ASSESSMENT OF THE COASTAL EUTROPHICATION IN THE SOUTHERN CALIFORNIA BIGHT

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Introduction

We conducted an ocean numerical modeling study of the effects of anthropogenic coastal nitrogen and carbon export on the carbon, nitrogen, and oxygen cycles in coastal region of the Southern California Bight.

The model is being used to assess if wastewater and stormwater nitrogen (Fig. 1) from 20 million is exacerbating the increasingly global threat of ocean acidification and deoxygenation and their potential effects on the marine ecosystems.
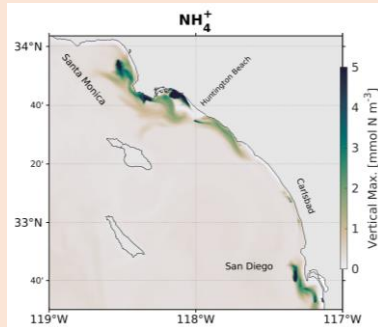

Fig 1, showing inputs of high NH4+ concentrations in 02/1997

ROMS-BEC – the **R**egional **O**ceanic **M**odeling **S**ystem is fully coupled to the **B**iogeochemical **E**lemental **C**ycling model at a resolution of 300m and forced by WRF dx = 6km

Terrestrial forcing – Time series of terrestrial (rivers and wastewater) and atmospheric fluxes of nutrients and carbon were compiled to force the model

Configuration and validation

The model has been evaluated against a consistent set of data from CalCOFI, POTW agency and remote sensing (e.g. Fig 2)
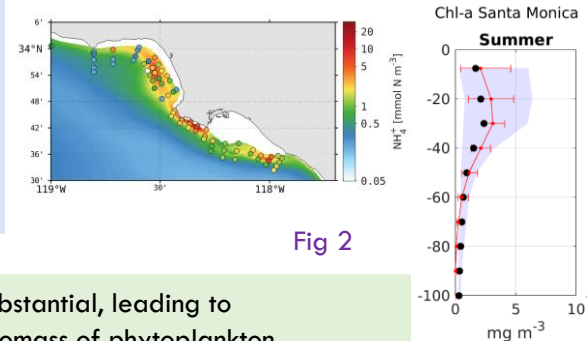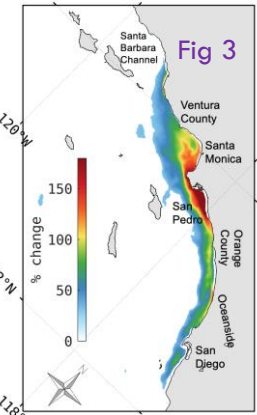

Fig 2

Fig 3

The increase of phytoplankton productivity in the coastal ocean (Fig 3: % change in productivity by nutrients loads) impacts subsurface carbon and oxygen cycles and is likely to compress habitat for a variety of marine organisms, with cascading ecological effects.

Major findings

The human effects on the regional ecosystem are substantial, leading to
- Significant increases in the photosynthesis and biomass of phytoplankton,
- Increase in oxygen loss (4-a) and acidification of the water column. (Fig 4: an average cross section in Santa Monica Bay shows that the amplification of photosynthesis at the surface causes increase of oxygen, and at depth, settling of the organic matter causes a loss of oxygen).
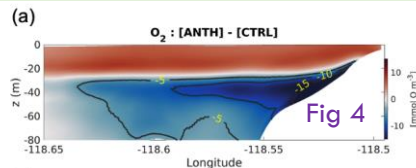

Fig 4

Next steps In collaboration with the state and local stakeholders
1) Update the runs to present years [2000-2020],
2) Conduct source attribution studies (point vs non-point source),
3) Run wastewater recycling and nutrient management scenarios

Acknowledgements