

# MODELING THE EFFECTS OF ANTHROPOGENIC NUTRIENT INPUTS ON OCEAN ACIDIFICATION AND HYPOXIA

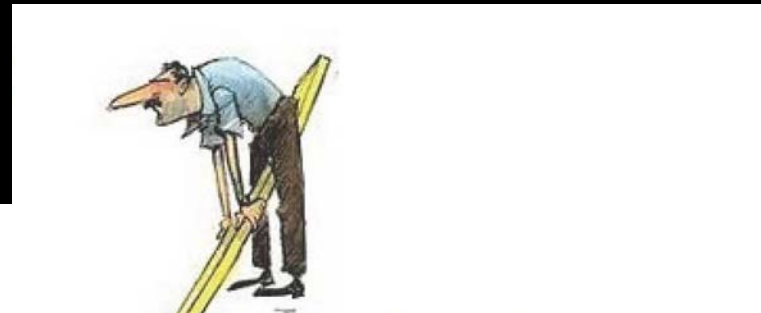


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# ARE ANTHROPOGENIC NUTRIENTS AN IMPORTANT DRIVER FOR OAH IN AN UPWELLING DOMINATED SYSTEM?

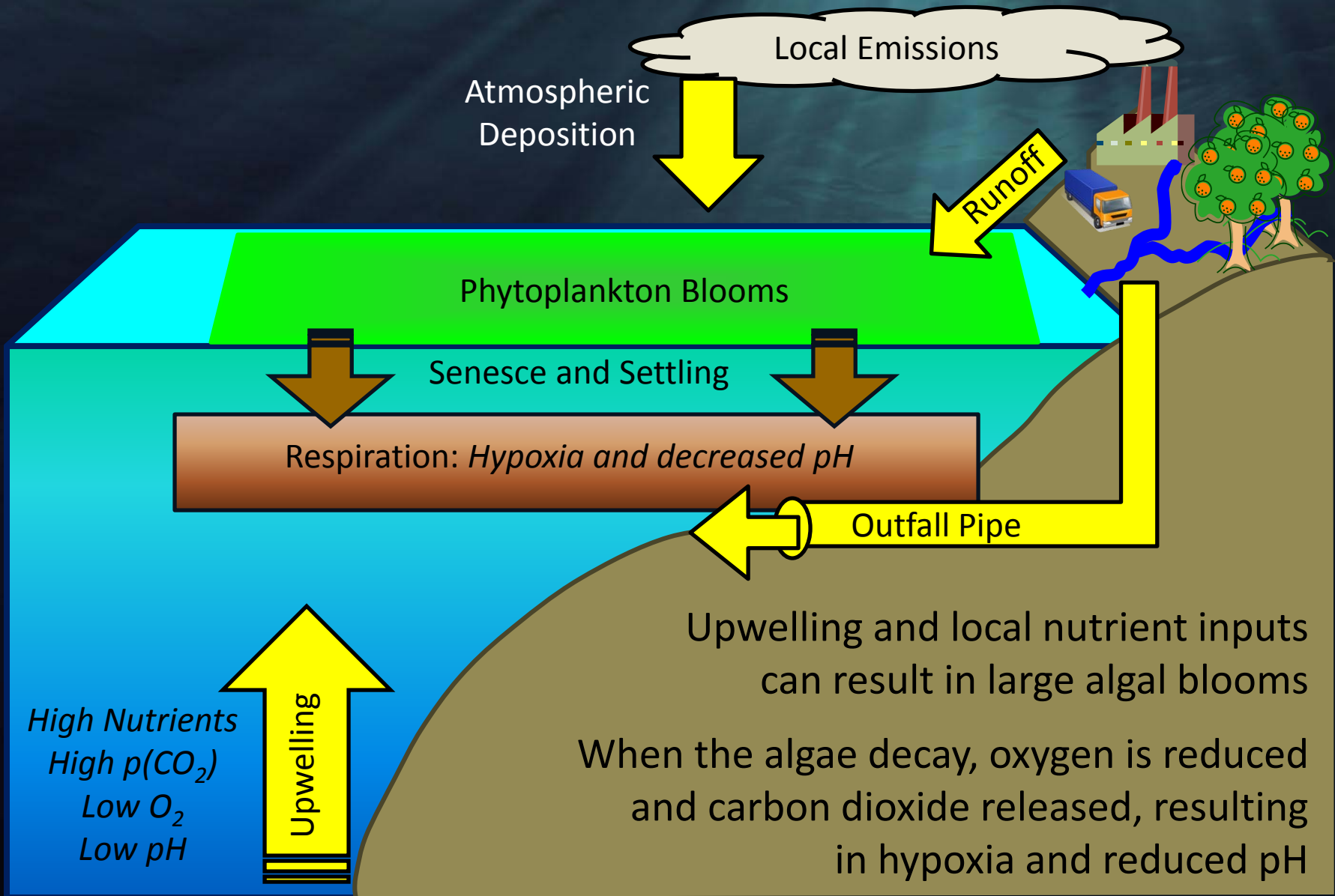
## Two Opposing Viewpoints

California is dominated by coastal upwelling therefore eutrophication is not a primary concern



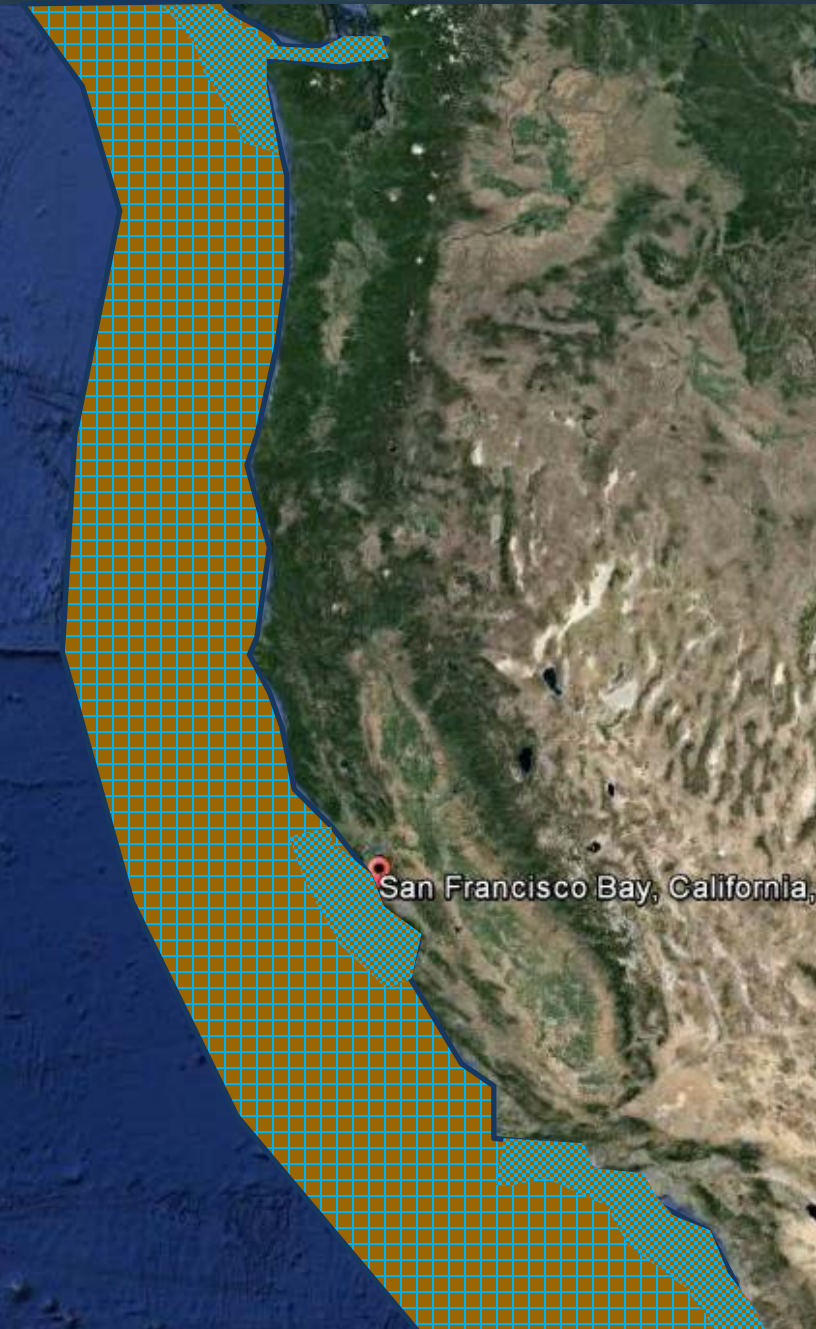
Global increases in human population, fertilizer use, oil consumption etc. inevitably lead to the the degradation of the environment including impacts to the coastal ocean

# CONCEPTUAL MODEL: EUTROPHICATION IN COASTAL WATERS



# WEST COAST OAH PANEL CALLS FOR COUPLED MODELS

- Identify areas along shelf with greatest susceptibility
- Predict future trends in DO and pH under climate scenarios
- Assess effects of anthropogenic inputs
- Applications for
  - Water quality management
  - Fisheries management
  - Marine spatial planning



# SCCWWRP HAS TEAMED WITH UCLA, UW, AND NOAA PMEL TO DEVELOP & USE MODELS TO INFORM MANAGEMENT

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- OPC provided funding to kick start project
- SCCWWRP & partners investing considerable funding to collect data
- Team was recently awarded \$1.4 million NOAA grant
- SCCWWRP will hire a modeler to share with UCLA as a post-doc

# PROGRAM GOALS

- Develop OHA model of California Current System (CCS), with regional downscaling
  - Southern California Bight, Central Coast, and the Oregon Coast
- Use the model to understand the relative contributions of following factors on OAH in CCS:
  - Natural climate variability
  - Anthropogenically-induced climate change
  - Anthropogenic inputs
- Transmit these findings to coastal zone water quality and marine resource managers

# APPROACH

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- Three main technical activities:
  - Downscale physical models and bring closer to shore
  - Better integrate local nutrient processes into the model
  - Add effects on lower trophic levels
- Validate!
- Run climate change and management scenarios
- Outreach to inform management actions

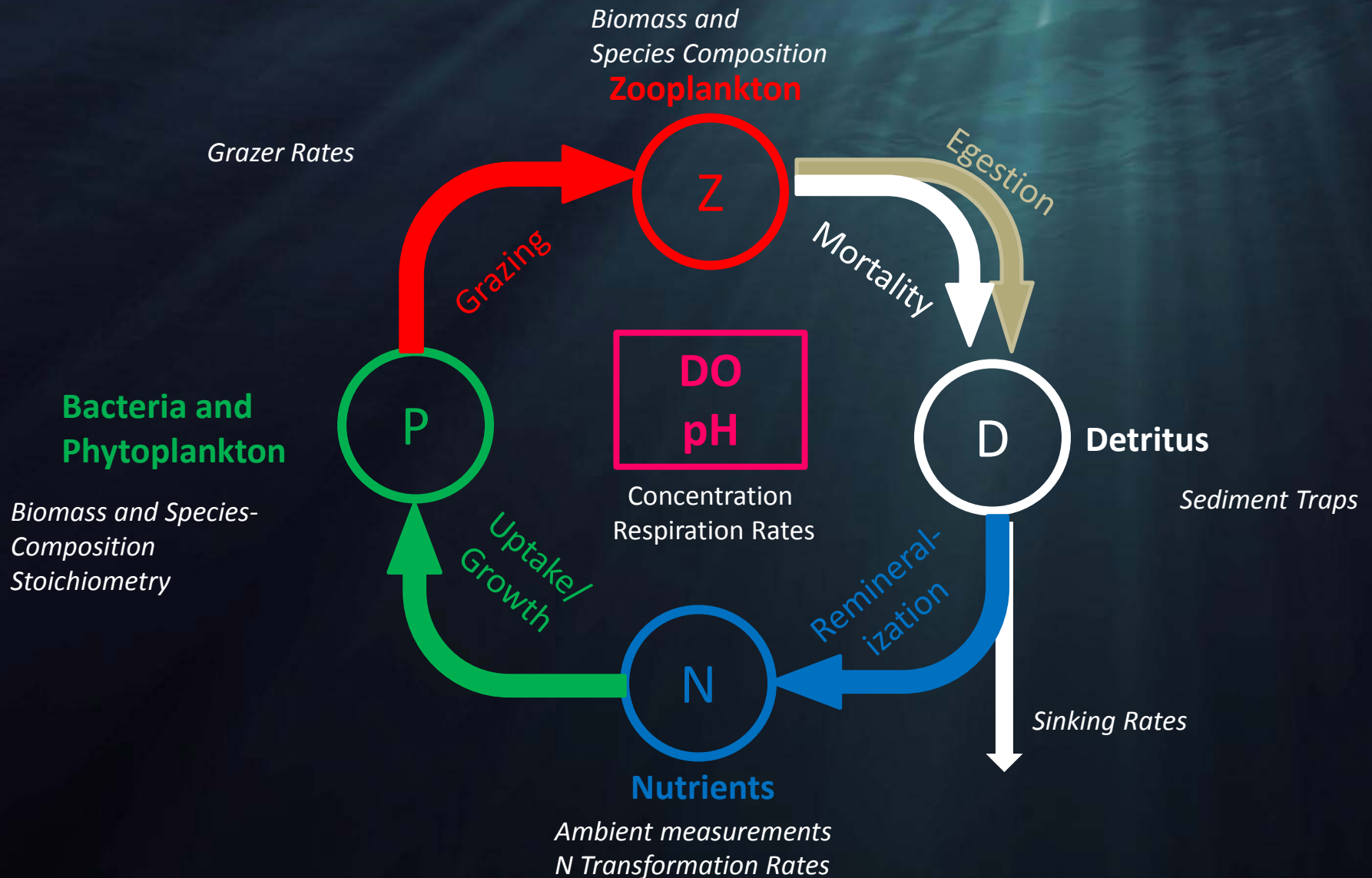
# SCCWWRP AND ITS MEMBERS PROVIDING DATA TO BUILD AND VALIDATE THE MODELS IN SCB

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- Compiling historical data (terrestrial and atmospheric inputs and ocean conditions)
- Improving monitoring going forward
  - Installation of moorings for continuous monitoring
  - Improved pH measures in your quarterly sampling
- Conducting biogeochemical process studies



# BIOGEOCHEMICAL MODEL: RATES AND INFORMATION NEEDED



# MODELING SCENARIOS WILL BE INFORMED THROUGH DISCUSSIONS WITH MANAGERS

- Current day with and without anthropogenic nutrient reductions
- Future climate change (IPCC 2050-2070), with and without anthropogenic nutrient reductions
- CTAG will be a key partner in this process
  - In defining the scenarios to be evaluated
  - Discussion of management endpoints use to interpret the output

# ANTICIPATED PRODUCTS IN 2018

- Refined coupled physical –biogeochemical model for California Current
  - Downscaled to regions of intense management interest
  - Validated to quantify uncertainty for OAH
  - Other uses....
- Early discussion of biologically-relevant OAH endpoints
- Science and management outreach products quantifying effects of anthropogenic nutrient inputs and identifying OAH hotspots

# Questions?

