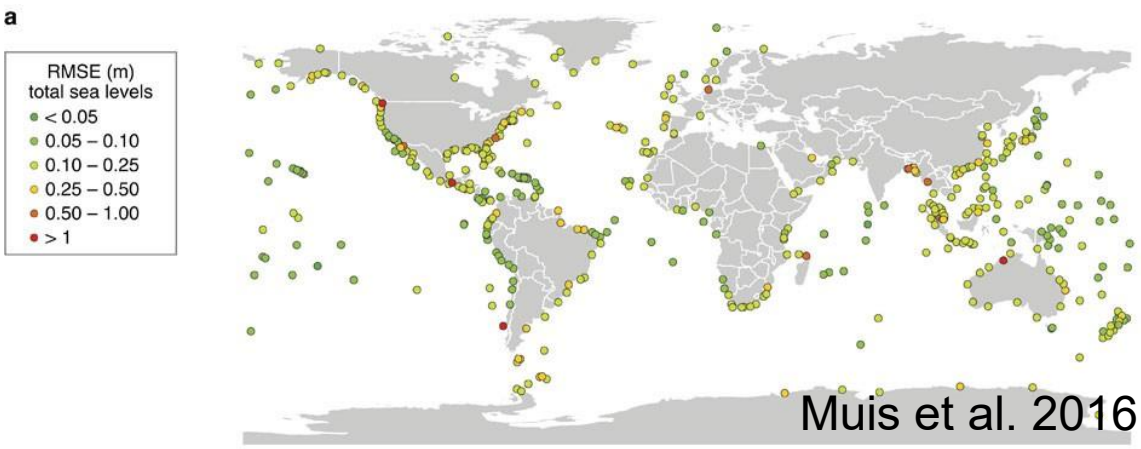
ERA 5 FORCING FIELDS

- Data exchanged at 500 gauges distributed worldwide – careful selection applied to include areas that could most benefit from a global ‘CIFI’.
- Hindcasts and observations run through the same piece of code to minimize external differences.
- Mechanics in place, more results available online: https://hpfx.collab.science.gc.ca/~olh001/verification/surgemip/

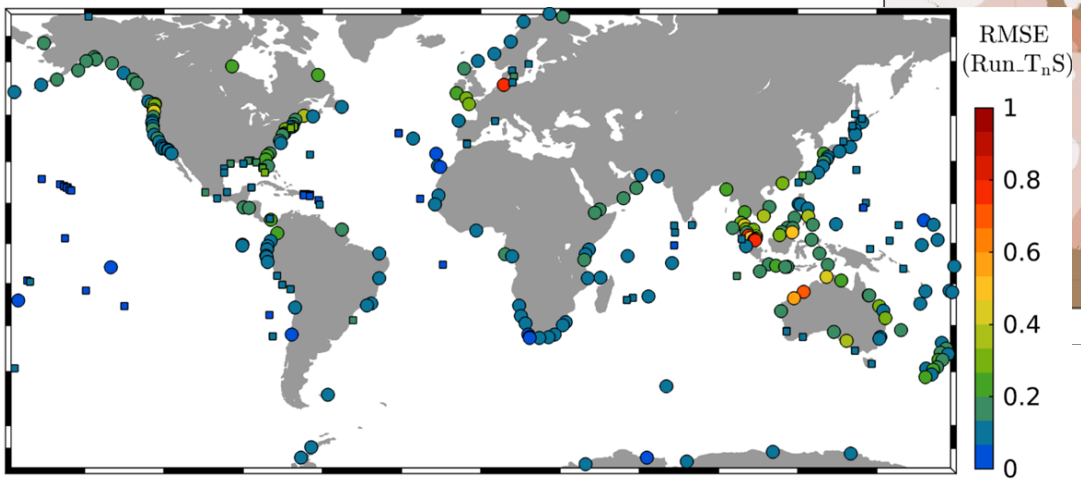
WHERE DID WE STAND WHEN WE STARTED?

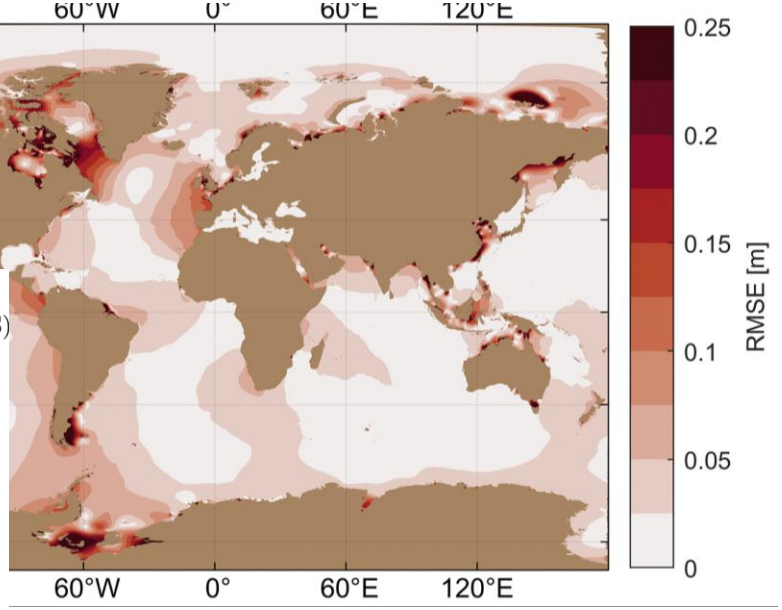
- A few global systems - verified over different time periods and tide gauges.

- Rich diversity of regional models that often do not overlap



Muis et al. 2016



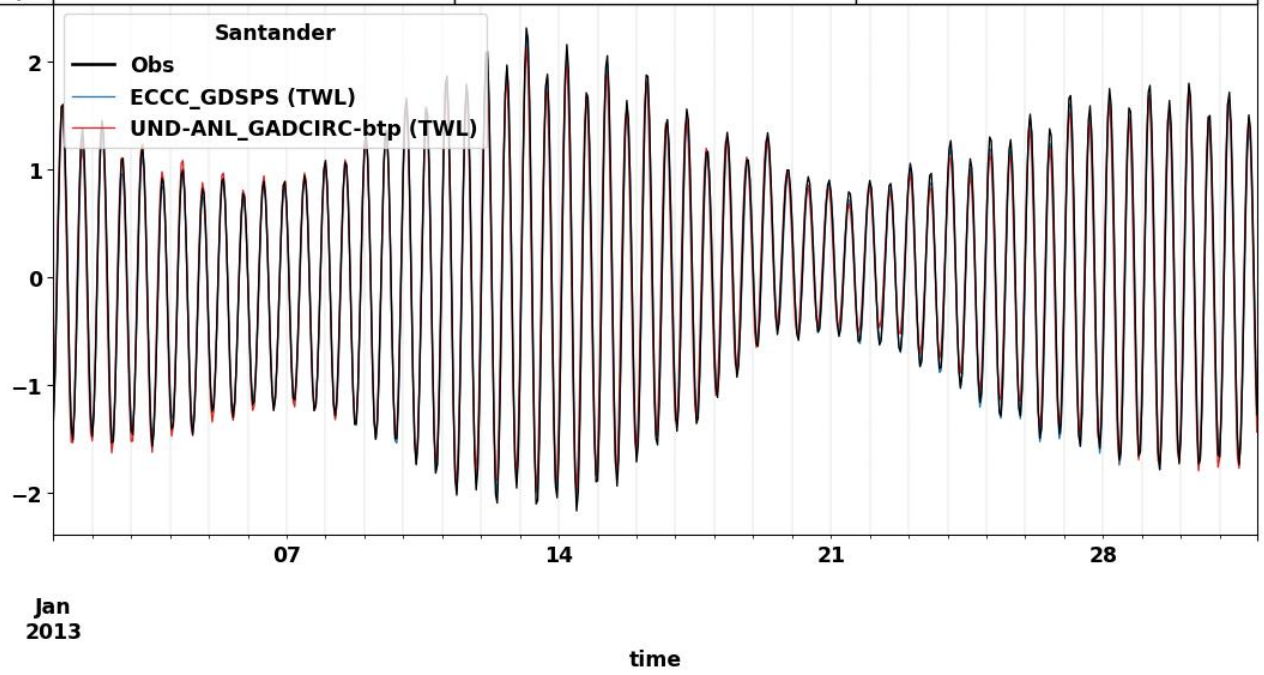


Pringle et al. 2021

Wang et al. 2021

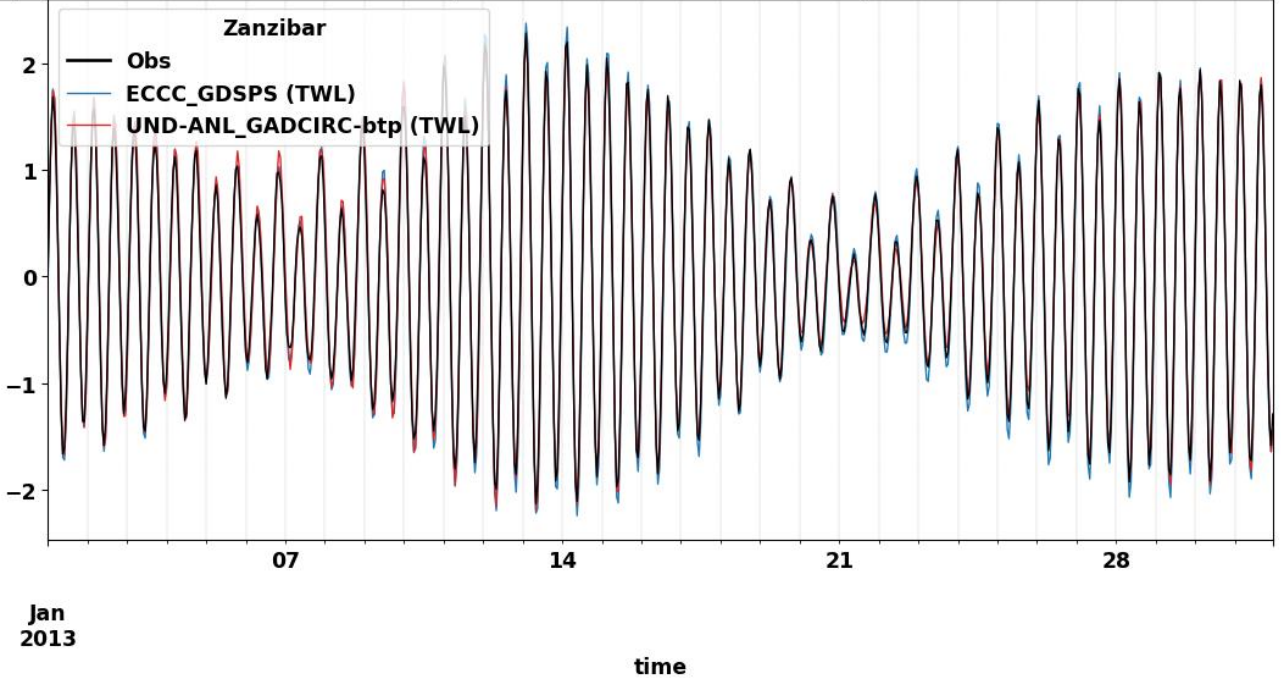
TIME SERIES OF TWL AT SANTANDER JAN. 2013

	γ^2	σ_ε	corr.
ECCC_GDSPS (TWL)	0.00	0.0546	1.00
UND-ANL_GADCIRC-btp (TWL)	0.02	0.1564	0.99

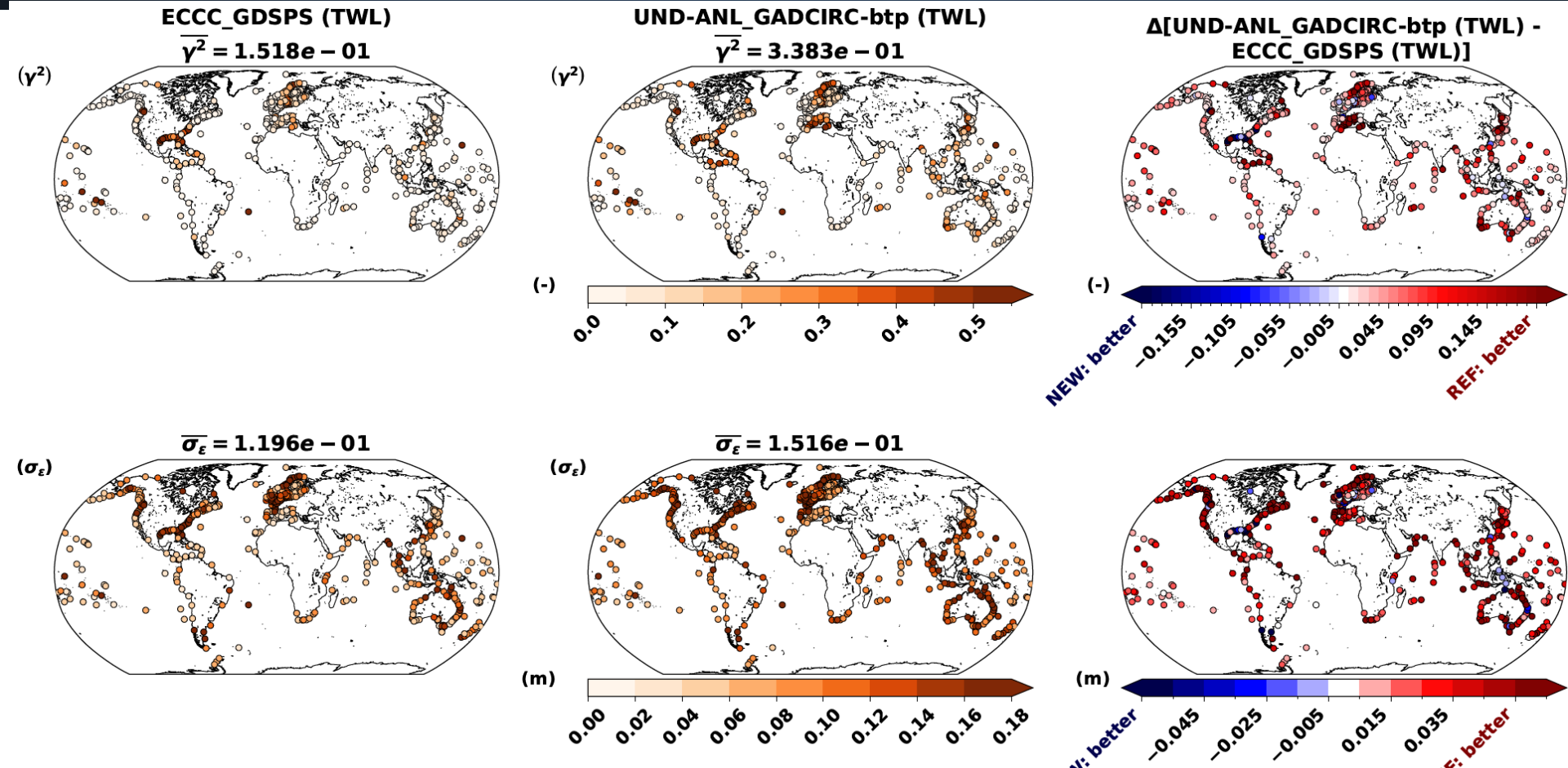


TIME SERIES OF TWL AT ZANZIBAR JAN. 2013

	γ^2	σ_ε	corr.
ECCC_GDSPS (TWL)	0.01	0.1014	1.00
UND-ANL_GADCIRC-btp (TWL)	0.01	0.0915	1.00

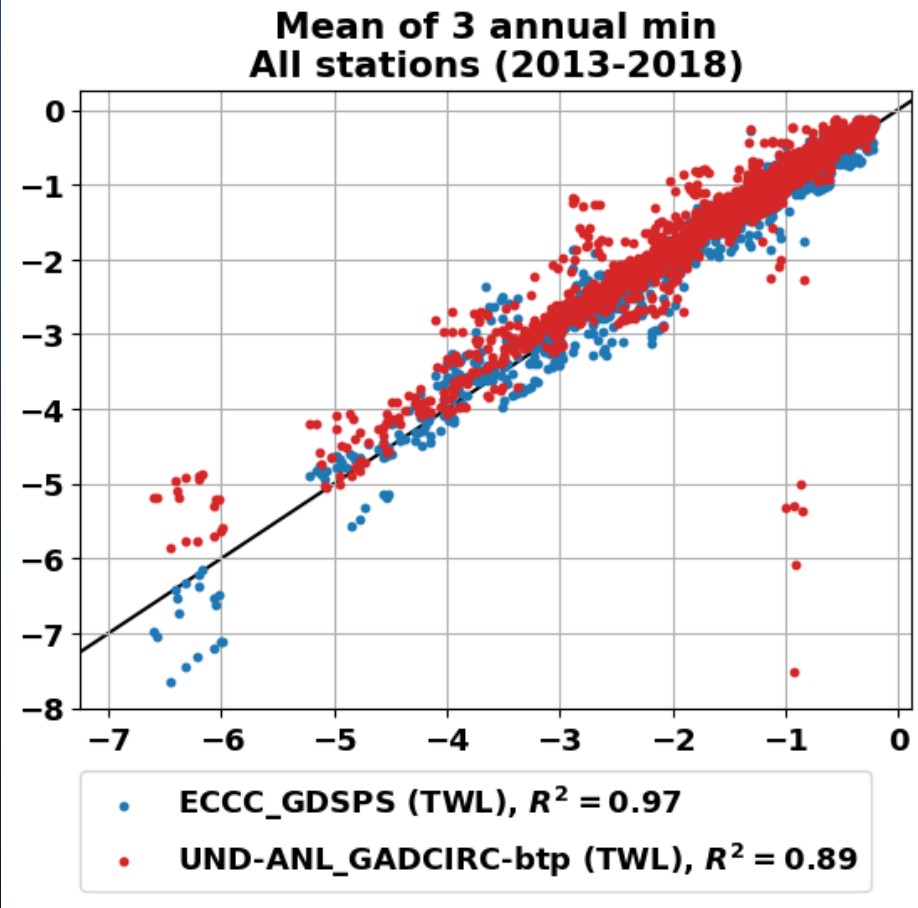


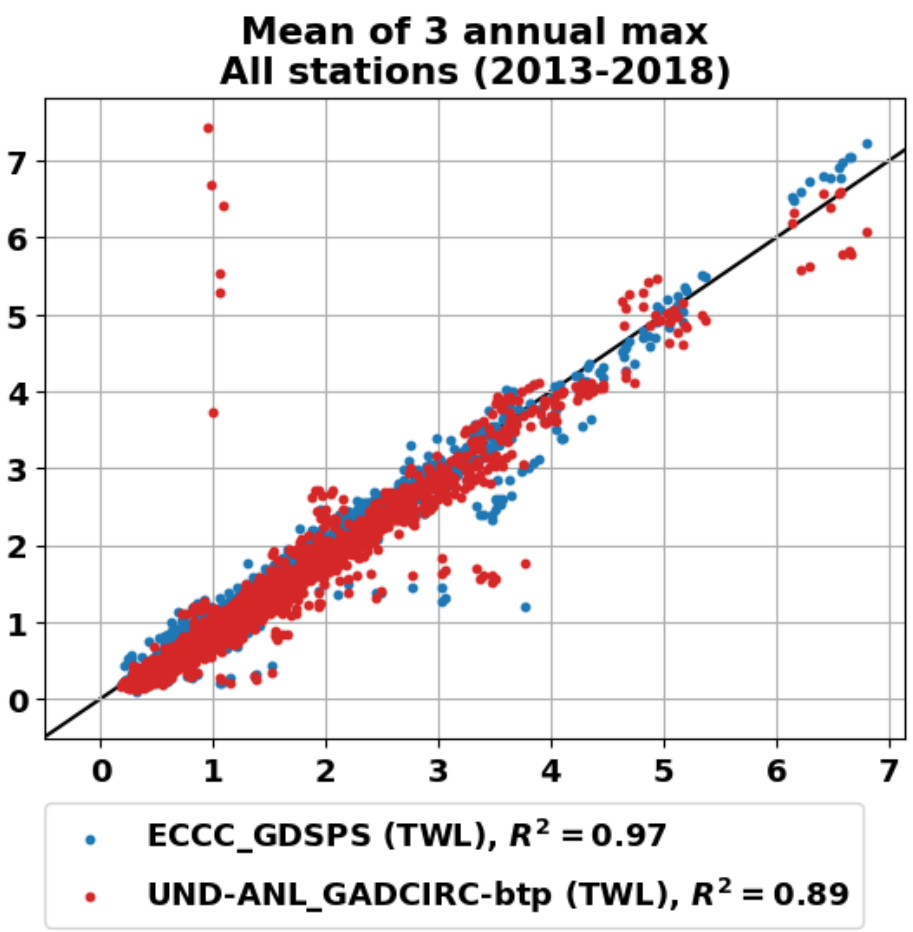
PRELIMINARY RESULTS FOR TWL 2013-2018



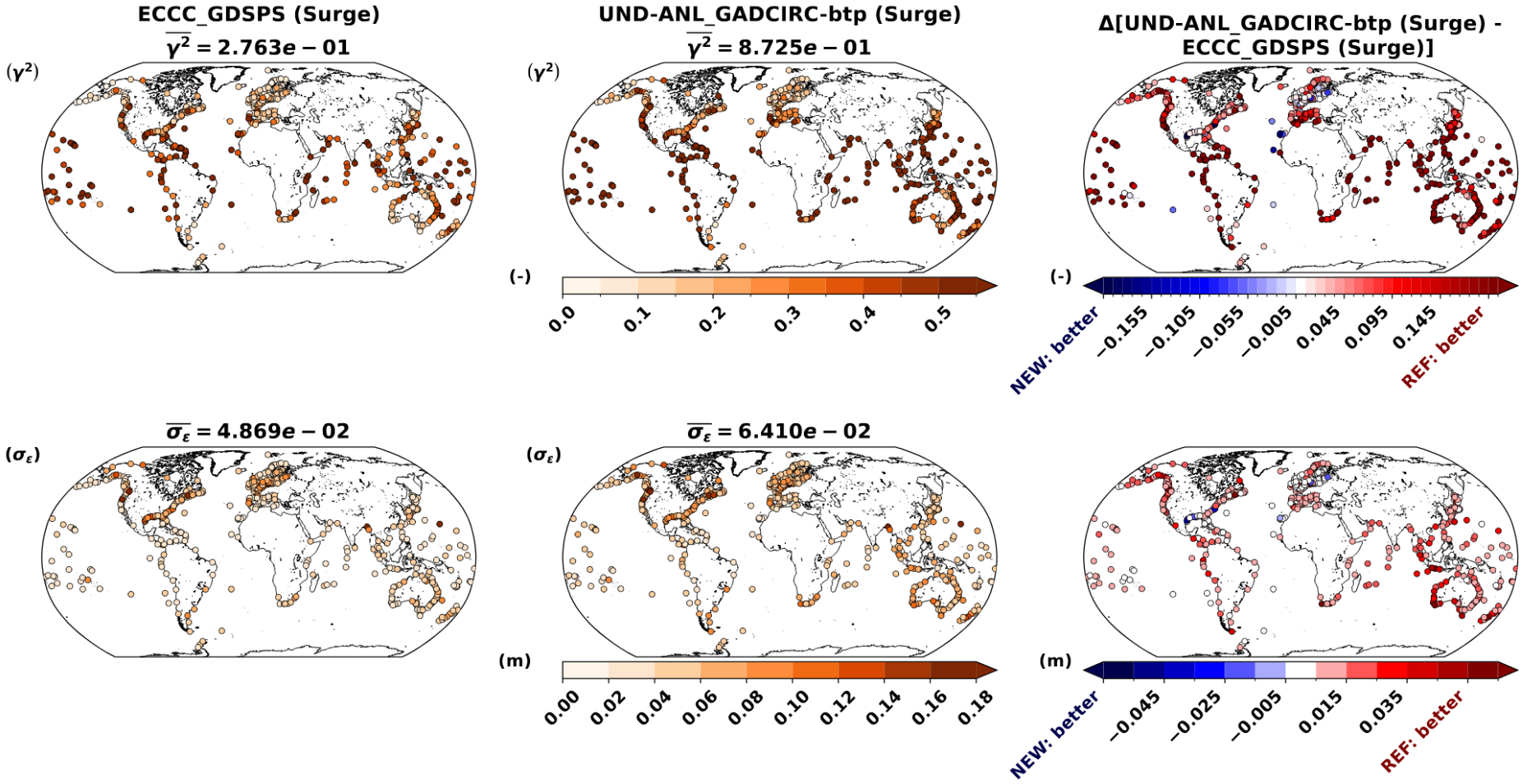
STDE is 11 cm for ECCC_GDSPS and 15 cm for UND-ANL_GADCIRC-btp. UND-ANL_GADCIRC-btp is better in regions with complex coastlines where unstructured grid allows higher resolution.

ARE EXTREMES CAPTURED?

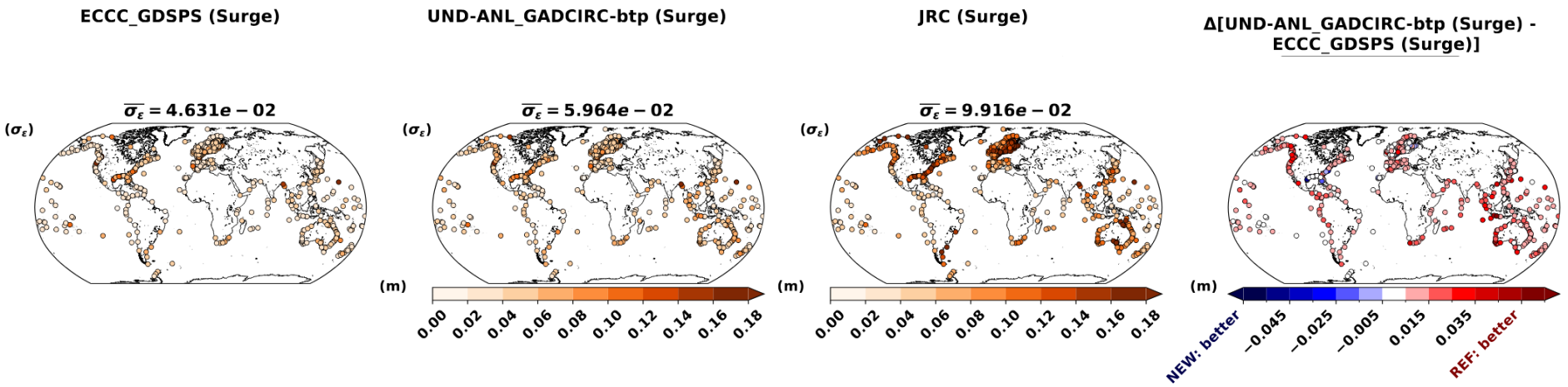




TIME SERIES OF STORM SURGES



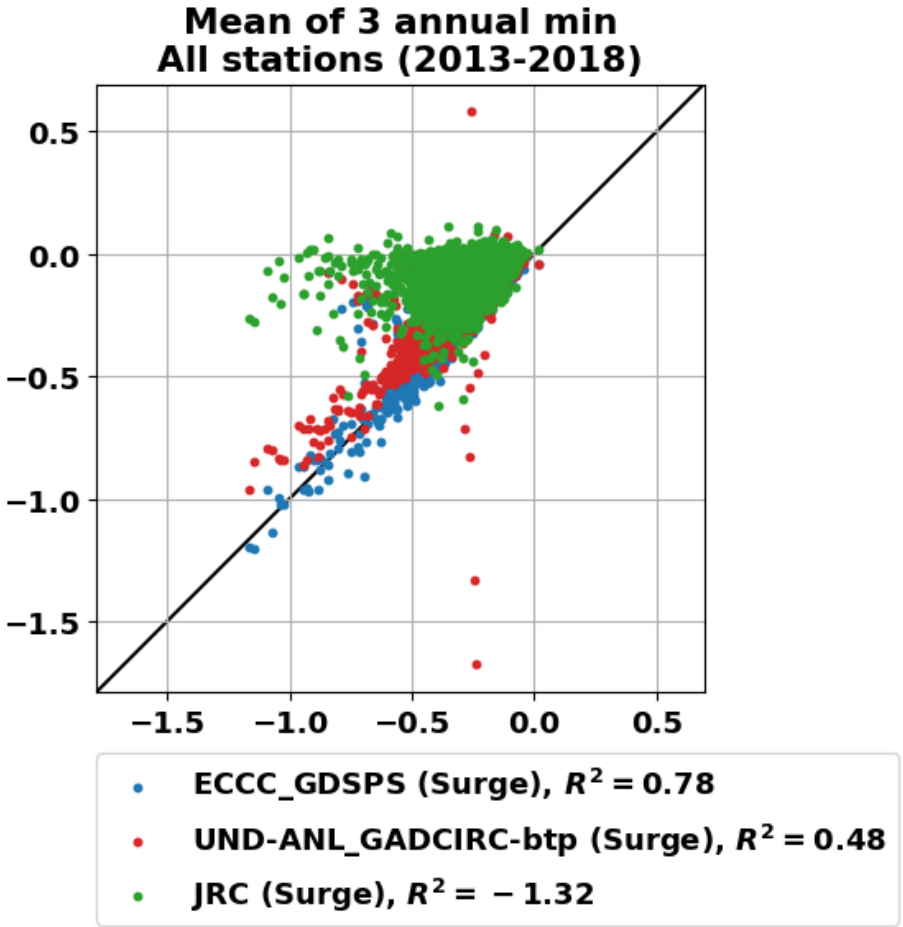
Overall error is 4.9 cm for ECCC_GDSPS and 6.4 cm for UND-ANL_GADCIRC-btp.

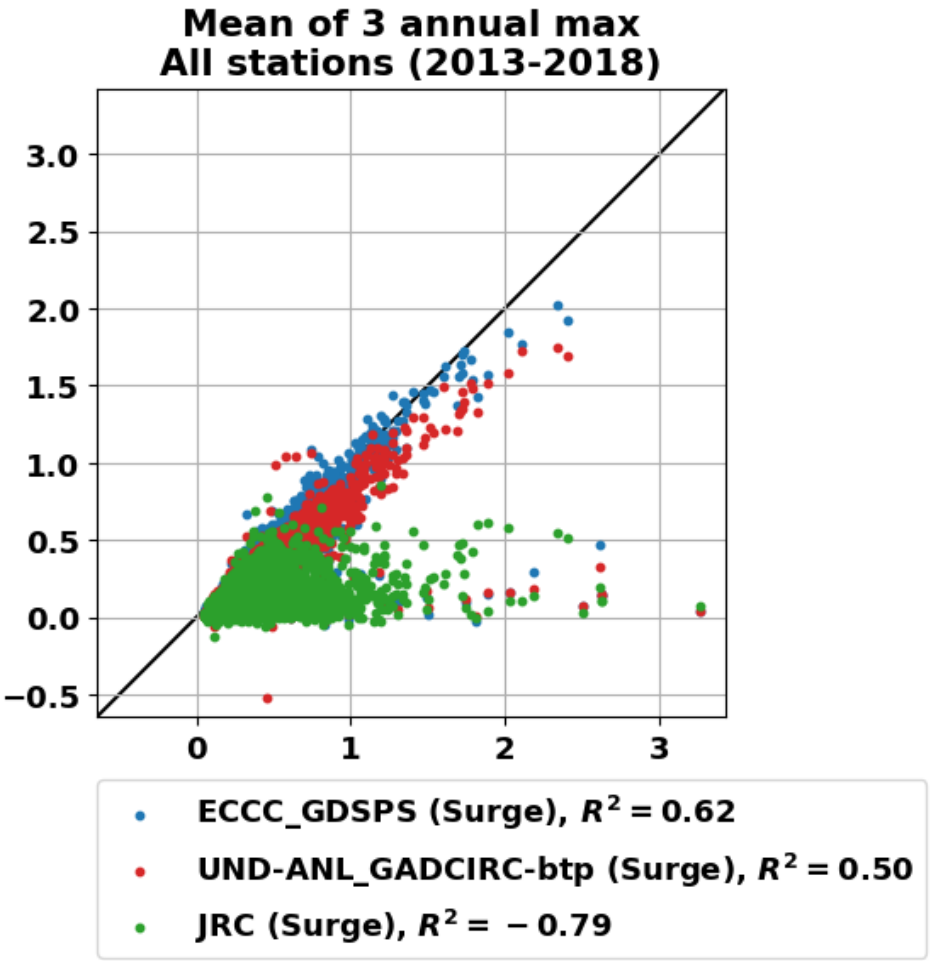


STDE: GDSPS: 4.6 cm; GADCIRC-btp: 6.0 cm; JRC: 9.9 cm
JRC model is a statistical model trained on pre-processed tide gauge and satellite data, only produces daily min/max

DAILY MAX SURGE – NOW INCLUDES JRC'S DATA

DAILY MIN MAX OF SURGES

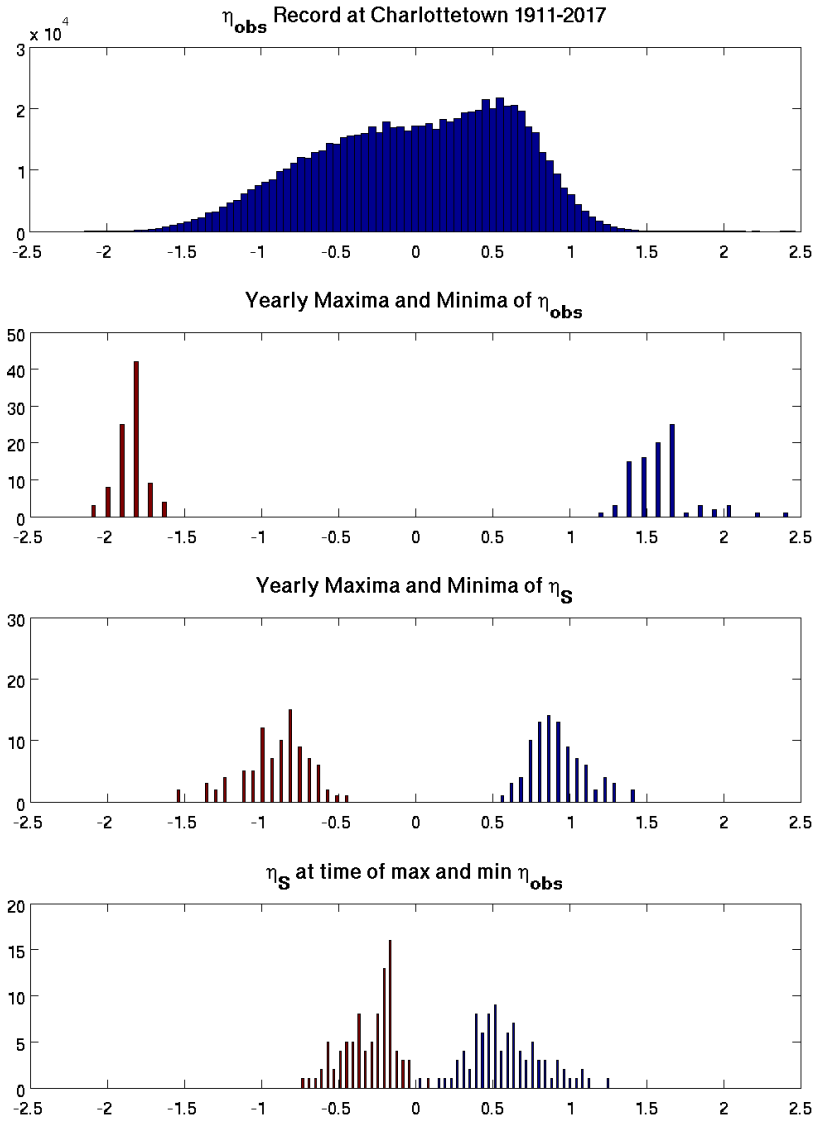




MIN AND MAX H_{OBS} AND H_S

- **Extreme surges are rarely the ones leading to extreme total water levels**

- We must forecast surges at all times, not only when large storms are expected



SURGEMIP/CLIP

Want to get involved?

- Want to contribute to next topics and activities, SurgeMIP, AI, ensemble, compound effects, …

F2F meeting

This Friday

2pm Rm 2

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