Context for Today's Discussion on Model Uncertainty Analysis

Managers have a long history of relying on computer modeling to guide decisions to protect quality

- But…all models generate predictions with some degree of error, which can lead to questions about how much their predictions can be trusted

A coupled physical biogeochemical model is being used to investigate the effects of anthropogenic nutrients on ocean acidification and hypoxia (OAH) in southern California.

We need to quantify model uncertainty so that you can confidently use the model to guide water quality decisions

We Worked with CTAG to Identify Concrete Steps to Quantify Model Uncertainty and Improve Management Confidence in Its Use

- Convened an expert workshop to educate ourselves on approaches to quantify model uncertainty

  ➢ Workshop produced several recommendations to increase "managerial confidence in models"

- CTAG, with assistance of OAH Modeling technical advisory group (TAG), modified those recommendations specifically for ROMS-BEC applications in the Bight

- CTAG prioritized those recommended studies

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WE ARE FORMULATING WORKPLANS FOR THE TOP THREE OPTIONS

1. Updated model validation

2. Effects of natural (climate) variability on expression of eutrophication outcomes

3. Independent peer review

Goal of today's discussion is to communicate what each component is, the benefits, and the process to work with CTAG to implement them

What is Model Validation?

*Process of comparing model predictions against monitoring data and published studies*

Answer Three Types of Questions:

1. Is this model working the way we think it should, based on published understanding of physics and biogeochemistry of southern California Bight ?

2. Are we getting the same answers in comparison with monitoring data?

3. Are we getting the same answers for the right reasons?

   • Focus on comparing predictions with data on rates of transformation

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Approach: Build on Foundation of Previous Model Validation Study

- Update to present day from simulations of two decades ago

- Assess skill with new data types you've invested in:

  - time series

  - new high quality pH bottle data

- Focus on the biogeochemical model skill, emphasizing gradients linked to recent management relevant findings

- Assess model uncertainty at time and space scales linked to biological effects

Why Quantify "Natural Variability"?
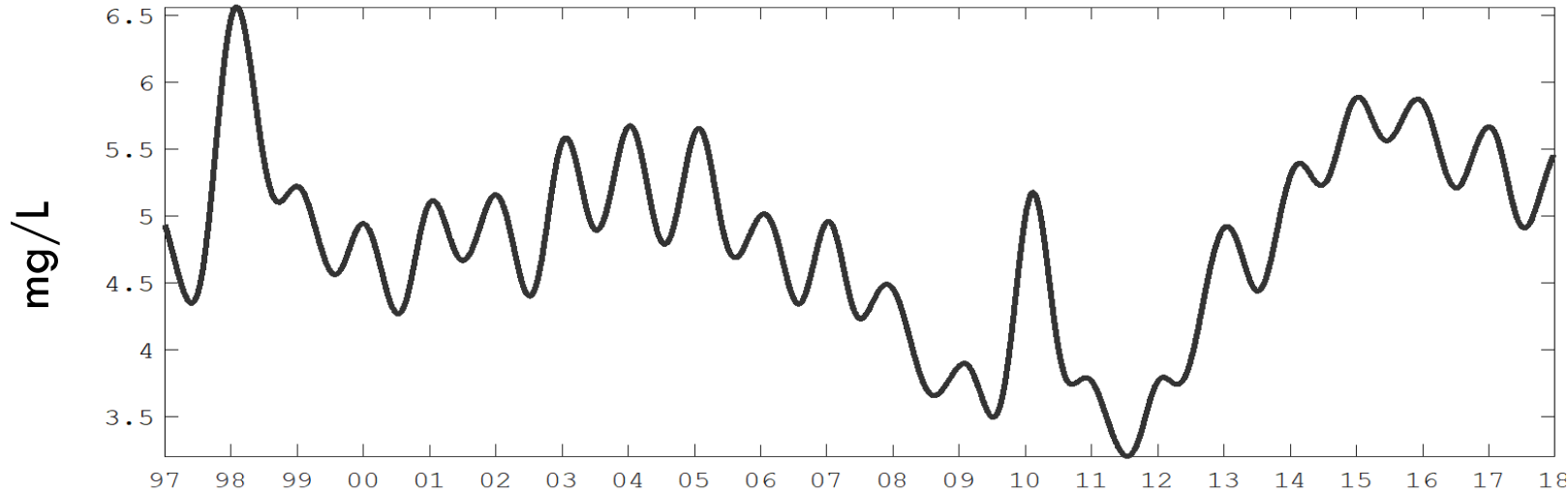
Average subsurface DO in the Bight from ROMS-BEC showing strong natural interannual variability

Two Science Themes Provide Important Context for the Decisions You Are Facing

1. What is the background variability in OAH and how does this <u>naturally</u> limit habitat capacity?

   - How does magnitude compare with effects from local nutrient and global climate change?

2. We know variability in ocean state cause intense variations of OAH from year to year…so how do ocean conditions influence the magnitude of:

   - Effect of local nutrient inputs?

   - Biological effects?

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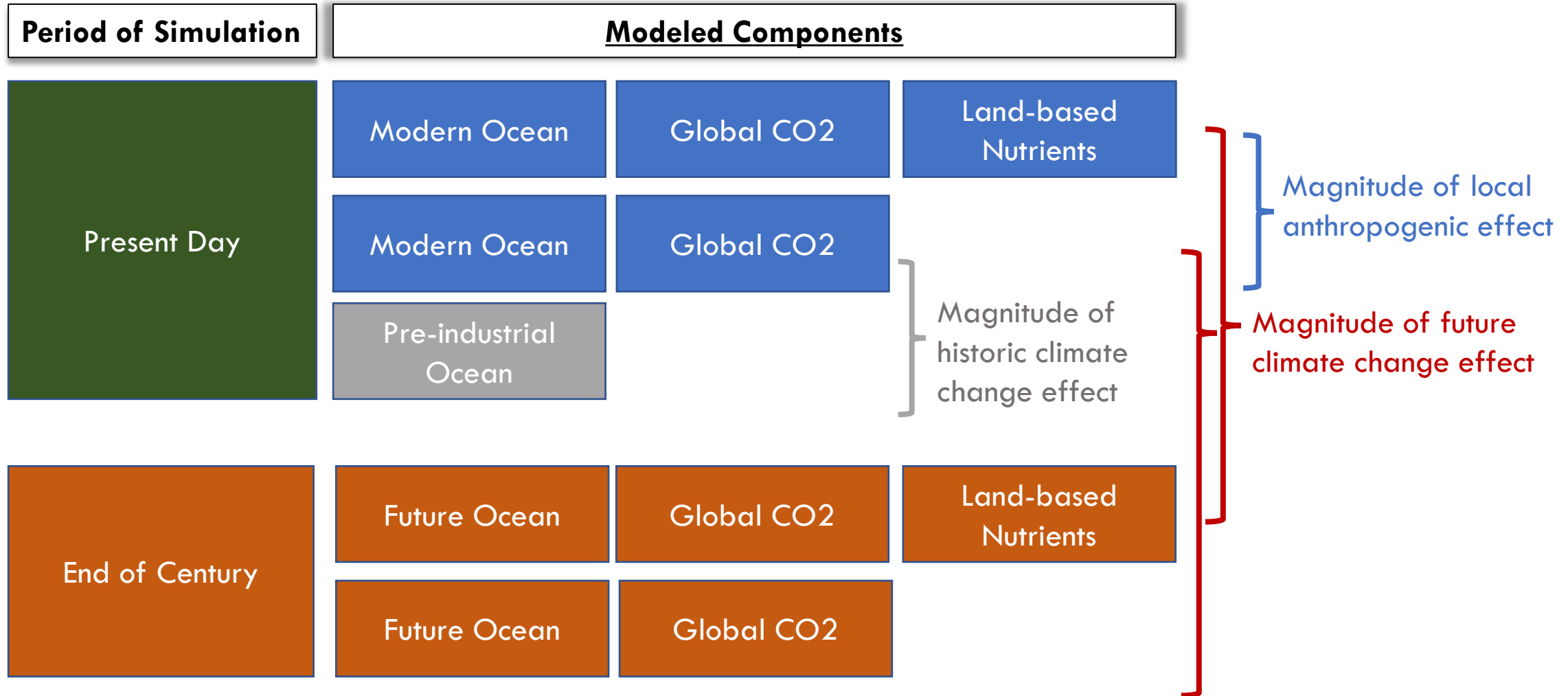
Question 2 Approach

- Hold land-based nutrient loads constant
- Simulate ocean states capturing different "climate phases" that influence algal blooms ( ) and temperature (from 🌡️ to 🌡️)
- Understand influence on OAH response and habitat capacity
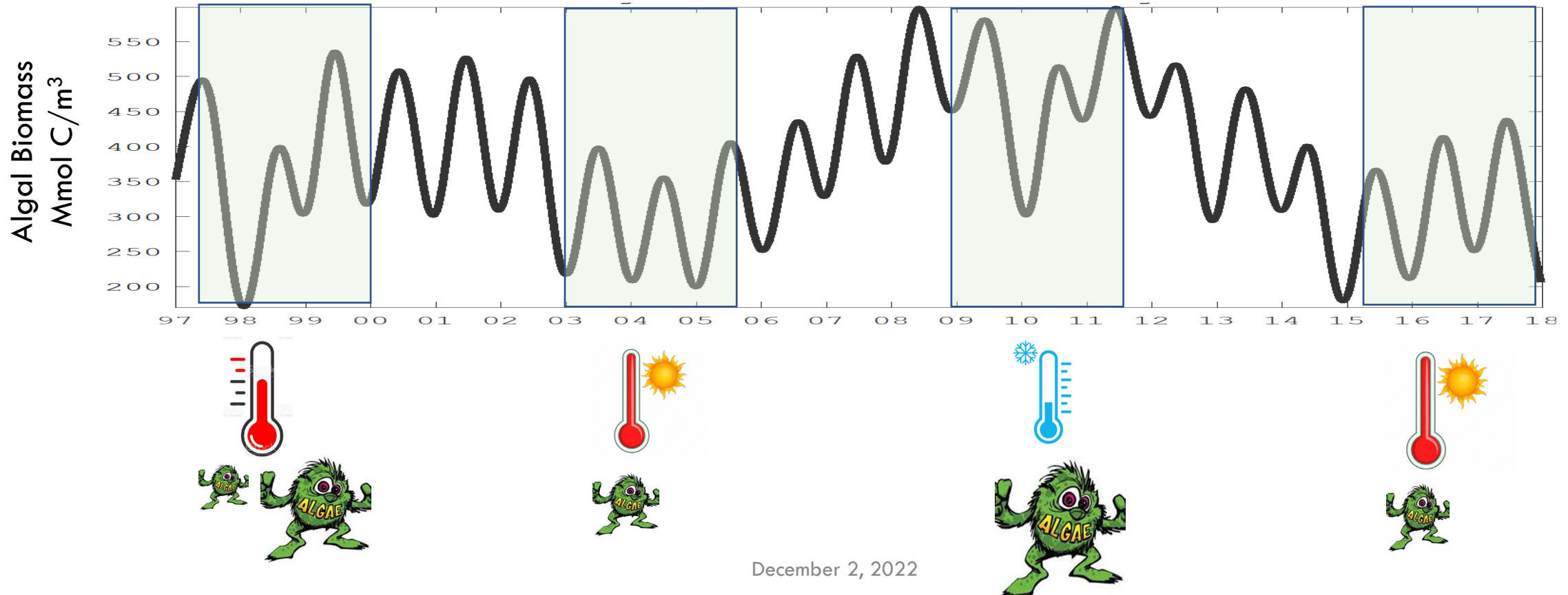
Why Independent Expert Peer Review?

The purpose is to provide you with the answers you need to feel more confident to use ROMS-BEC

1. Is the model constructed well?

2. What is the uncertainty in model predictions?

3. What things can we do to improve our confidence in the model?

With CTAG and other Partners, We Are Addressing the Challenges in Pulling off a Successful Peer Review

<u>Challenges</u>

1. Financial

2. Create confidence in the review process

   - Right charge questions

   - Right experts

   - Affirm that process is truly independent

<u>Solutions</u>

Calif. Assoc. of Sanitary Agencies has agreed to fund

Move deliberately to get consensus with CTAG on the process

What Does that Process Look Like?

1. Establish a steering committee

   Balance of regulated and regulatory agencies and scientists

2. Identify facilitator for process

   National Water Research Institute is a leading candidate for this role

3. Identify the format for meetings and desired timing

4. Identify the charge questions

5. Identify the criteria to select expert panelists

   Range of expertise and experience needed

6. Facilitator identifies candidates

   Steering Committee members have right to reject any candidate

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Timing, Interim and Final Products

Model Validation

- Workplan
- Oral findings
- Journal manuscript

Natural Variability Study

- Workplan
- Oral findings
- Journal manuscript

Model formulation and validation

Model applications

Peer Review

- Workplan
- Steering Committee selected
- Facilitator engage
- Format, charge questions, criteria for panelist selection
- Meeting #1 (September 2023)
- Meeting #2 (April 2024)
- Meeting #3…etc
- Final report

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Comments? Questions?