STAC Review of the CBP Partnership's **Climate Change Assessment Framework (CCAF) …**

Maria Herrmann

The Pennsylvania State University

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Panel

- Scott Doney – University of Virginia
- Tal Ezer – Old Dominion University
- Keryn Gedan – George Washington University
- Maria Herrmann – Penn State
- Philip Morefield – US EPA
- Barbara Muhling – Univ. of California Santa Cruz
- Douglas Pirhalla – NOAA
- Stephen Shaw – SUNY-Environm. Science & Forestry

Review request

- Request: conduct an evaluation of the Partnership's climate change assessment framework and plans for incorporating climate change into programmatic efforts;
- Format: 16 specific questions
  - WS model
  - WQST model

What does it mean "to incorporate climate change into …"?

Global climate change → Chesapeake climate change

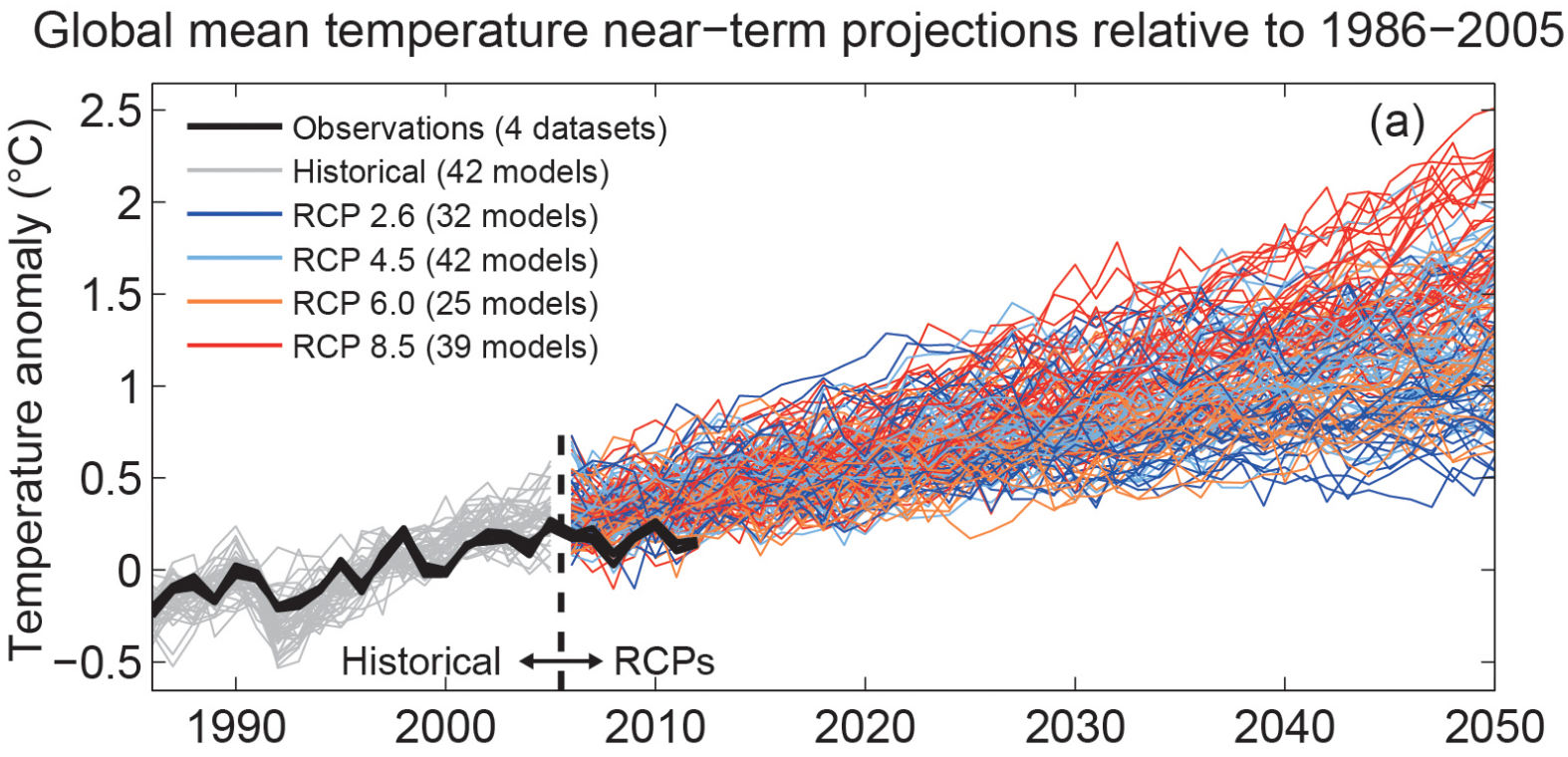

Fig. TS.14 from IPCC, AR5, Technical Summary

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Global climate change → Chesapeake climate change

Variables?
RCPs?
GCMs?
Downscaling?

What does it mean ”to incorporate climate change into …”?

Global climate change → Chesapeake climate change

Variables: temp, precip
RCP: 4.5 & 8.5
GCMs: median and 80% CI
Downscaling: BCSD

Selection of RCPs

- The approach to select RCPs and largely follows accepted practices in the climate change impacts research community;
- While different RCPs are not likely to diverge strongly at the 2025 timescale, more difference in the RCPs should be expected in the longer-term projections.

Selection of GCMs

- The full uncertainty in future climate effects is underestimated by the current set-up of model selection, which uses the 10th and 90th percentiles of GCM projections, rather than the full ensemble spread. While excluding a subset of models based on their historical performance is reasonable, excluding models based solely on their forward projections implies that one has reason to believe that these models are flawed, or their projections are unlikely.

Downscaling

- The use of readily available downscaled product (BCSD) rather than creating a customized downscaling procedure for the Chesapeake domain seems appropriate and justified.
- Consider conducting a review and an inter-comparison of multiple available downscaled products over the Chesapeake domain.

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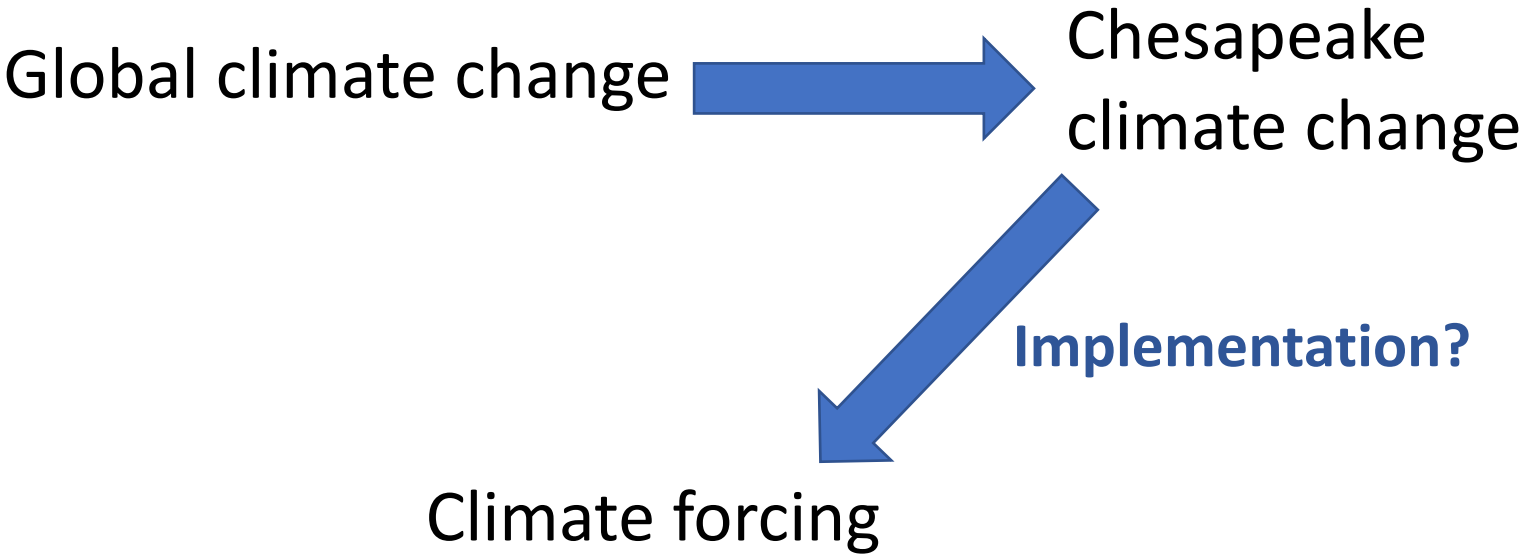

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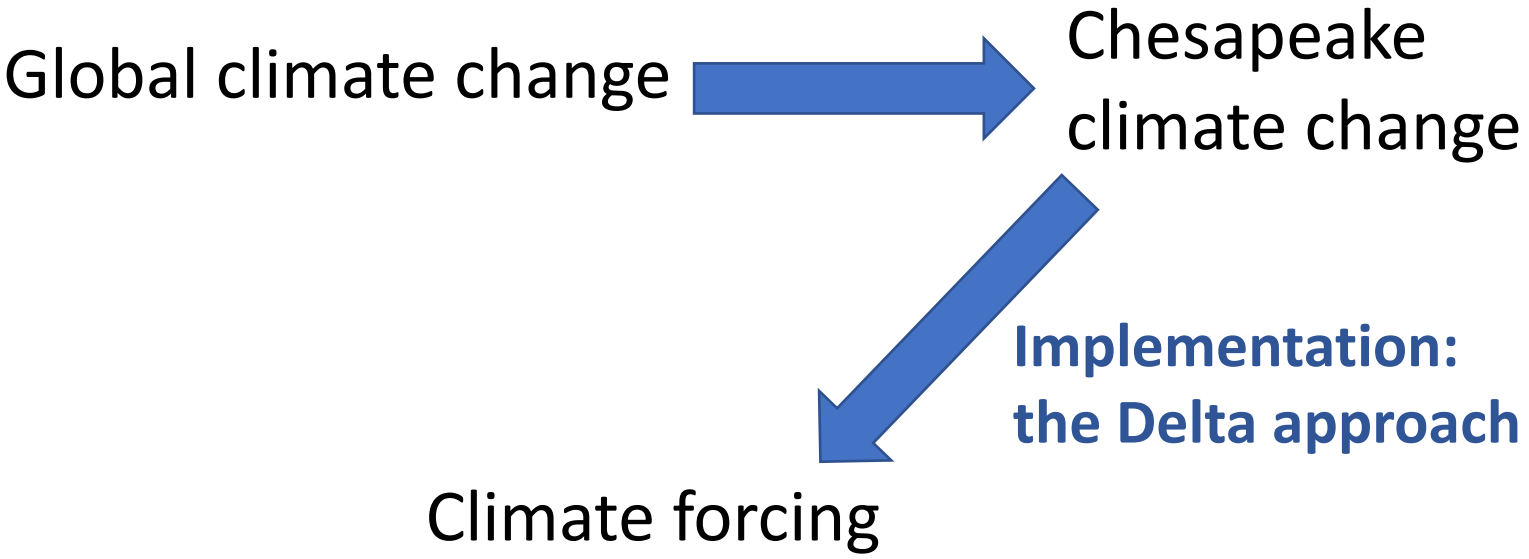

Implementation: the Delta Approach

The Delta Approach is well-designed to address changes in mean conditions but is not fully capable of analyzing future changes in variability and extreme events. To a large degree, the magnitude of the future precipitation events is being dictated by the 1991-2000 baseline period used as the template for daily variability. While the panel does not necessarily suggest that the use of this 10-year period to set the variability is invalid, it seems essential to clearly document that this choice likely has a large role in establishing the magnitude of future extremes.

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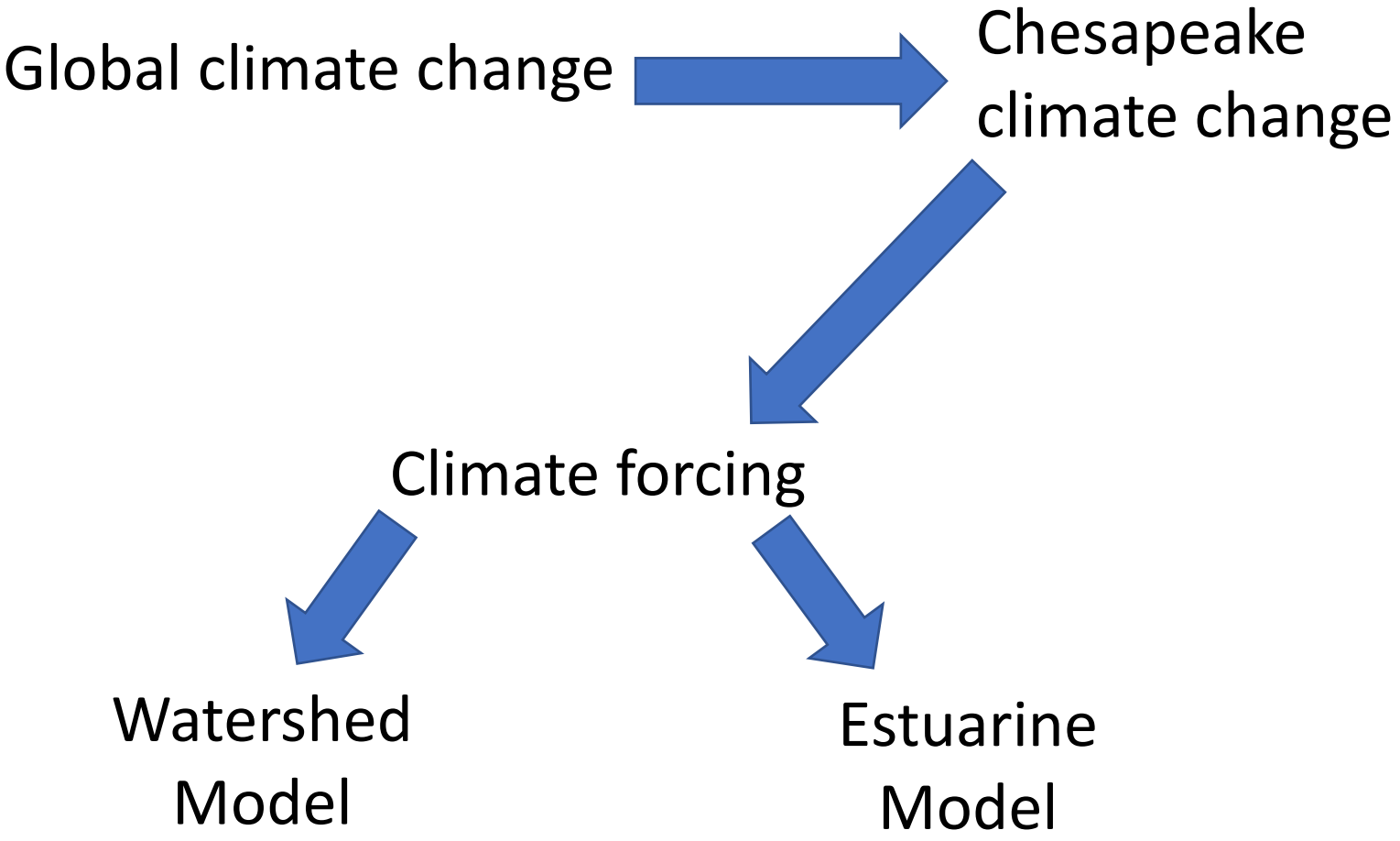

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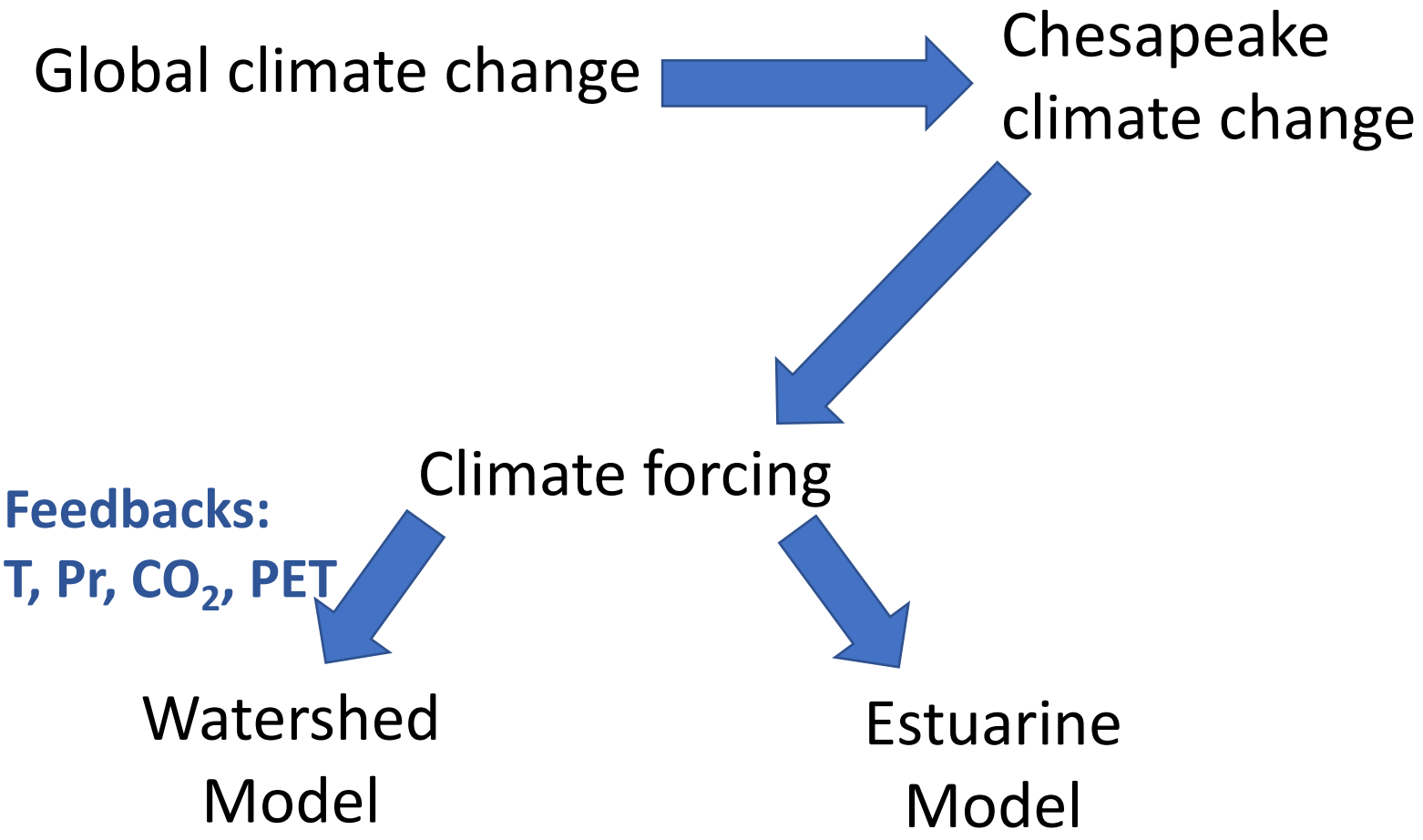

Implementation: Precipitation for 2025

- The panel has concerns related to the decision to extrapolate precipitation from the last 100 years out to 2025. The STAC Workshop report appropriately observed that precipitation is highly influenced by decadal-scale variations in climate, and recommended against extrapolation over the short term. However, it is not clear how extrapolating over the full record corrects for this decadal-scale, natural variability.

Implementation: Evapotranspiration

- The selection of “high precipitation/high temperature” and “low precipitation/low temperature” climate futures does not capture the full potential range of the boundary conditions for evapotranspiration.
- While Hargreaves-Samani is more favorable than the Hamon method, it may still be overestimating ET (although less so than Hamon) – need to acknowledge that ET estimates may still be biased high.

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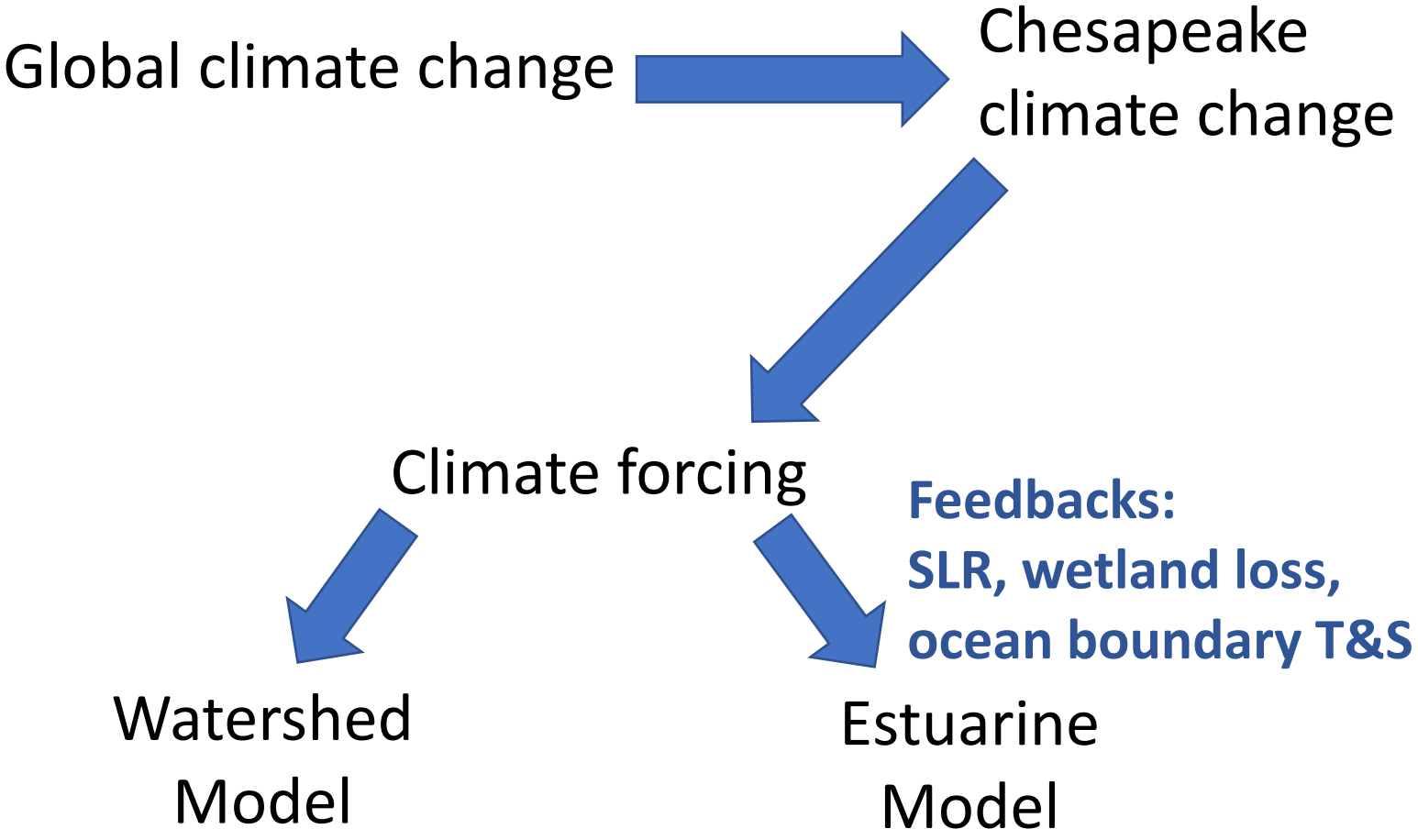


Implementation: SLR

- While the current treatment of relative and global mean sea level rise (SLR) seems appropriate, the potential overall impacts of SLR on the Chesapeake Bay most likely will go beyond what is included in CCAF (e.g., accelerated minor flooding), and should be discussed in the documentation.
- The panel notes inconsistency in the CCAF documentation in the definition of 'relative SLR' (relative to 2000, 1992, or 1995?); need to check that all projected numbers relate to the same reference level.

Implementation: Tidal wetlands

- The panel agrees with the conclusions of the CBP that there remains uncertainty in the response of tidal wetlands, but that the Sea Level Affecting Marshes Model (SLAMM) provides the most useful and applicable tool available for the geographic region at this time.
- Consider upgrading to the use of the most resent SLAMM version highest resolution DEM.

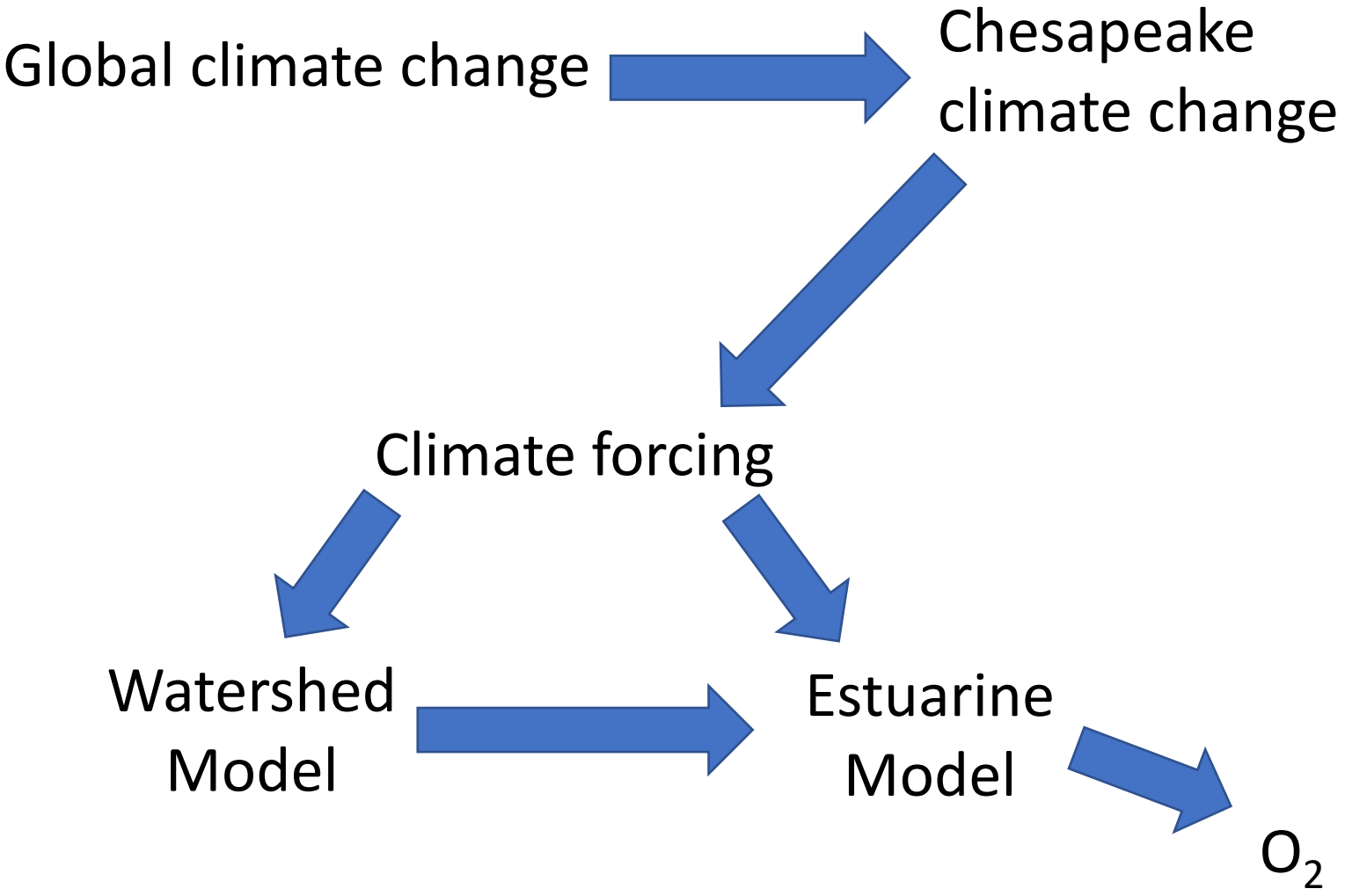
Main conclusions

- The panel greatly appreciates the effort that was taken to incorporate the latest climate science into the CBP modeling suite. Given the current state of knowledge, the combination of using climate model projections and downscaling provides an acceptable baseline for estimating changing climate conditions for the Chesapeake Bay, and the panel finds the CCAF approach to be fundamentally sound.

Main concerns

- The panel had a number of concerns about the details of the CCAF strategy; details were not adequately addressed in the provided documents.
- Recommendation: prior to taking any further steps with CCAF, integrate the collection of document, reports, etc. and the webinar materials provided to the review panel into a single comprehensive document.

Conclusion: document and justify all choices made at each step in CCAF



Extra slides

Statistical downscaling solves two problems presented by GCMs:

- Spatial resolution is too coarse
- The models are biased

Why we use MACA among the many statistical downscaling choices:

- It has all the variables we need, except for downwelling longwave radiation
- It has the highest spatial resolution available (1/24^{o})

Projected annual temperature and precipitation change by the 20 GCMs