Chesapeake Hypoxia Analysis & Modeling Program (CHAMP):

Predicting impacts of climate change on the success of management actions in reducing Chesapeake Bay hypoxia

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CHAMP goals

Develop a Chesapeake Bay scenario-forecast modeling system to:

- Isolate future impacts on Chesapeake hypoxia of *climate change* from those due to *anthropogenic nutrient inputs*

- Determine whether the WIPs/TMDLs will successfully reduce hypoxia (and meet WQS) under future climate conditions

CHAMP models

Use *multiple models* in Chesapeake scenario-forecast modeling system:

- Multiple climate scenarios **(PSU: Najjar/Herrmann)**
  - Downscaling (MACA vs. BCSD; 20+ GCMs)
  - Emission scenario (RCP 4.5 vs. 8.5)
- Three watershed models:
  - CBP WSMp6 (**CBP: Shenk/Bhatt**)
  - DLEM (**Auburn: Tian/Yao**)
  - Sparrow (**USGS: Ator**)

} **Up to six model combinations**

- Two estuarine models:
  - CBP WQSTM (**CBP: Linker/Tian**)
  - ChesROMS-ECB (**VIMS: Friedrichs/St-Laurent/Hinson**)
- Oyster population model (**ODU: Hofmann**)
  - To examine impact of hypoxia on living resources

CHAMP simulations

Four types of watershed+estuarine simulations:

- Realistic hindcasts (1985-2014; 1991-2000)
- Future simulations (2021-2030; 2046-2055)
- Factorial future simulations
  climate change vs. land use/population change
- Decision support: alternative management scenarios

Forcing fields for Future Simulations:

For an "apples to apples comparison" all model combinations must use same future forcing fields:

- Temperature, Precipitation, Winds, Humidity (**Najjar**)
- Future Atmospheric Deposition (**Bash**)
- Population/Land use Change (**Claggett**)

CHAMP Overview

- ✧ Opportunity for academic research to impact management decisions

- ✧ Opportunity for MTAG to suggest management-oriented (hypoxia focused) research questions that need addressing

→ STAC climate change workshop (September 2018)

- Short-term recommendation: Sea Level Rise
- Medium-term recommendation: Retrospective estuarine model comparison (1985-2014)