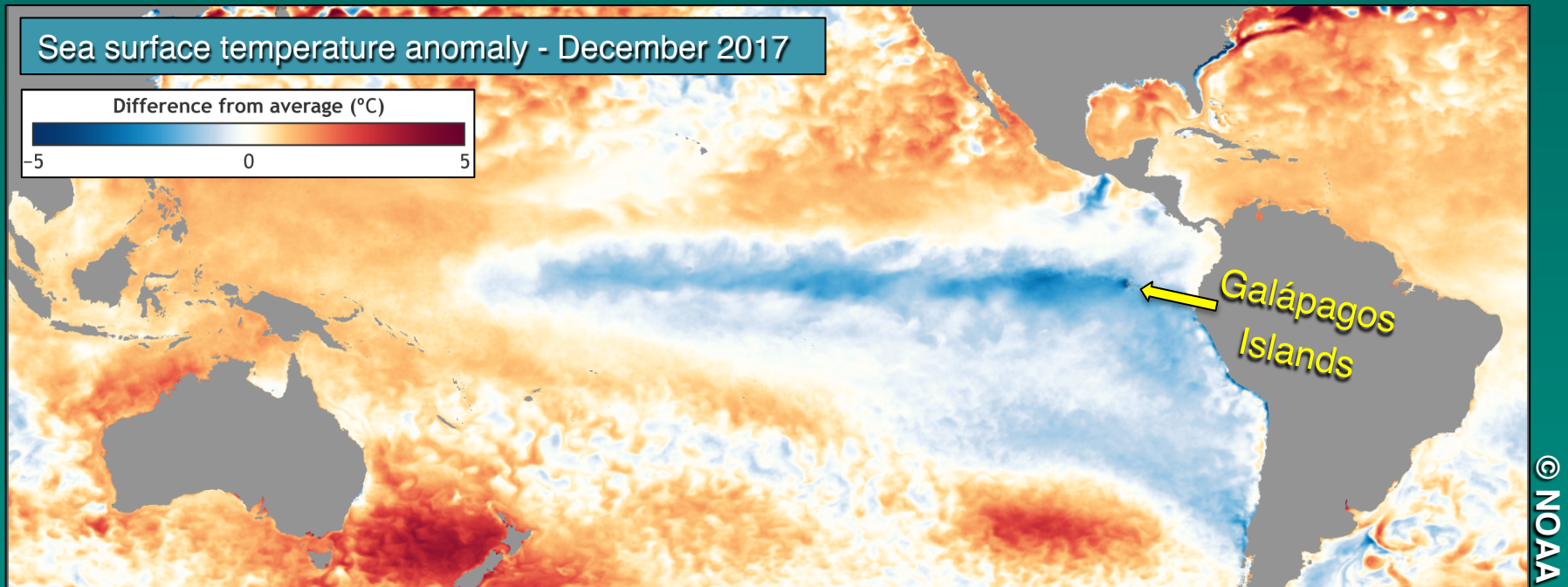


Predictability of the Galápagos Archipelago Upwelling Plume (P-GUP)



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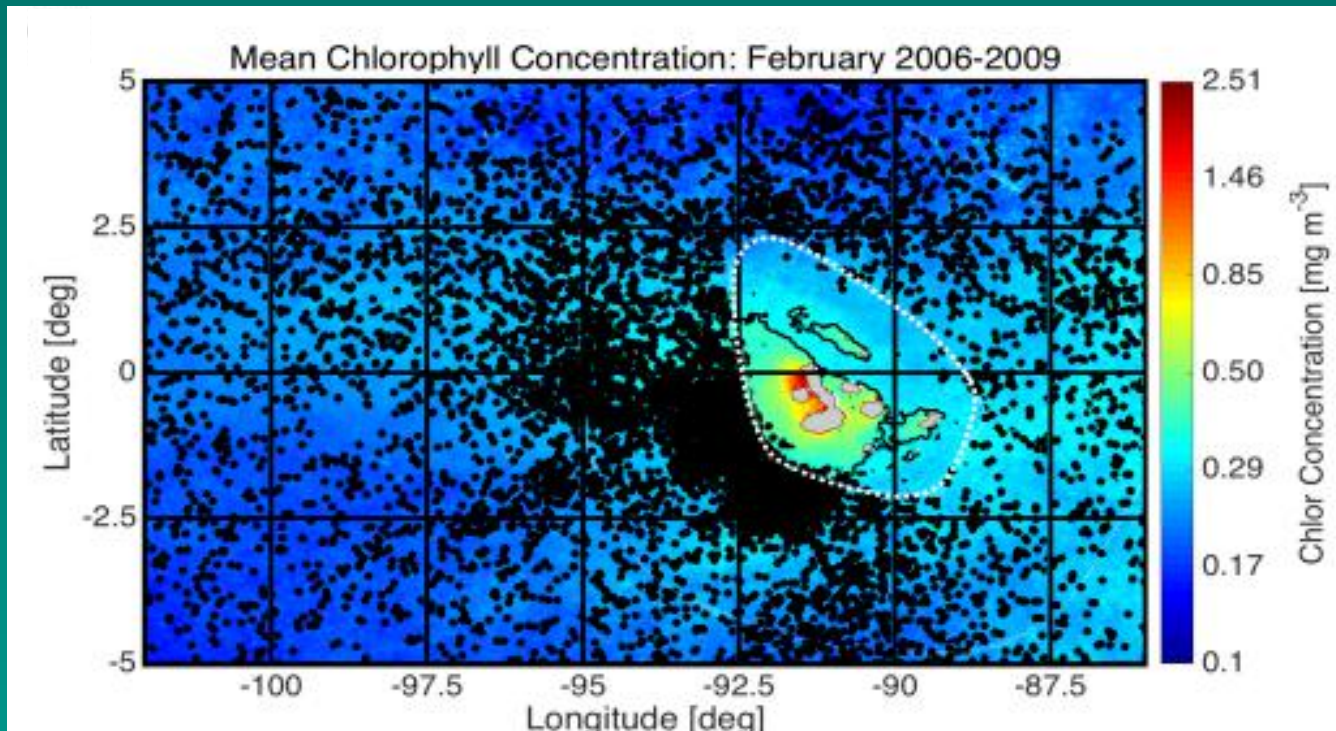
The Challenge

- Galápagos upwelling sustains an iconic biological hot spot, which underpins:
 - one of the world's largest UNESCO World Heritage Sites & Marine Reserves



The Challenge

- Galápagos upwelling sustains an iconic biological hot spot, which underpins:
 - one of the world's largest UNESCO World Heritage Sites & Marine Reserves
 - a major (US\$1 billion) tuna and shrimp fisheries industry

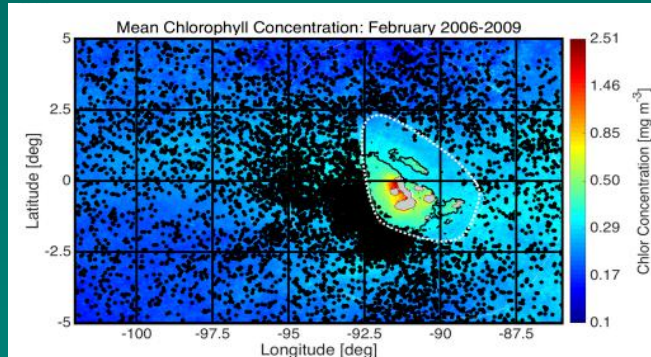


Modified from Palacios et al. (2006)

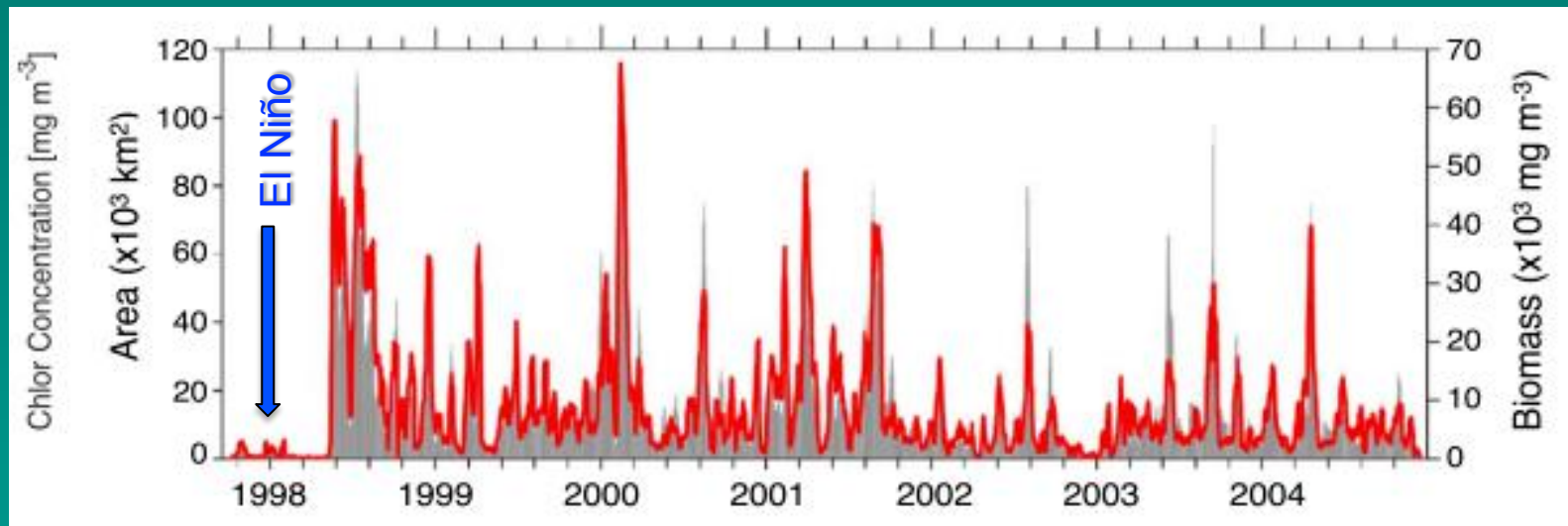
Satellite-measured chlorophyll (shaded) and locations of Ecuadorian industrial tuna fishing (dots). White dotted line: Marine Reserve boundary.

The Challenge

- Management of the tension between conservation and industrial exploitation made extremely challenging by the acute variability and climate sensitivity of Galápagos upwelling – the causes of which are unknown



Adapted from Palacios et al. (2006)

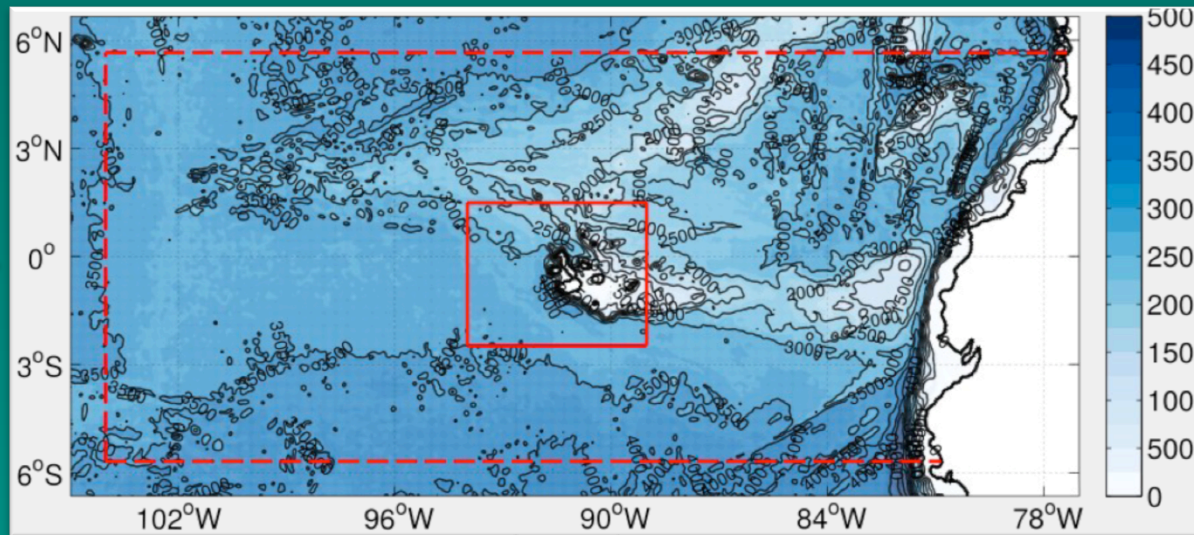


Satellite-measured time series of the area and chlorophyll biomass of the Galápagos upwelling plume

P-GUP Objectives

- To define, quantify and provide mechanistic understanding of the key processes controlling the rate of Galápagos upwelling
- To design and implement an ocean circulation model with the key processes – to support the follow-up development of a Galápagos upwelling prediction system

Bathymetry of the model domain (technical details available on request)



NERC-funded research on the Ocean Surface Boundary Layer (OSMOSIS)

- Advances in upper-ocean physics
- High-resolution (submesoscale) ocean modelling techniques

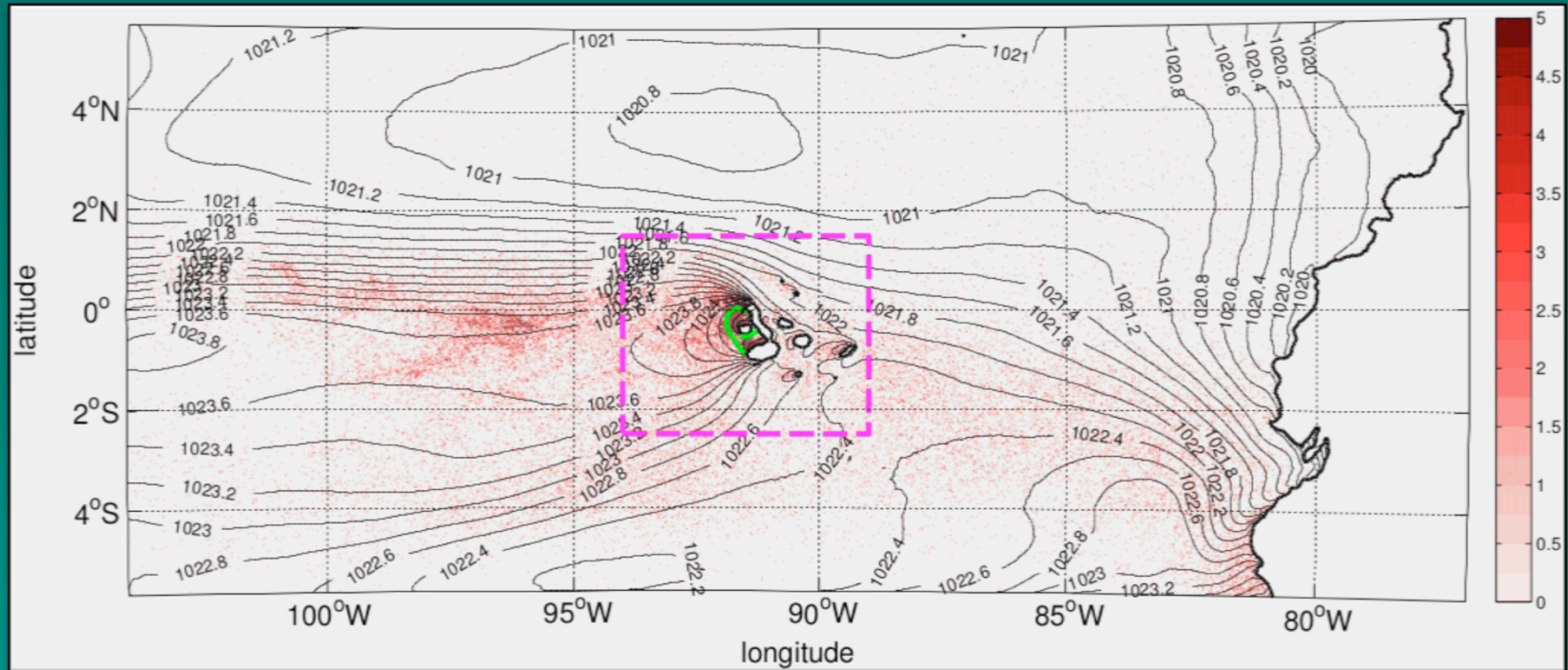
Team of Ecuadorian stakeholders

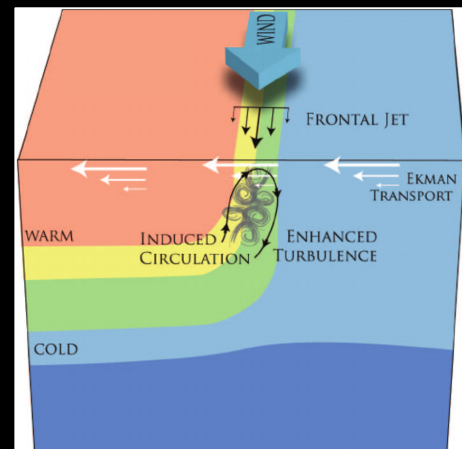
- Representatives of Ecuadorian Government, Navy & National Institute of Fisheries
- Conservation organisations (WWF, Conservation International)
- Ecuadorian biologists and economists at the Universidad de San Francisco de Quito

Key result

- Galápagos upwelling is controlled by northward winds interacting with sharp ocean fronts at the NW and SW tips of the archipelago

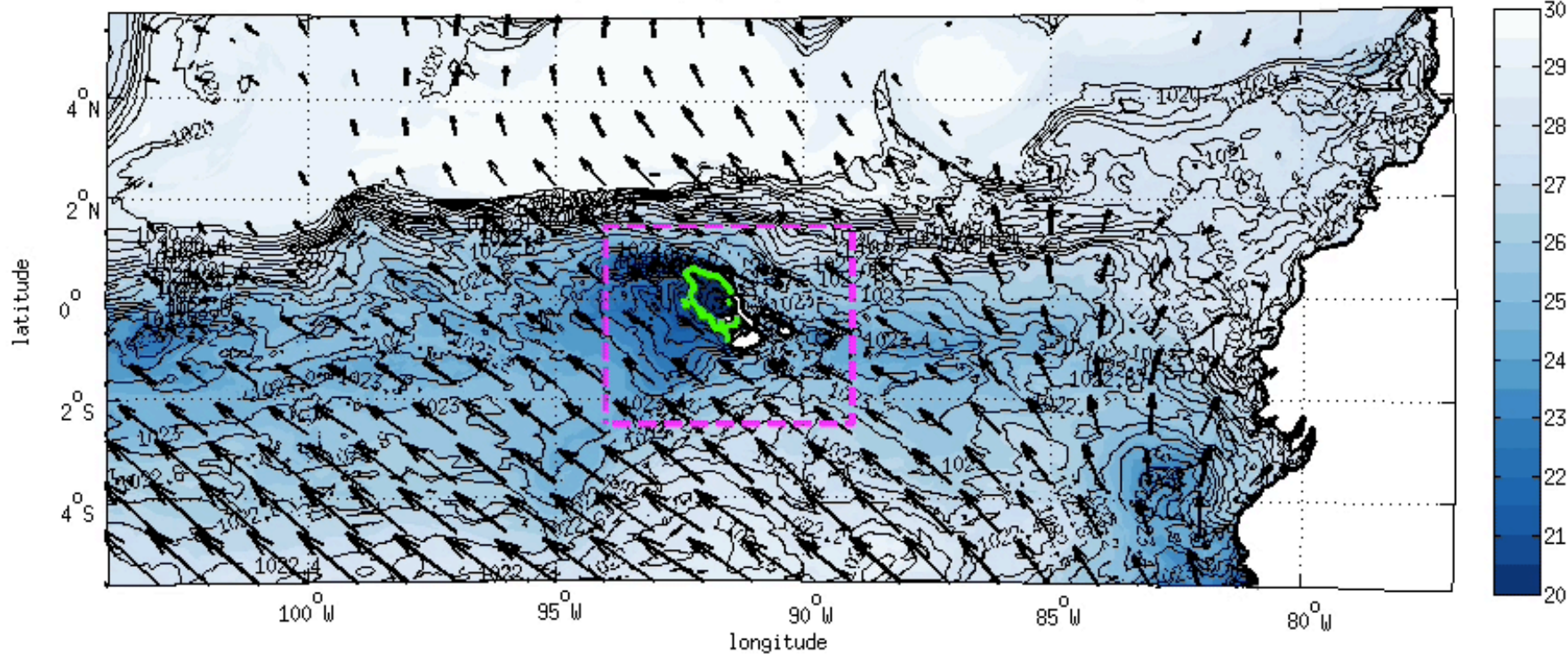
2-d histogram of the number of floats (released at 50-150 m west of 100°W) surfacing in each model grid point





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Sea Surface Temperature ($^{\circ}\text{C}$) 08-Apr-2010 (Wind Stress $> 0.01 \text{ ms}^{-1}$)



Outlook

- Ongoing translation of new physical understanding into a basic prediction system design
- Ongoing transfer of model to INOCAR (Oceanographic Branch of Ecuadorian Navy) for development of operational prediction system
- Knowledge exchange workshop in Puerto Ayora, Galápagos Islands, to discuss policy-relevant outcomes – May 2018
- Follow-up proposal to Schmidt Foundation to investigate ecosystem response to perturbations in Galápagos upwelling – June 2018

