

# TROPICAL PACIFIC OCEAN PROCESS STUDIES

## Decoding the Tropical Pacific for Observing and Models

The Tropical Pacific Observing System (TPOS)<sup>1</sup> redesign will deliver a capable, multi-discipline system to improve subseasonal and longer forecasts. Process studies to fill knowledge gaps in ocean-atmosphere connections are essential to refine TPOS and enhance connections with predictive models<sup>2</sup> To make progress and realize the goals of national and international initiatives<sup>3</sup>, we need to observe processes that have never been measured and translate this knowledge into observing networks and modeling systems advancements. CPO's Climate Variability and Predictability (CVP) Program is furthering modeling and pre-field planning in support of these recommendations.

<sup>1</sup>TPOS is supported by NOAA's Global Ocean Monitoring and Observing Program (GOMO), Pacific Marine Environmental Laboratory (PMEL), Climate Program Office (CPO), with significant engagement from the National Weather Service and international partners,

<sup>2</sup>The First Report of TPOS 2020, <sup>3</sup>[NOAA PPGC](#), [WCRP GPEX](#)



*Process studies can leverage the new features of the redesigned observing system: buoys, satellites, and autonomous instruments propel the forecast system.*

## NOAA Programs advance community activities for TPOS.



technology development  
pilot studies funded in FY16



phase 1 pre-field modeling  
studies funded in FY18



phase 2 pre-field modeling  
studies funded in FY22



Workshops with USCLIVAR

## Advancing Planning for Process Studies in the Tropical Pacific

**Eastern Region focusing on Cold Tongue**

Upwelling/mixing physics and parameterization in ocean circulation and climate models, and on the minimum sustained observations needed to quantify the Pacific upwelling and monitor changes over time  
*(see the white paper)*

**Central Region focusing on Eastern Edge of the Warm Pool (EEWP)**

Air-sea interactions and the role of upper ocean salinity layers in maintaining warm surface waters at the eastern edge of the west Pacific warm pool, focusing on air-sea coupling on intraseasonal timescales  
*(see the white paper)*

**Eastern Cold Tongue Region**

**Anna-Lena Deppenmeier**, Mixing and upwelling processes in the Equatorial Pacific Cold Tongue

**Matthew Mazloff**, Mixing processes and larger scale forcing of upwelling in the Tropical Pacific Ocean

**Andrew T. Wittenberg**, Equatorial Pacific Climate Processes via Hierarchical Coupled Modeling

**Both Regions**

**Hyodae Seo**, Ocean-atmosphere-wave interactions in the Tropical Pacific

**Yolande Serra**, Capabilities of Uncrewed Surface Vehicles to study ocean phenomena in a virtual setting

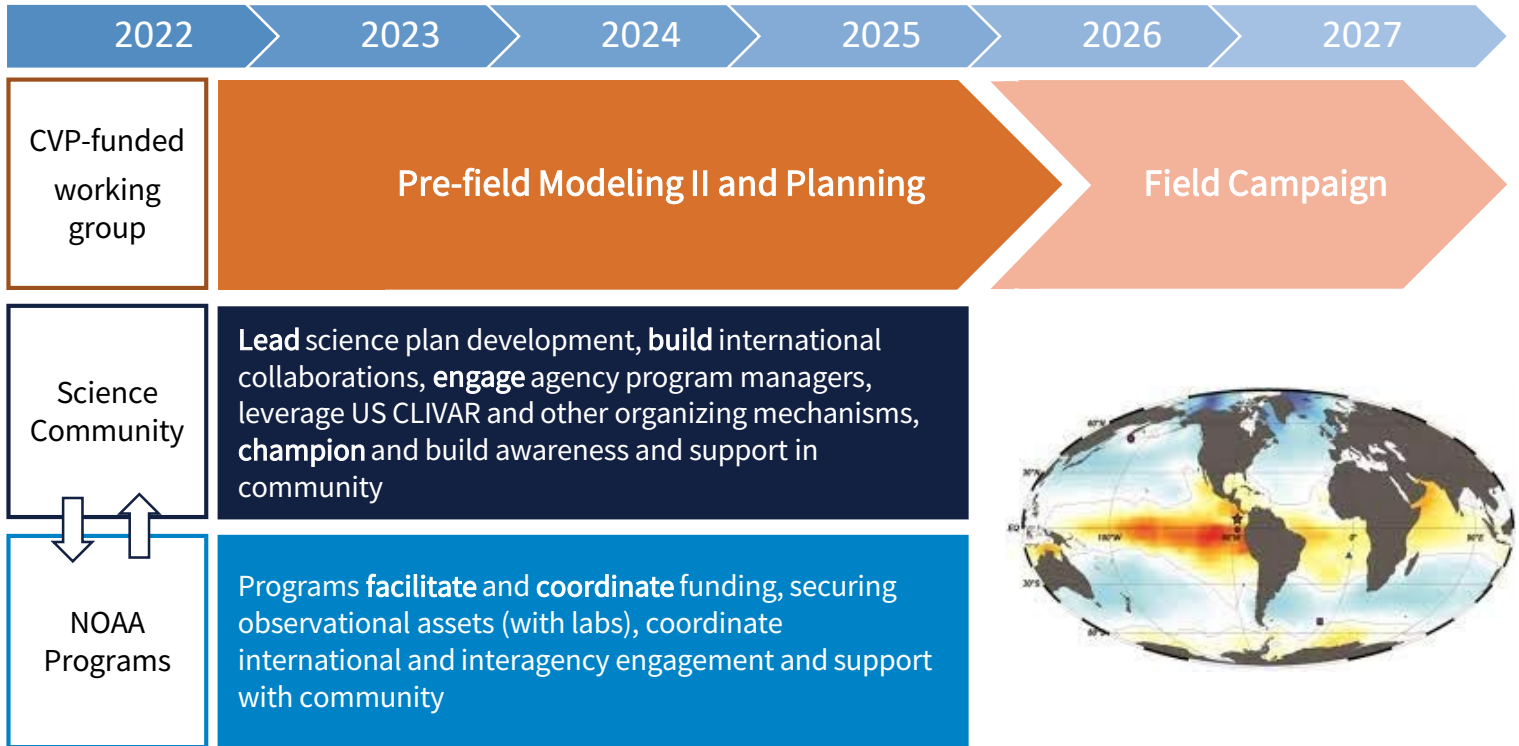
**Chidong Zhang**, Combined Uncrewed Systems deployed in a modeling framework to study the Air-Sea Transition Zone

**Central Region (EEWP)**

**Aneesh Subramanian**, Reducing systematic errors in modeling the coupled ocean-atmosphere boundary layer

**Carol Anne Clayson**, Field measurement strategy for the eastern edge of the warm pool in the tropical Pacific Ocean

# Current projects build upon previous investments to prepare for a field campaign.



## Partnerships are vital to the Tropical Pacific Ocean process studies.



### What are we working towards together?

Broad community and NOAA support for a science plan that has clear mutual benefits to participating nations

International partner engagement from the scientist to agency level to bring resources and observing assets to the field for research yielding outcomes

US federal agency awareness and participation in areas relevant to their missions

*Saildrones (left) are equipped to measure ocean and weather variables. (NOAA)*