

Tidal Evaluation of the Alaska Coastal Circulation Models Developed for the Next Generation Water Resources Modeling Framework (NextGen)

SESSION NUMBER - H31W

OWP OFFICE OF WATER PREDICTION

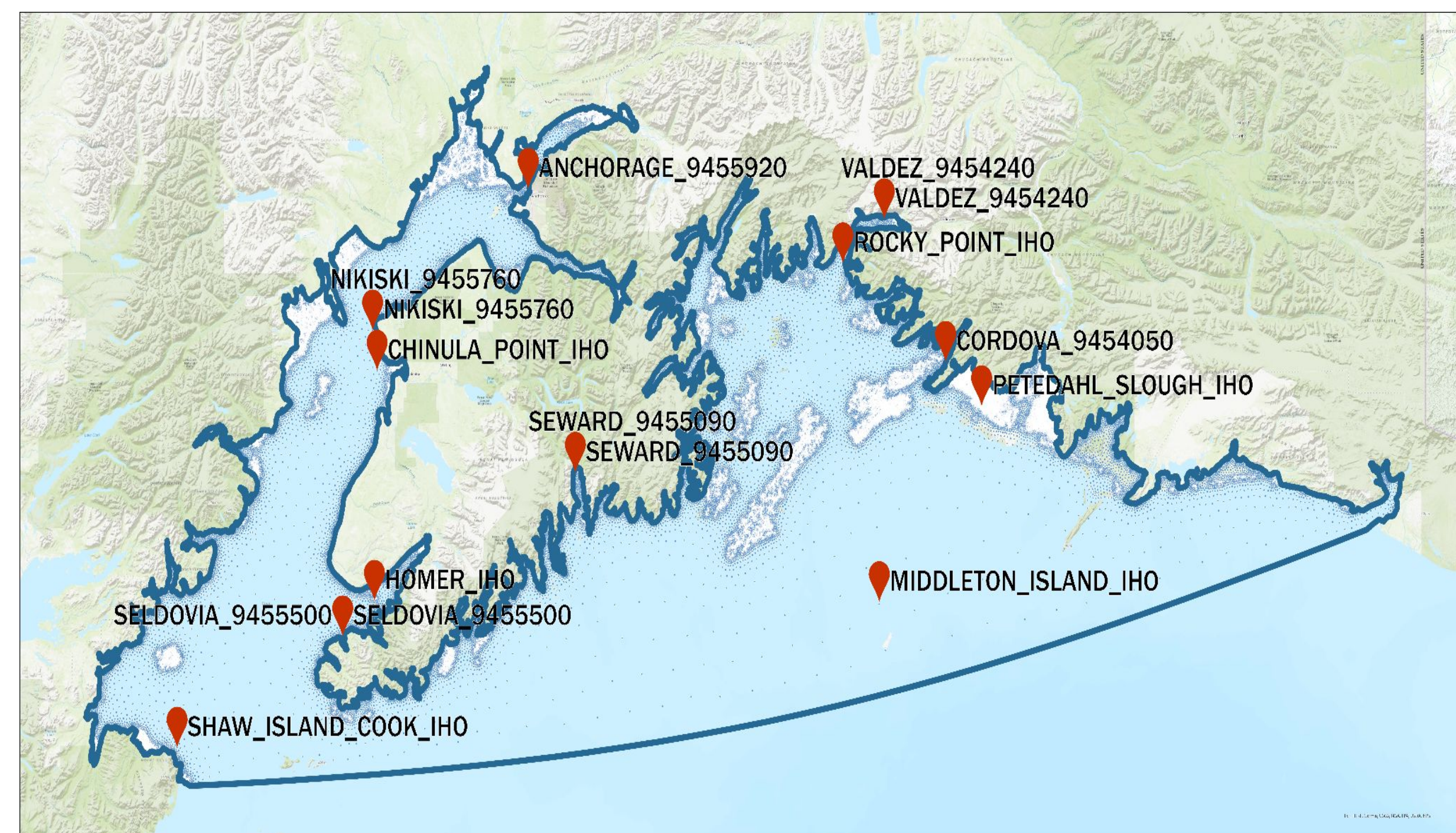
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Alaska NextGen Coastal Models

- The Office of Water Prediction's (OWP) coastal team has developed a coupled modeling system (using SCHISM and D-Flow FM) to simulate tide and total water levels in the coastal regions of Alaska.
- That model domain includes Cook Inlet, Prince William Sound, the Copper River estuary, Icy Bay and nearshore portions of the Gulf of Alaska.
- This work is supplement to the other works shown by Kefelegn et. al. and Ducker et. al. AGU 2023.



Alaska model domain and tide evaluation stations

Model Development

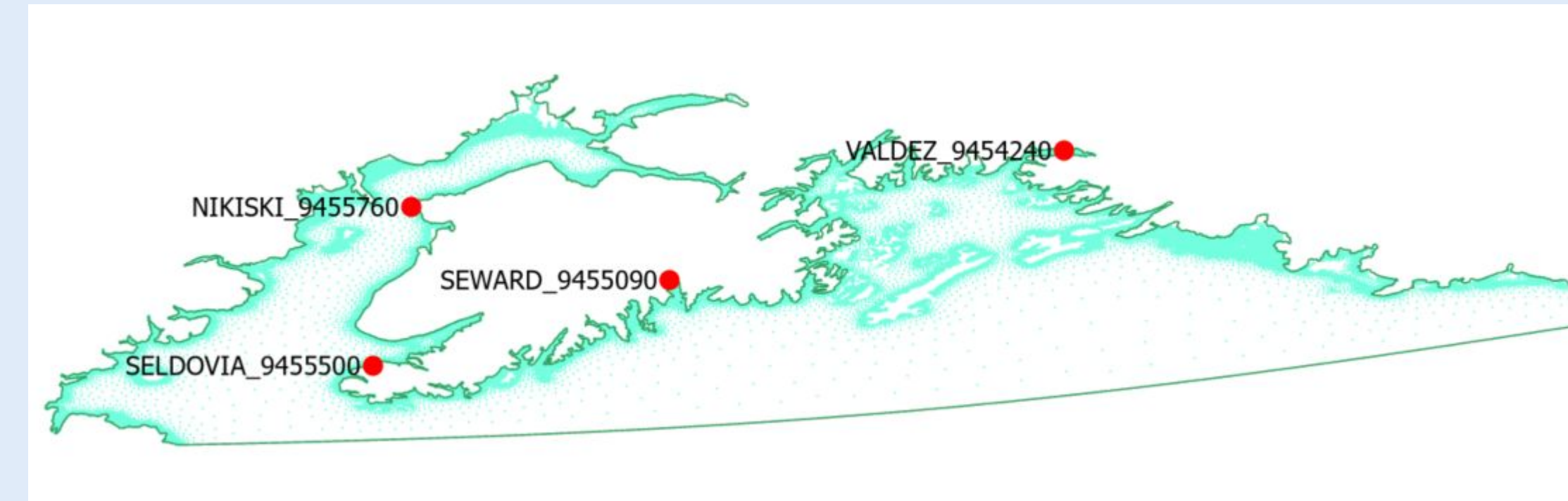
D-Flow FM and SCHISM computational mesh were developed based on:

- Density function methods were performed using ArcGIS, SMS and Delft software.
- Topographic and bathymetric information was obtained from NOAA, USGS and other local data sources.
- Bottom roughness values were obtained from available land cover and land use data.
- Tidal boundary was obtained from a global tide model.

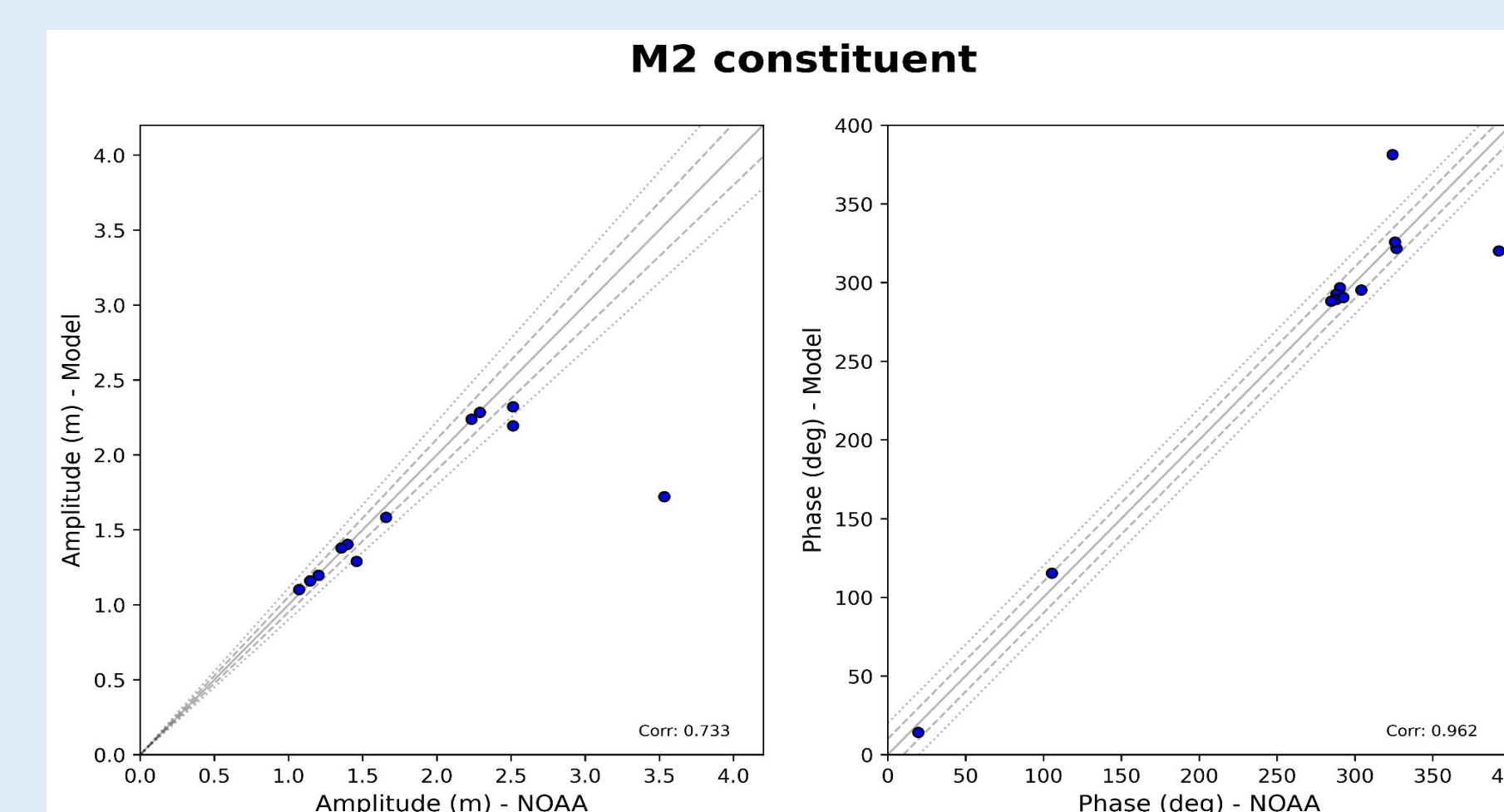
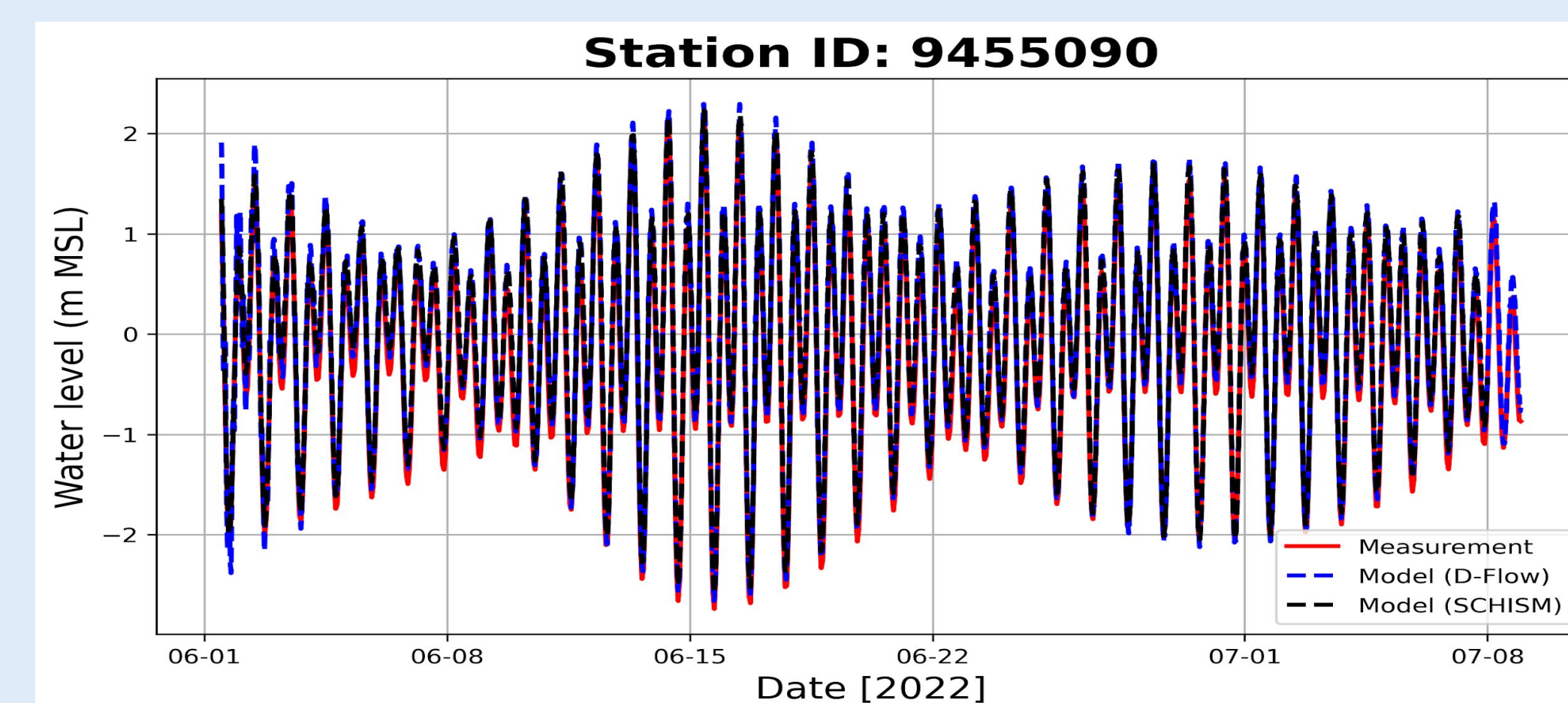
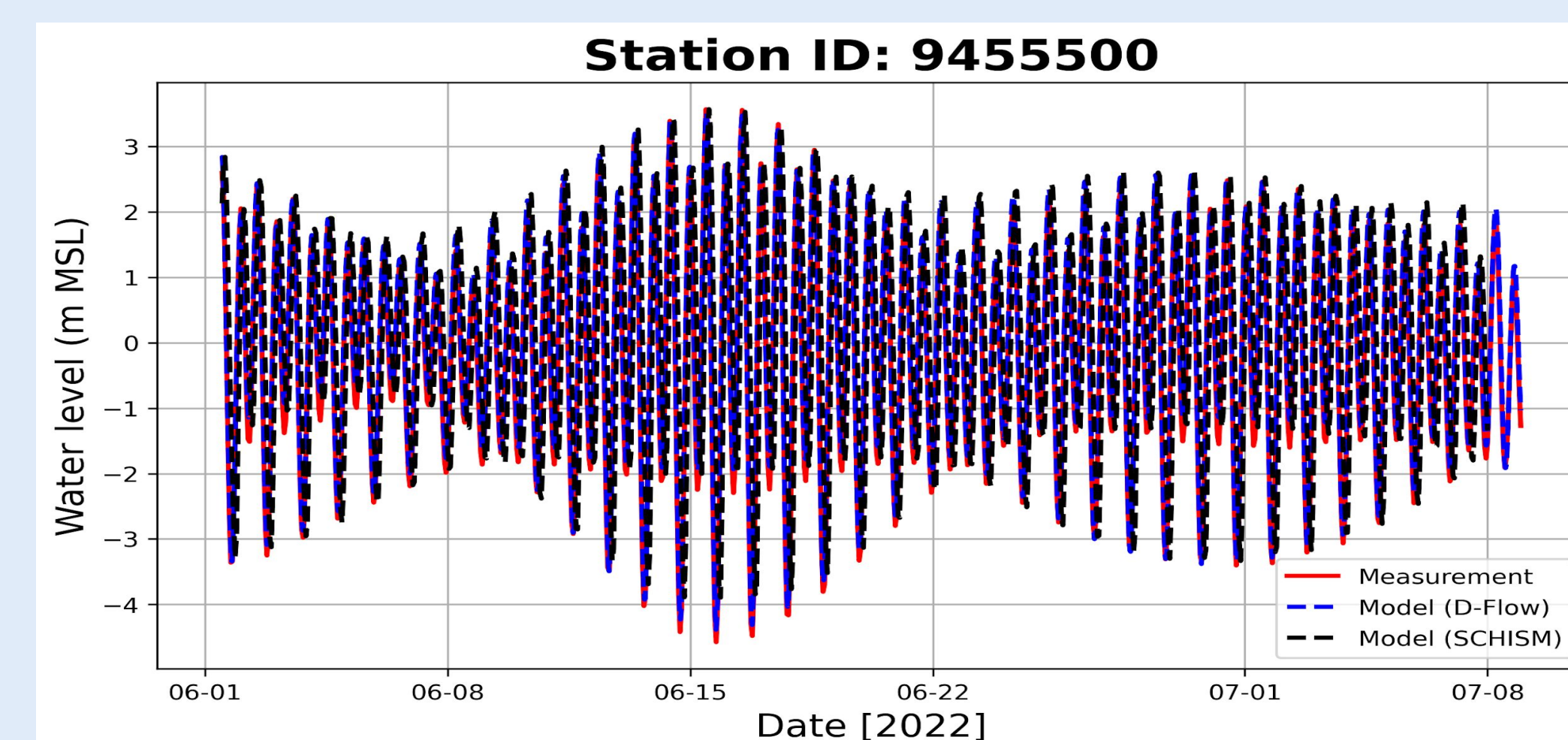
ACKNOWLEDGEMENTS:

Appreciate support from the colleagues at the Office of Water Prediction, Lynker, University of Alabama in Tuscaloosa, Deltares, and SCHISM developers for assisting with the development of the coastal models presented here.

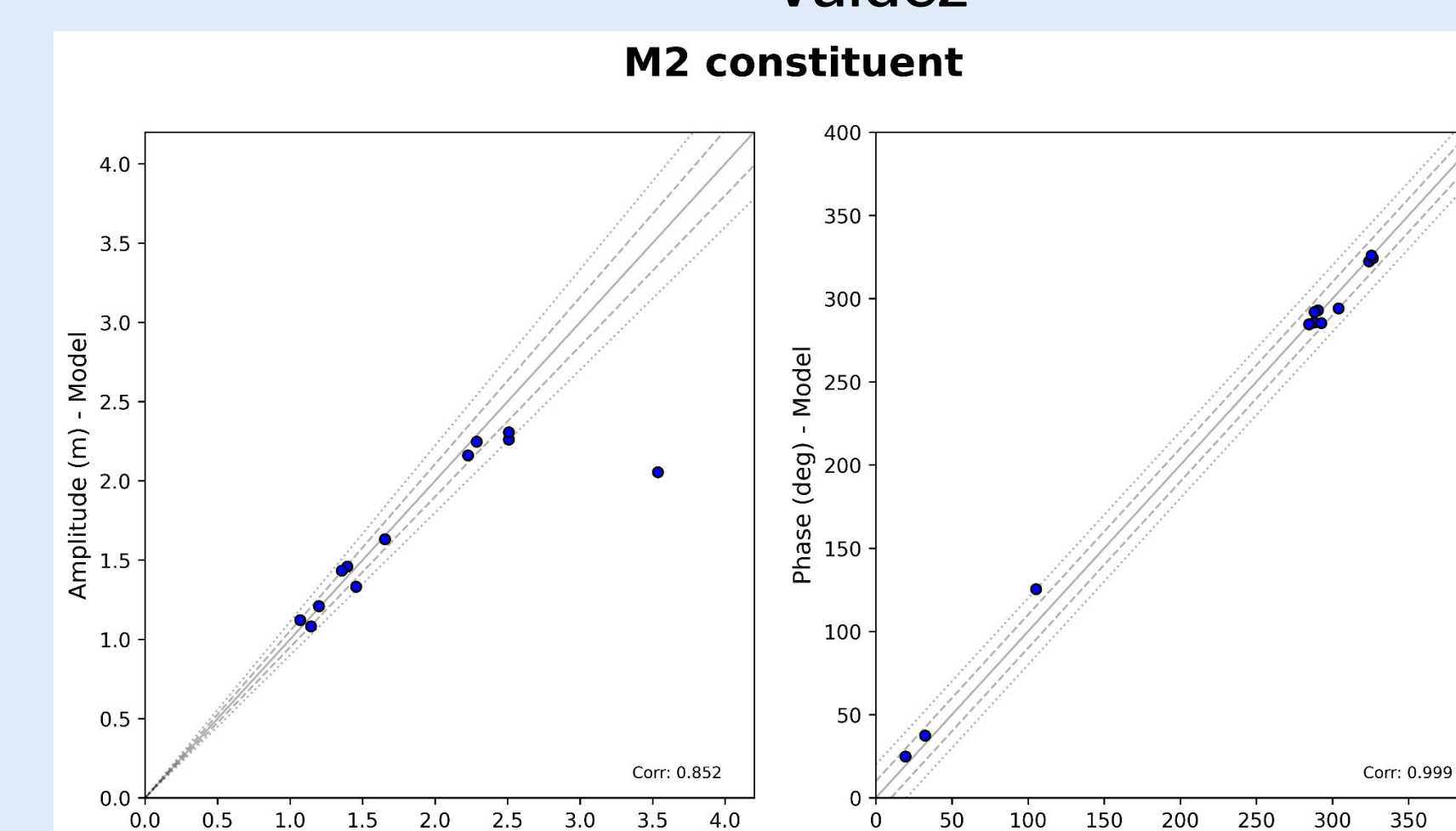
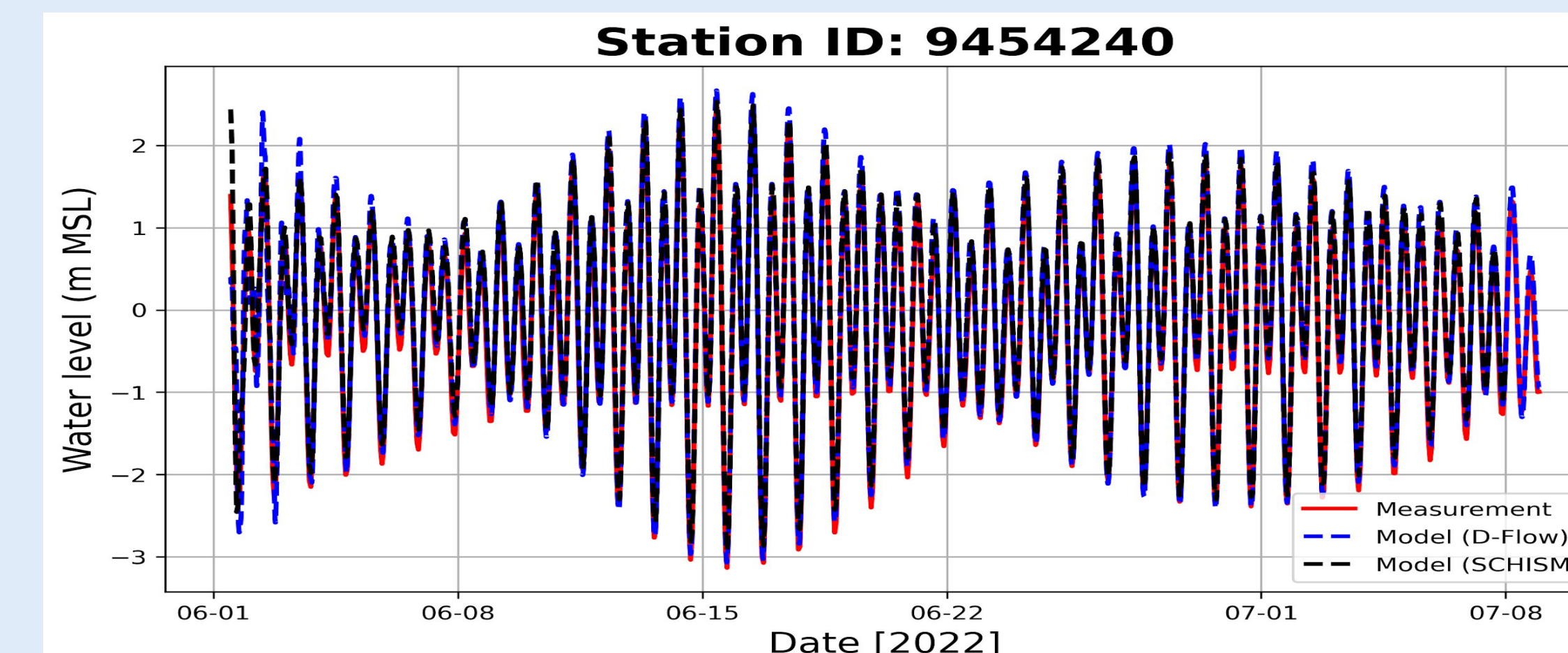
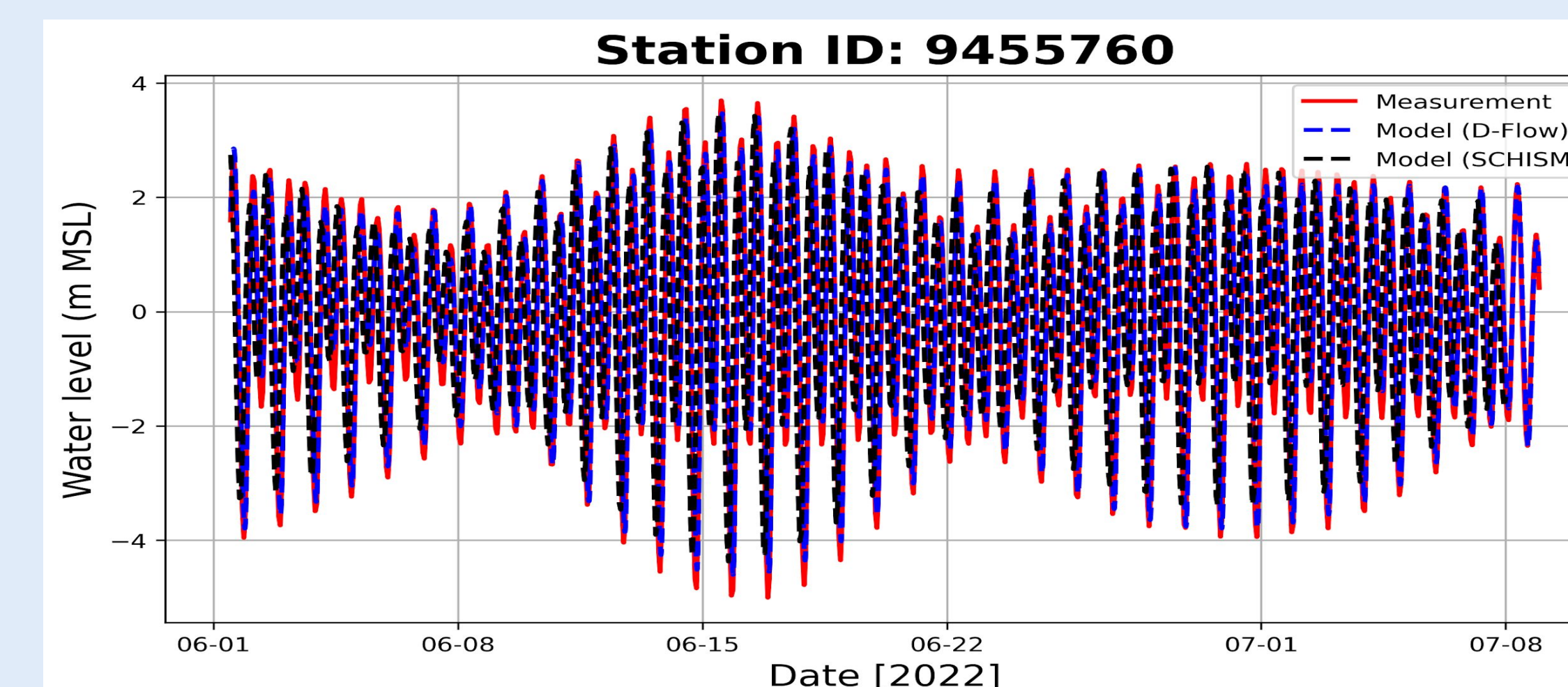
A well-performing tidal model of Alaska provides confidence for a successful expansion of NextGen's TWL prediction capabilities



Tide evaluation stations for time series plots



SCHISM

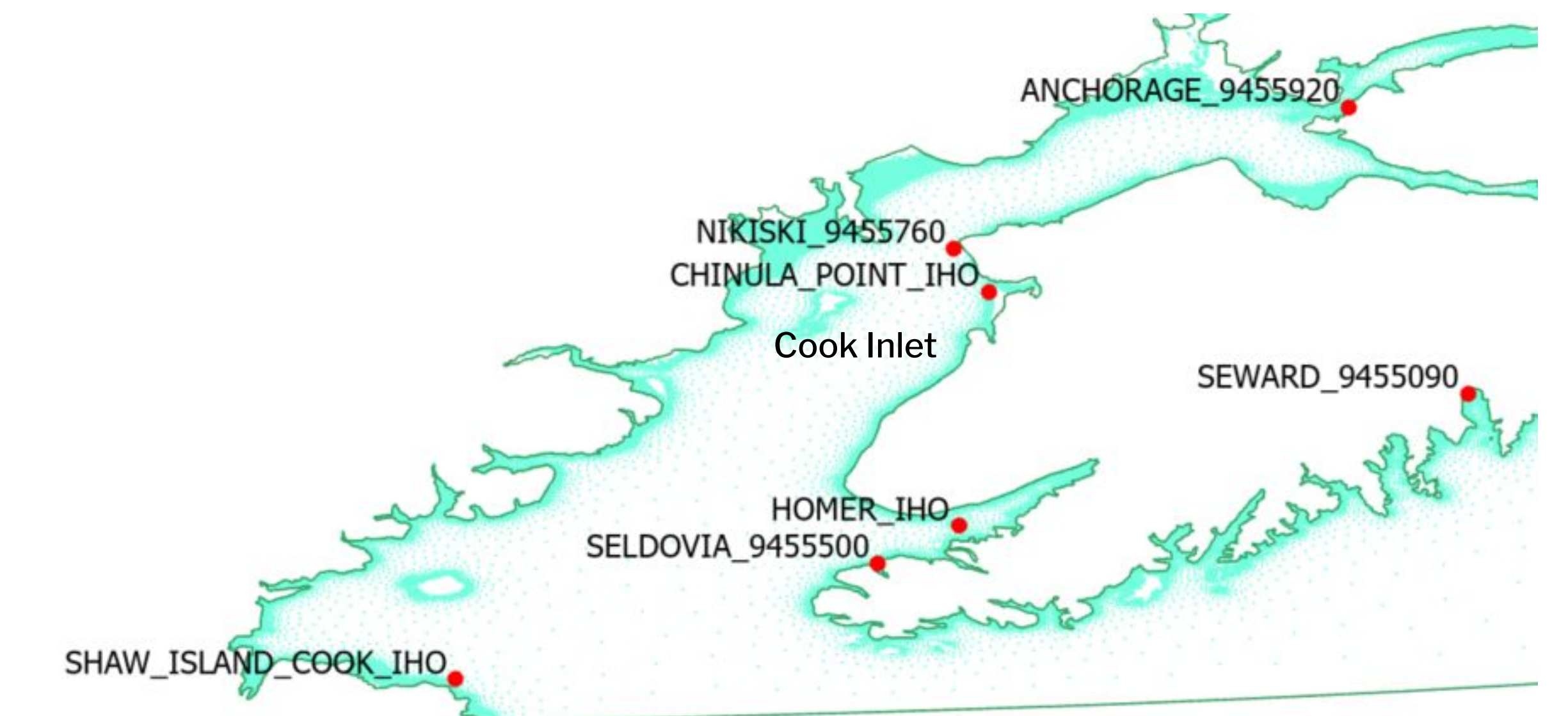


D-Flow FM

Model skills for all stations

Station_Name_ID	DFlow FM			SCHISM		
	corr	rmse	skill	corr	rmse	skill
CORDOVA_9454050	0.99	0.17	0.99	0.99	0.21	0.99
VALDEZ_9454240	0.99	0.15	1.00	0.99	0.13	1.00
SEWARD_9455090	1.00	0.10	1.00	1.00	0.08	1.00
NIKISKI_9455760	1.00	0.17	1.00	0.57	1.60	0.75
SELDOVIA_9455500	0.99	0.26	1.00	0.37	2.05	0.62
ANCHORAGE_9455920	0.90	1.38	0.89	0.96	1.46	0.86
CHINULA_POINT_IHO	0.99	0.32	0.99	0.99	0.30	0.99
HOMER_IHO	1.00	0.19	1.00	0.99	0.19	1.00
MIDDLETON_ISLAND_IHO	1.00	0.07	1.00	1.00	0.09	1.00
PETEDAHL_SLOUGH_IHO	0.98	0.19	0.99	0.99	0.16	0.99
ROCKY_POINT_IHO	0.96	0.36	0.98	0.97	0.29	0.98
SHAW_ISLAND_COOK_IHO	1.00	0.13	1.00	1.00	0.09	1.00

Model skills along Cook Inlet



Stations along Cook Inlet

	Predicted M2 Amplitude	Predicted M2 Phase	SCHISM M2 Amplitude	SCHISM M2 Phase	D-Flow FM M2 Amplitude	D-Flow FM M2 Phase
SHAW_ISLAND_COOK_IHO	1.65	326	1.60	326	1.81	327
SELDOVIA_9455500	2.21	324	2.26	22	2.37	323
HOMER_IHO	2.29	327	2.30	322	2.45	324
CHINULA_POINT_IHO	2.51	20	2.34	14	2.50	25
NIKISKI_9455760	2.38	31	2.21	320	2.45	37
ANCHORAGE_9455920	3.58	106	1.74	116	2.15	126

D-Flow FM and SCHISM skills along Cook Inlet

Conclusions and future work

- 1) For most of the stations, both the SCHISM and the D-Flow FM models perform above 95% skill level.
- 2) As tide propagates inland, amplitude increases along the Cook Inlet. The model captures this phenomenon accurately. However, model skill deteriorates close to inland stations due to lack of accurate bathymetric information.
- 3) Channel alignments and topo-bathy data are lacking in the Alaska model domain, and additional data are required to improve model skills.
- 4) High resolution mesh along the inland rivers and accurate topo-bathy will be included in future work.

REFERENCES:

SCHISM - http://ccrm.vims.edu/w/index.php/Main_Page
D-Flow FM - <https://oss.deltares.nl/web/delft3dfm/manuals>

CONTACT

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