

AGU 100 | FALL MEETING

Town Hall

Monday, December 9, 2019 | 12:30 PM - 01:30 PM

Community -based Coupled Coastal Modeling in Support of Total Water Prediction

To join our Poll Everywhere:

In a browser Pollev.com/cdean464

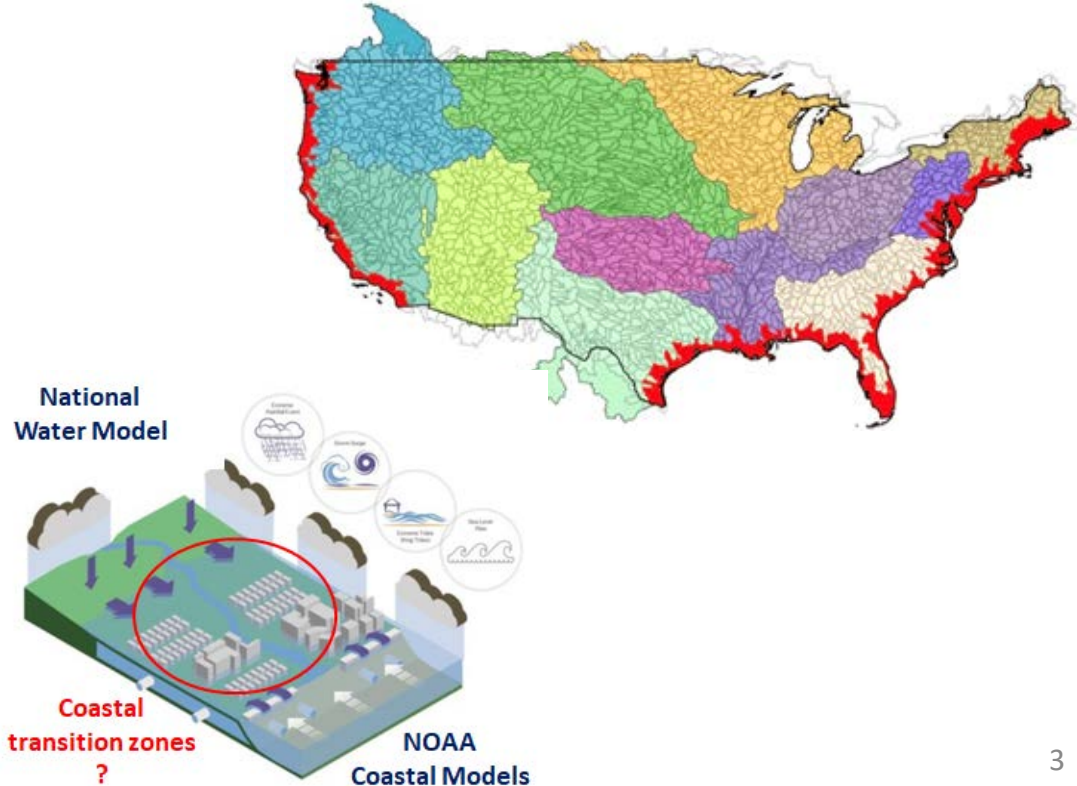
OR

Text [CDEAN464](https://cdean464.com) to [22333](https://22333.com) to join

What organization do you represent?

Introduction

Over 100 million Americans who live near the coast aren't protected by total water forecasts that account for combined freshwater and saltwater flooding. The NOAA Water Team is collaborating to provide lifesaving environmental intelligence through **coastal coupling**.



Introduction



Challenge

Coastal coupling of models through collaborative community engagement for integrated coastal solutions employing research, model development and application, data provision, observations, analysis, and service delivery.

Mission

To enable

- Coupling of models across the coastal zone
- Actionable information provided to stakeholders in accessible and user-friendly formats
- Accelerated national coverage of integrated water prediction capabilities

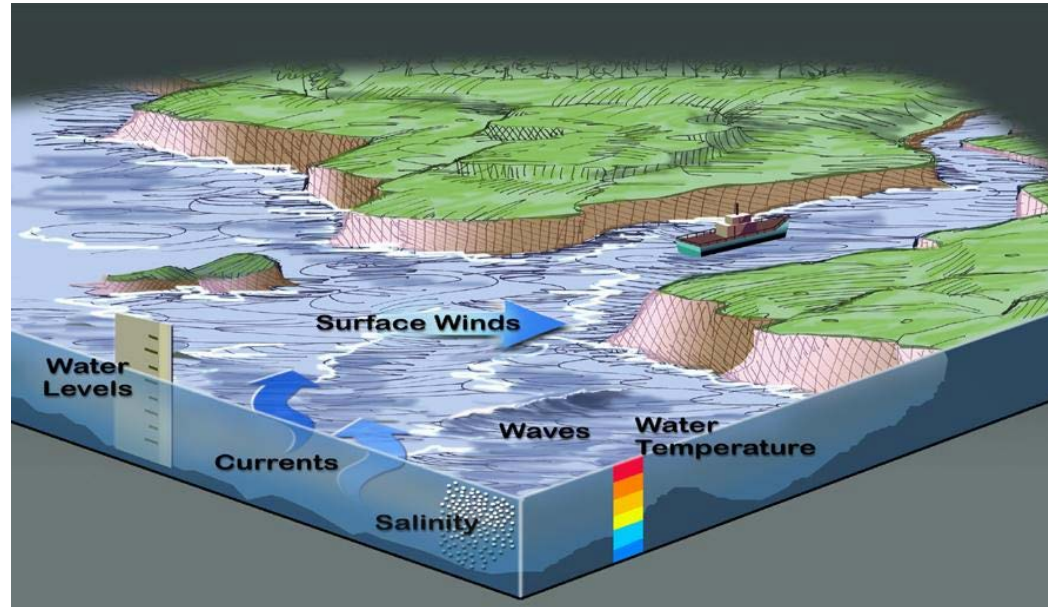
Derrick Snowden

A national network of operational hydrodynamic models (**Operational Forecast System, OFS**) providing nowcasts and short-term (2-5 day) forecasts of:

- Water levels
- Currents
- Salinity
- Temperature

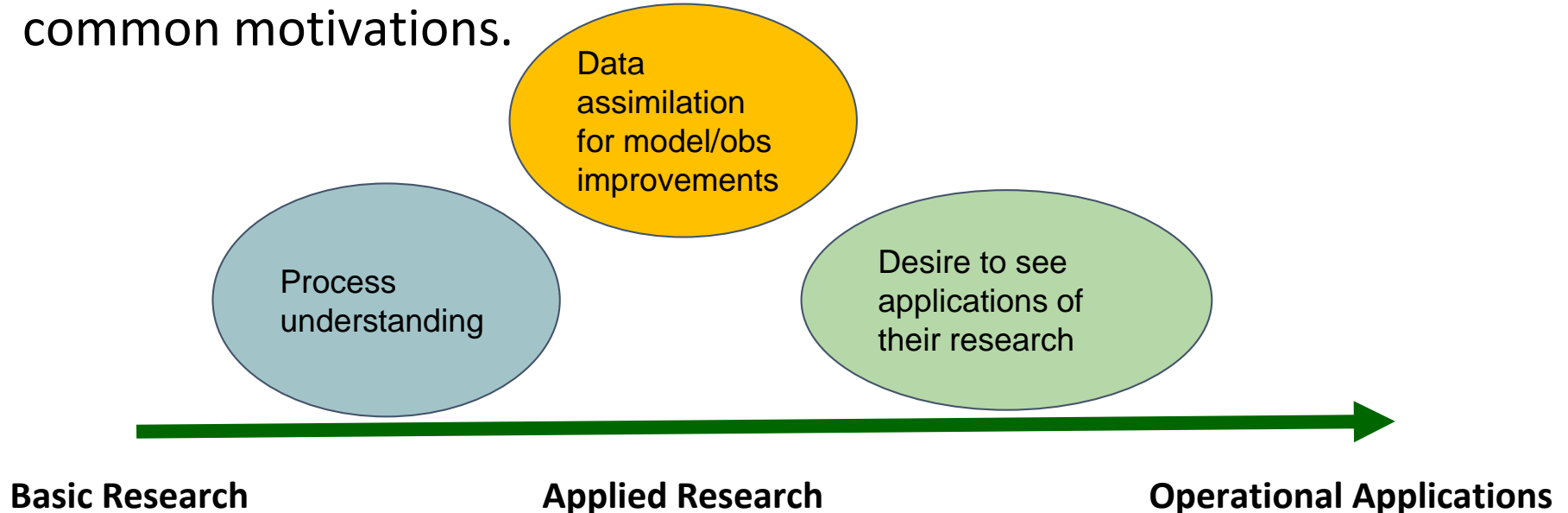
Future developments:

- Inland Hydrology
- Waves
- Ice coverage



Derrick Snowden

Practitioners are motivated differently. CoP's organize around common motivations.



Derrick Snowden



- Software engineering
- Software infrastructure
- User support services
- Cloud-based high performance computing
- Scientific innovation
- Management and planning
- External engagement and community

Interagency Ocean Observations Committee - Modeling Strategy

- Model coupling
- Data assimilation
- Nearshore processes
- Cyberinfrastructure and model skill assessment
- Modeling for observing system design and operation
- Probabilistic prediction methods
- Fast predictors

Hindcast Coastal Hydraulics and Coupling

- Expanding from a regional-scale domain to an East and Gulf Coast domain by September 2020.

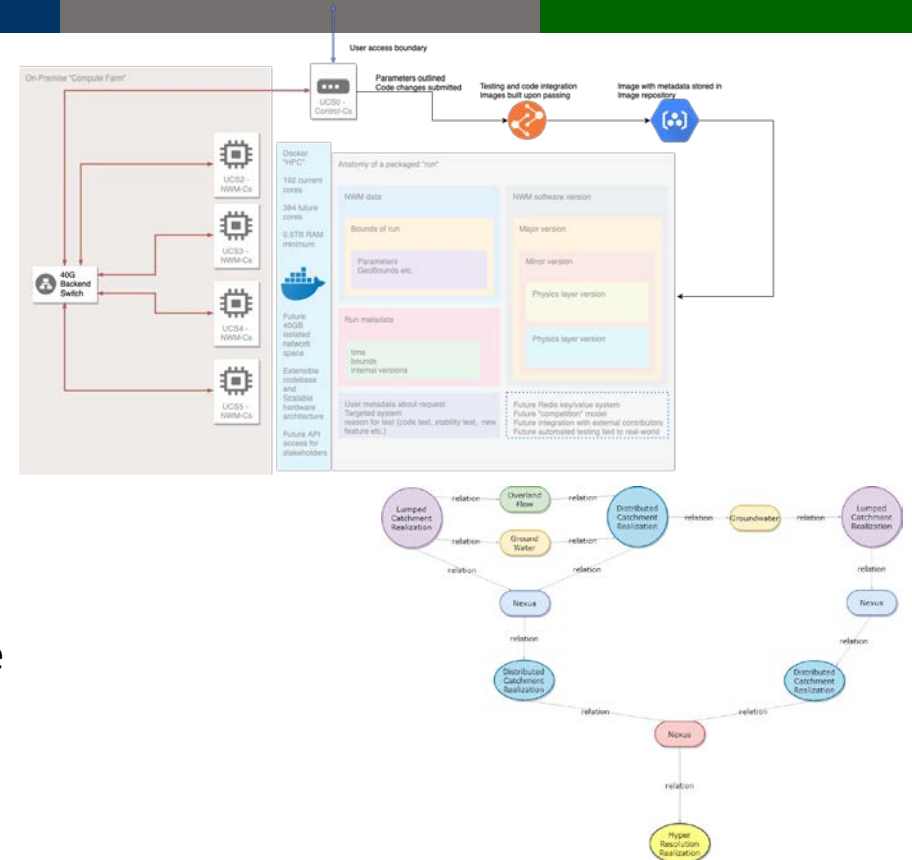
Forecast Coastal Hydraulics and Coupling

- National Water Model v.3.0 (summer 2022) will feature freshwater-estuary-ocean model coupling in the forecast mode
- Will allow for simulation of compound flooding involving freshwater, storm surge and tides



Community Development

- Community of Practice - Engage academic and other partners and enable their contributions
- Test and Evaluation Environment - Enable community members to work directly with the National Water Model
- Evolved Architecture - Modern software infrastructure that supports multiple modeling interests



Path Forward:

- Focus should not exclusively on soft and hardware

Key issues include:

- Available resources and data
- Organizational capacities: agencies and academic institutions
- Public/Community needs and goals
- REPOSITORY OF KNOWLEDGE

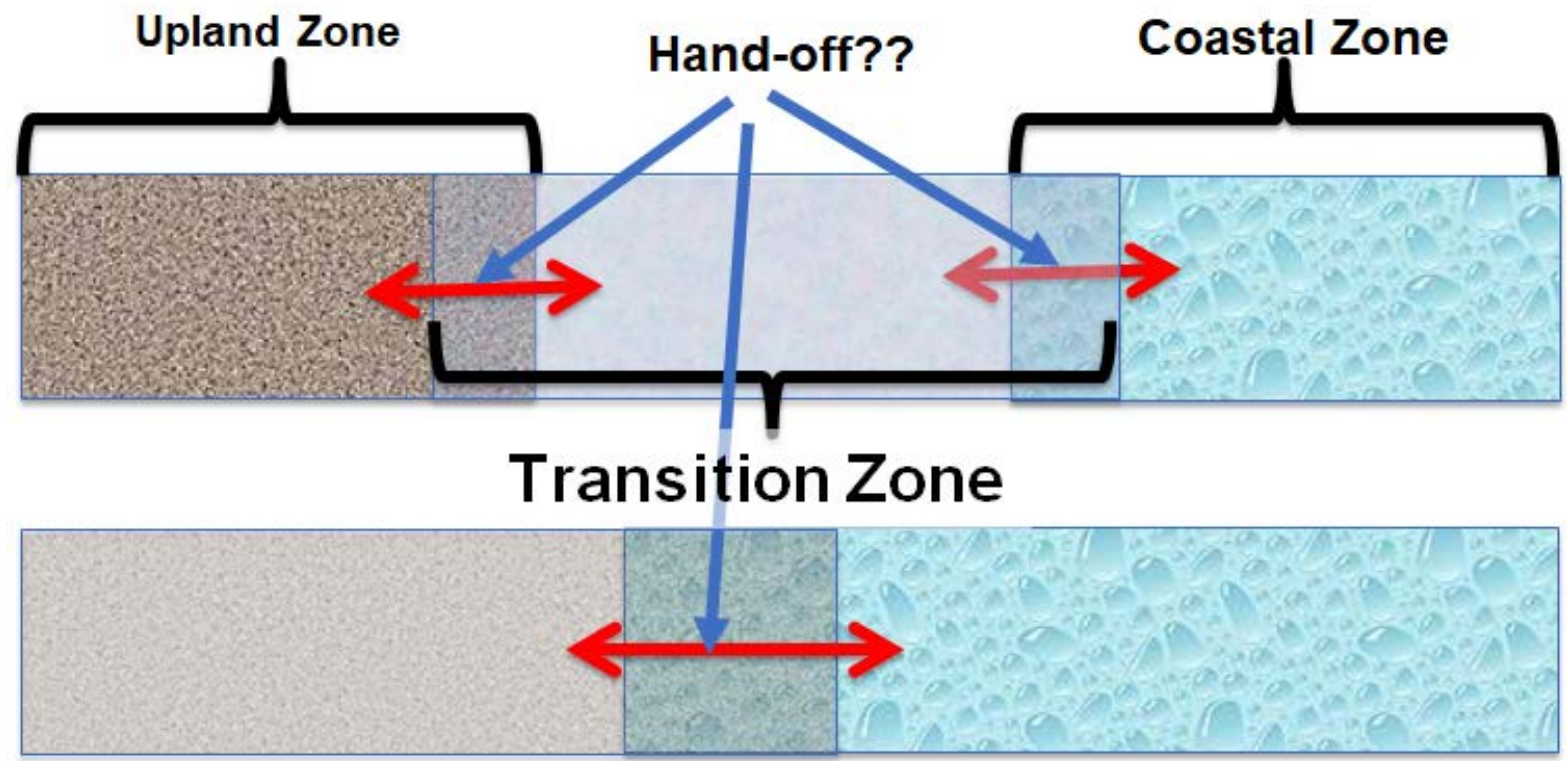
Transition

Inland Processes:
LULC
Channel/river network
Floodplain capacity
Drainage impediments

Coastal Processes:
Wind Forcing
Coastal currents
Density stratification
Surge/waves

Zone

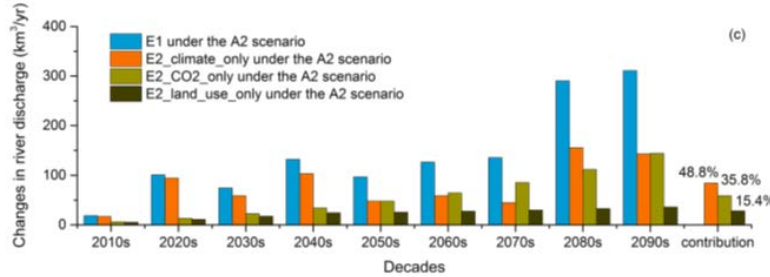
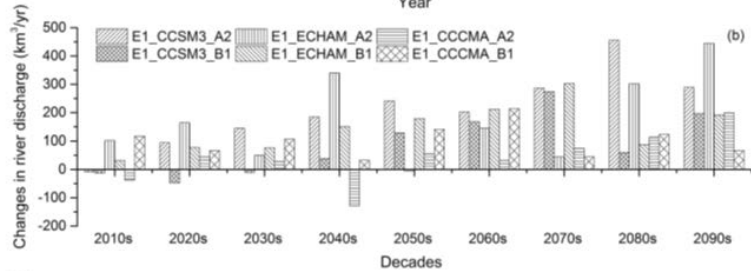
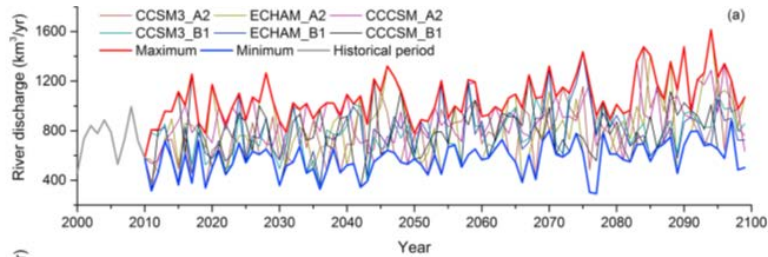
Ehab Meselhe



Community -based Coupled Coastal Modeling in Support of Total Water Prediction

Ehab Meselhe

Tao et al., 2014



	More economic focus	More environmental focus
Globalisation (homogeneous world)	A1 rapid economic growth (groups: A1T; A1B; A1FI)	B1 global environmental sustainability
Regionalisation (heterogeneous world)	A2 regionally oriented economic development	B2 local environmental sustainability

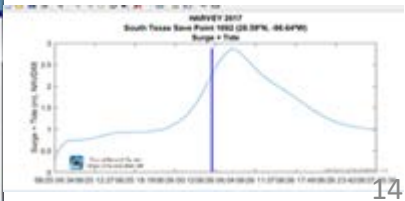
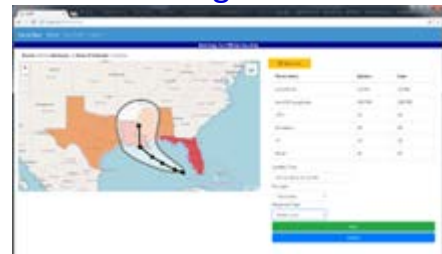
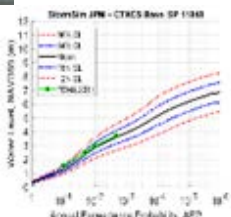
- A2 and B1 scenarios represent high and low levels of population growth, economy, and energy consumption, respectively
- E1 model suggests that river discharge would be substantially enhanced (10.7– 59.8%) by the 2090s.
- A2 scenario: land use change and atmospheric CO2 elevation outweigh climate change effect (35.8% + 15.4% > 48.8%).

Probabilistic Coastal Hazard Assessment Framework

Suite of numerical models and methods for risk-informed decision making:

- High-fidelity models: Coastal Storm Modeling System (coastal waves & surge)
- Storm Database: Coastal Hazards System (simulation archive, reusable)
- Probabilistic Methodologies (quantify risk and uncertainty)
- Fast Real-time Storm Estimates: Coastal Hazards Rapid Prediction System (AI)

Coastal Storm Database and Rapid Hazard Estimation



USACE seeks to develop an Inland Hazards System analog to CHS

- More complete understanding of total flood environment for a given locality
- Surrogate model for rapid forecasting of approaching storms
- More accurate modeling tools for planning and design

Challenges:

- Number of degrees of freedom in highly altered inland systems
- Quantifying probabilities of compound flooding events and how to properly consider these in planning process

Additional Coastal Coupling Challenges:

- “Battleground” transition zone between fresh and salt water where riverine, estuarine and coastal zones collide
- Combining non-Newtonian regimes from post-wildfire debris flows with sediment transport, water quality and coastal modeling domains

Questions?

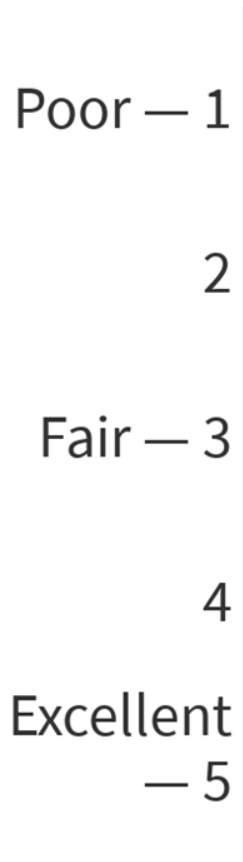
Looking ahead, what is needed to advance community modeling around coastal coupling?

What are the most effective methods for community collaboration?

Upcoming Events

- AGU - Continental-Scale Modeling: Process Heterogeneity from Summit to Sea (H43I, H51D, H52D, and H53D)
 - Posters - Thursday 13:40-18:00
 - Talks - Friday 8-10, 10:20-12:20, and 13:40-15:40
- 2020 AMS, 18th Symposium on the Coastal Environment
- 2020 Ocean Sciences Meeting - Inland-Coastal Model Coupling Using a Community-Based Approach
- CoP Annual meeting - May 12-14 at the National Water Center in Tuscaloosa, AL
- Webinar series

How effective was this town hall format for engagement?



**What specific topics would you like to focus on at CC CoP
future engagements?**

Thank you!

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