

# The Kon Tiki 2 Expedition: Documenting Climate Change, Litter and Pollution

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# From Peru to Easter Island and back



Easter Island

**Kon-Tiki II**  
2 rafts 2015/2016:  
Tupac Yupanqui &  
Rahiti Tane



# KON TIKII

# Kon Tiki 2 Expedition

## Leg 1: 2015



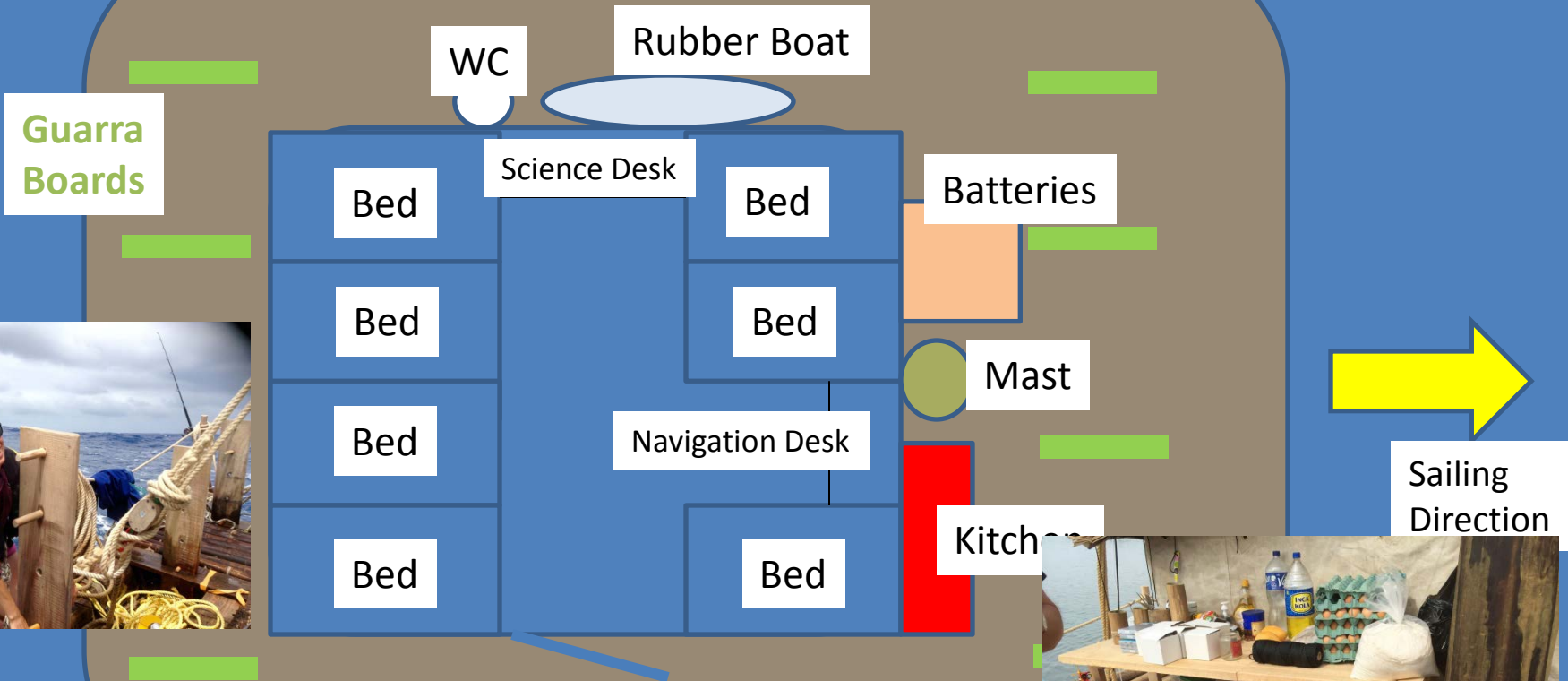
Photo Credit @KonTiki2 Expedition



# KON TIKII



## Raft design



# KON TIKII



Rahiti Tane, solar panels

**Photo Credits @KonTiki2 Expedition**



Official page for the Kon-Tiki2 Expedition

www.kontiki2.no/science

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KON TIKI II

Kon-Tiki2 is sailing two balsa rafts from South America to Easter Island. Roundtrip. Documenting climate change, marine life, plastics, pollution, guara board navigation, and human reactions to Pacific sunsets

Cecilie blogger også på norsk

# KON TIKI 2 SCIENCE PROGRAM

When the two rafts of the Kon Tiki 2 Expedition sailed from Lima in November they were equipped for full-scale ocean and climate research. During the two legs – Peru to Easter Island before Christmas and Easter Island to Peru after Christmas – the rafts will make thousands of measurements in order to understand how changes in marine life relate to climate change and ocean pollution. The expedition takes place during the El Nino of 2015/2016, a fortunate fact which will deeper insights into the interactions between the marine ecosystem and the changing marine environment. It also takes place during the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change, which makes it timely to "give the ocean's a voice". So what will we measure on our trip?

**Tweets**

**Kon-Tiki2 Expedition** @kontiki2 19h  
Spotted from Tupac Yapanqui. #whale? Call to all #marine #biologists...tell us what we saw! youtu.be/4w55durxmh4 Show Media

**Kon-Tiki2 Expedition** @kontiki2 16 Nov  
TY sail like tupaq, drink like tupaq, eat like rahiti Expand

**Kon-Tiki2 Expedition** @kontiki2 15 Nov  
TY @nrk #p1 #brønsj ringte. @wiumlie måtte fortelle sannheten om torgeirs fisk tilnå: 0 Expand

**Kon-Tiki2 Expedition** @kontiki2 15 Nov  
RT: Yesterday's Laugardag makes the raft smell good. Sunday morning w capt'n's yoga, doc's swim and fresh coffee. Expand

drone2-s.jpg IMG\_7308-s.JPG IMG\_7270-s.JPG IMG\_7232-s.JPG IMG\_7296-s.JPG Show all downloads...

NO 00:12 18.11.2015

1. [Marine Litter: Plastic and micro plastic pollution](#)
2. [Climate change and ocean acidification](#)
3. [El Nino and operational weather forecasting](#)
4. [Marine Life](#)

Bert van Bavel & Ian Allan

On-site analysis: Micro  
Near-Infrared Imaging



## MICROPLASTICS

Three stage automatic sampler



Manta Trawl



## Passive sampler



## AERONET MARITIME AEROSOL NETWORK

+ AEROSOL OPTICAL DEPTH

+ AEROSOL INVERSIONS



## Phytoplankton

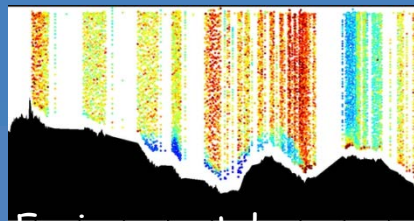
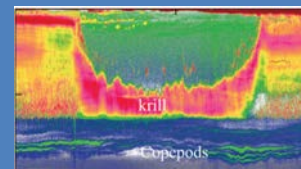


Scientific Equipment  
on Tupac Yupanqui &  
Rahiti Tane



Zoo-plankton  
and larger:  
Echo-Sounder

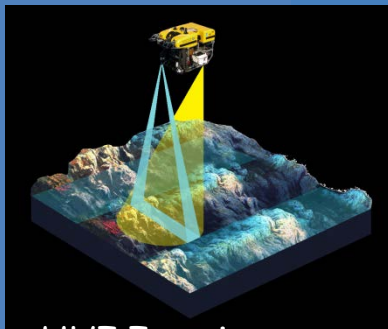
## DEEP OCEAN



Environmental  
Characterization  
Optics (ECOPuck)

KON  
TIKII

SURFACE OCEAN – Temp,  
sal, Ox, pCO<sub>2</sub>, pH, currents

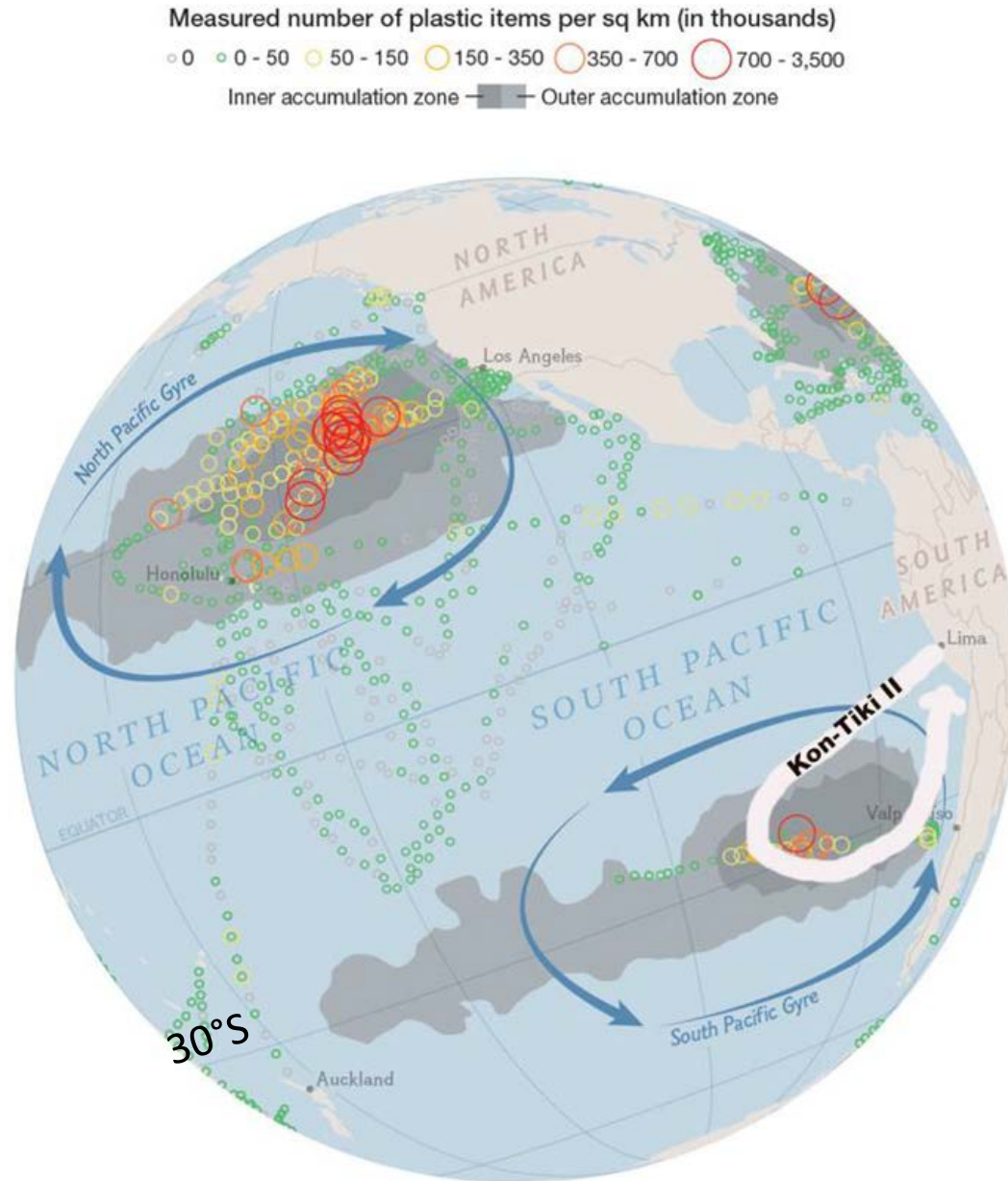


UHI Imaging



# KON TIKI II

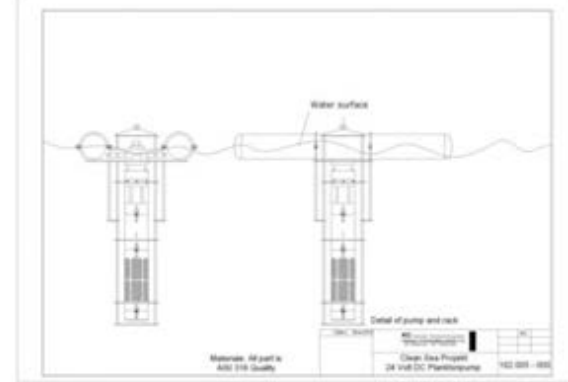
North Pacific  
plastic gyre:  
Discovered by  
Captain Charles  
Moore in 1997.





# Innovative tools for marine litter monitoring and remediation

Contact person: Bert van Bavel, NIVA

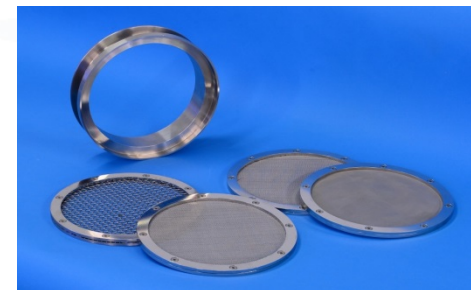


## Manta trawl (Eriksson et al.)

- 300  $\mu\text{m}$ 
  - 0.5 microplastics /  $\text{m}^3$

## Micro plastic sampler (Noren et al.)

- 80  $\mu\text{m}$ 
  - 150-2400 microplastics /  $\text{m}^3$
- 10-500  $\mu\text{m}$ 
  - 200-1000 microplastics /  $\text{m}^3$



## Three stage sampler

- 500  $\mu\text{m}$ , 300  $\mu\text{m}$  50-100  $\mu\text{m}$
- Surface and water column (deep sea water)
- Large volume > 10 000 L/hour

To our knowledge, this is the first time size distribution data have been obtained in any of the 5 Gyres.



CleanSea



# Manta Trawl on Tupac Yupanqui

KON  
TIKII



Photo Credits @KonTiki2 Expedition



# 3 –stage sampler on the Tupac Yupanqui



KON  
TIKII



Photo Credits @KonTiki2 Expedition



# The Southeast Pacific Garbage Patch:

## What I expected:

“For many people, the idea of a “garbage patch” conjures up images of an island of trash floating on the ocean. In reality, these patches are almost entirely made up of tiny bits of plastic, called microplastics. Microplastics can’t always be seen by the naked eye. Even satellite imagery doesn’t show a giant patch of garbage. **The microplastics of the Great Pacific Garbage Patch can simply make the water look like a cloudy soup.** This soup is intermixed with larger items, such as fishing gear and shoes”

## What I got:



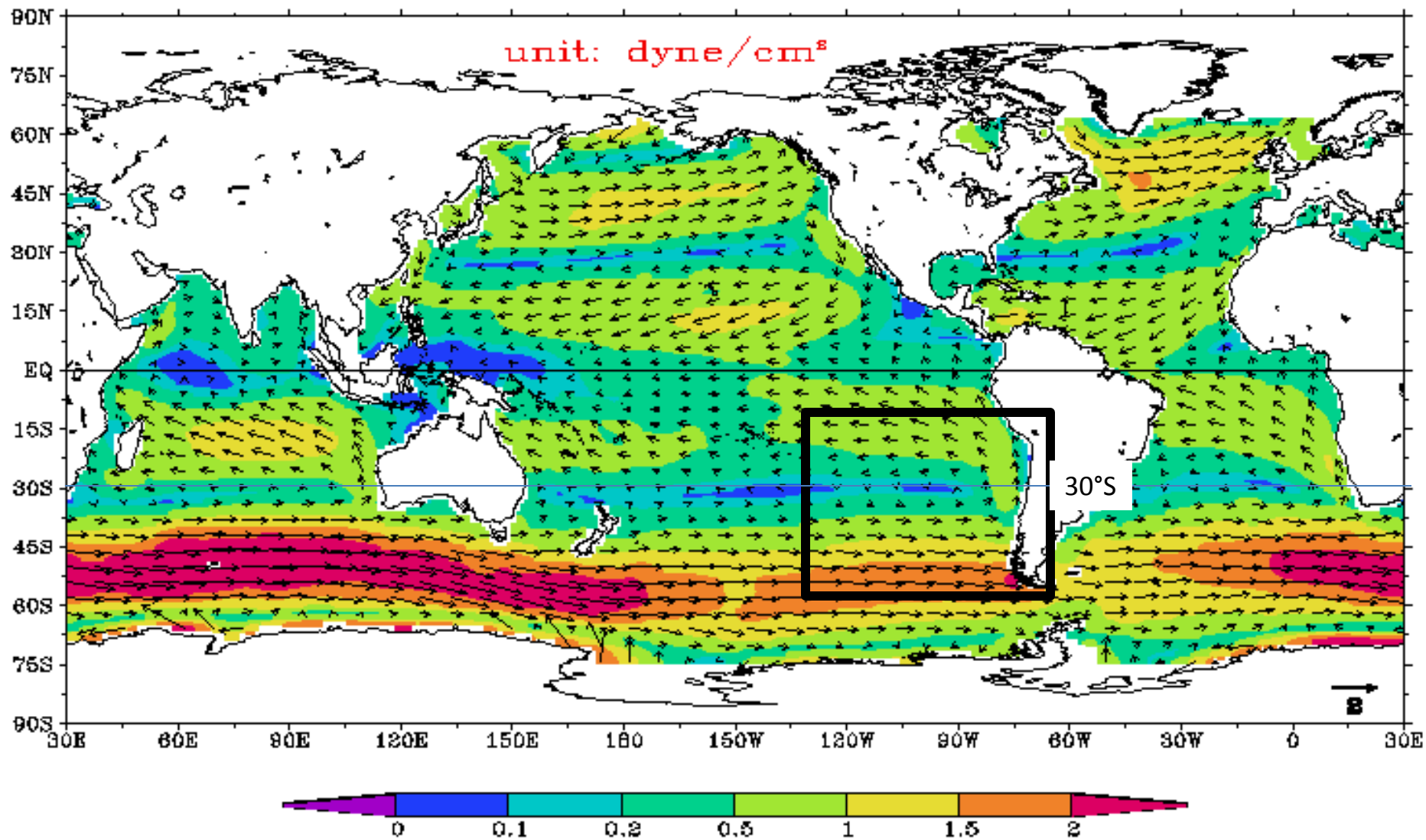
Hmmmm

Photo Credits @KonTiki2 Expedition

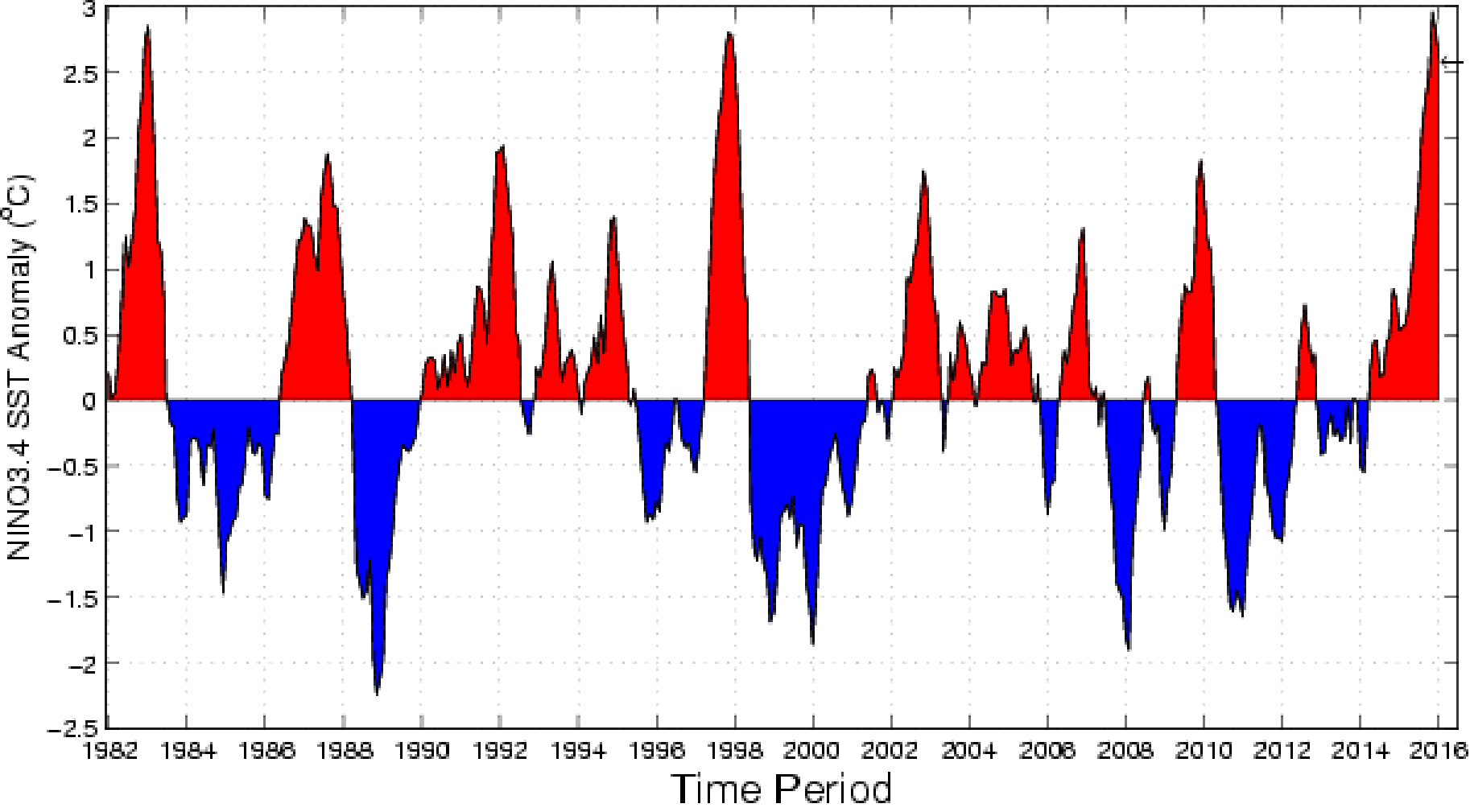


NATIONAL GEOGRAPHIC

# GODAS Wind Stress, 1982–2004 Ann



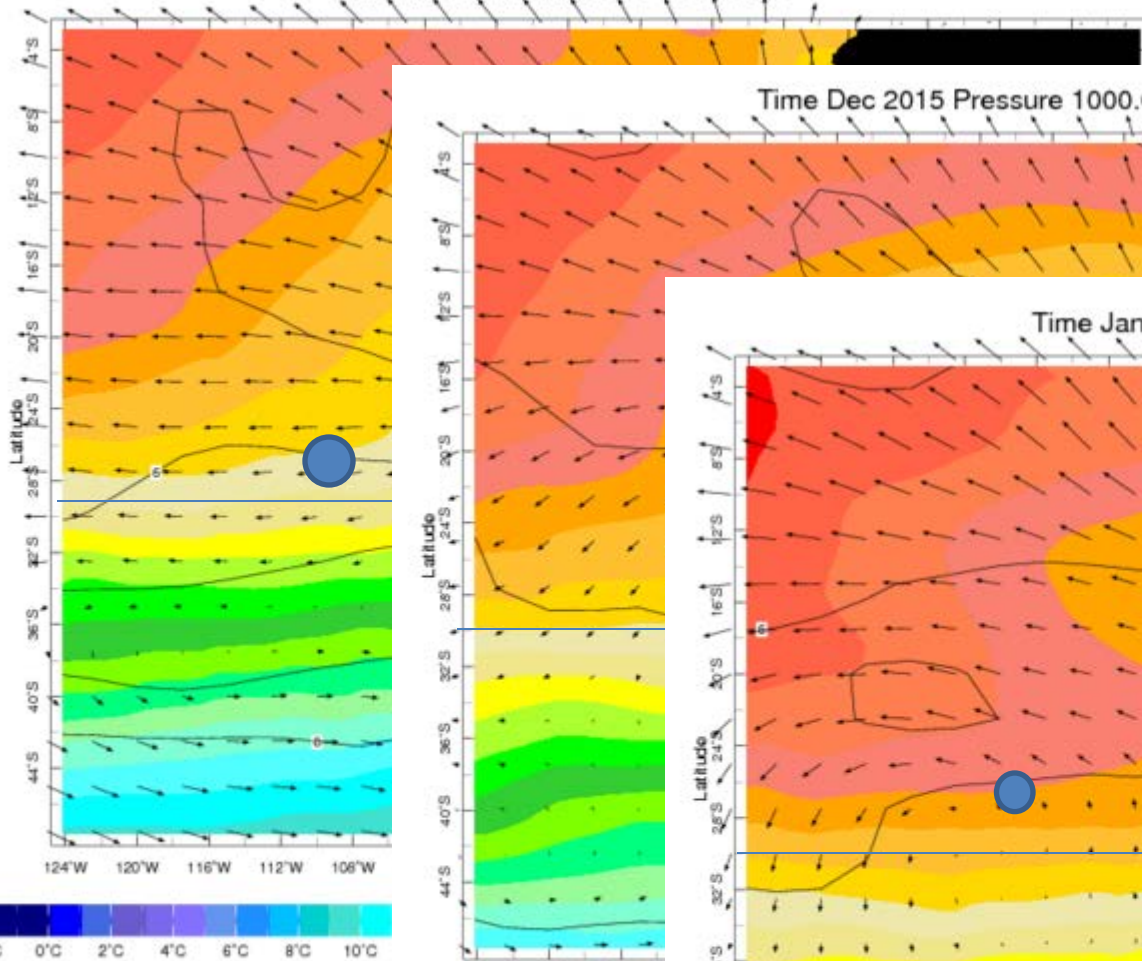
# Historical NINO3.4 Sea Surface Temperature Anomaly



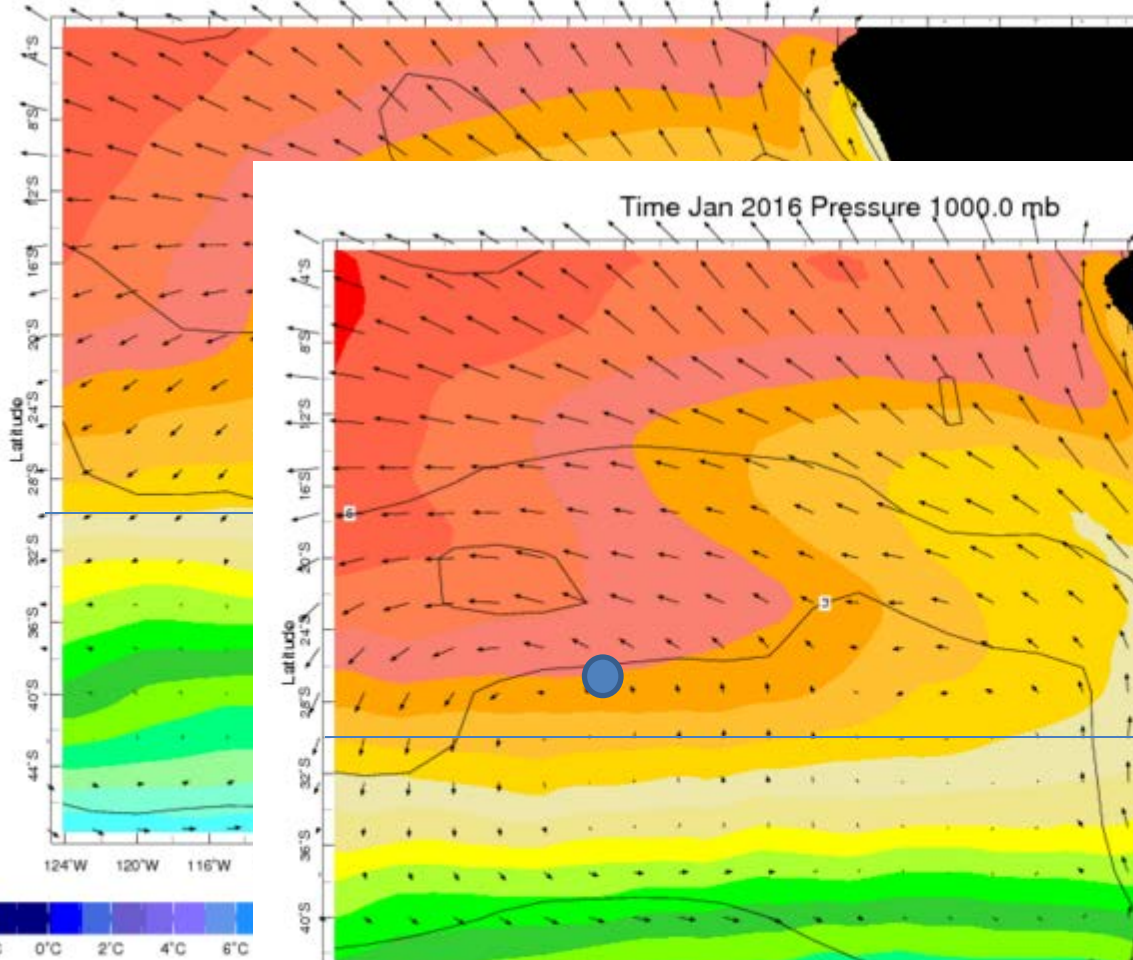
**El Nino Index: note 1998 and 2015**



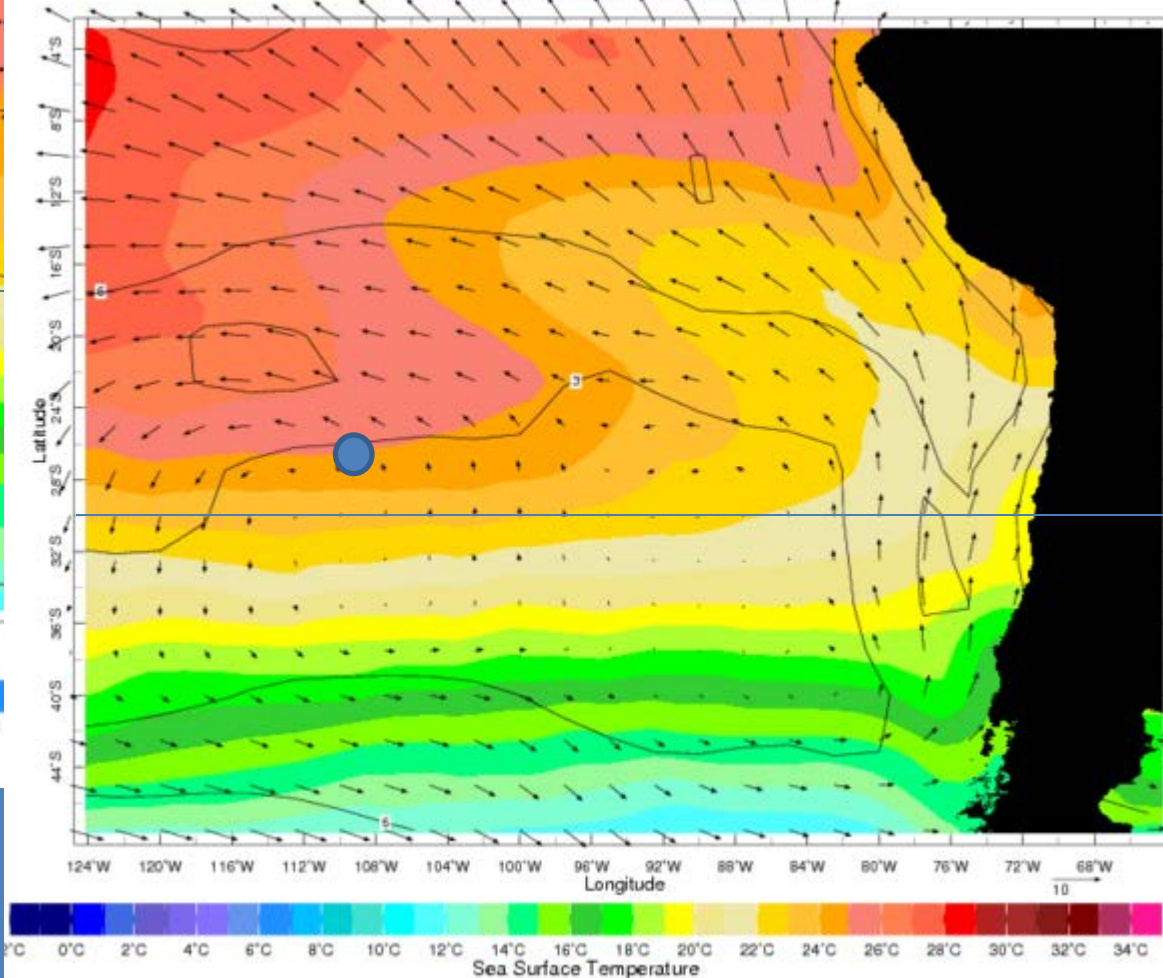
Time Nov 2015 Pressure 1000.0 mb

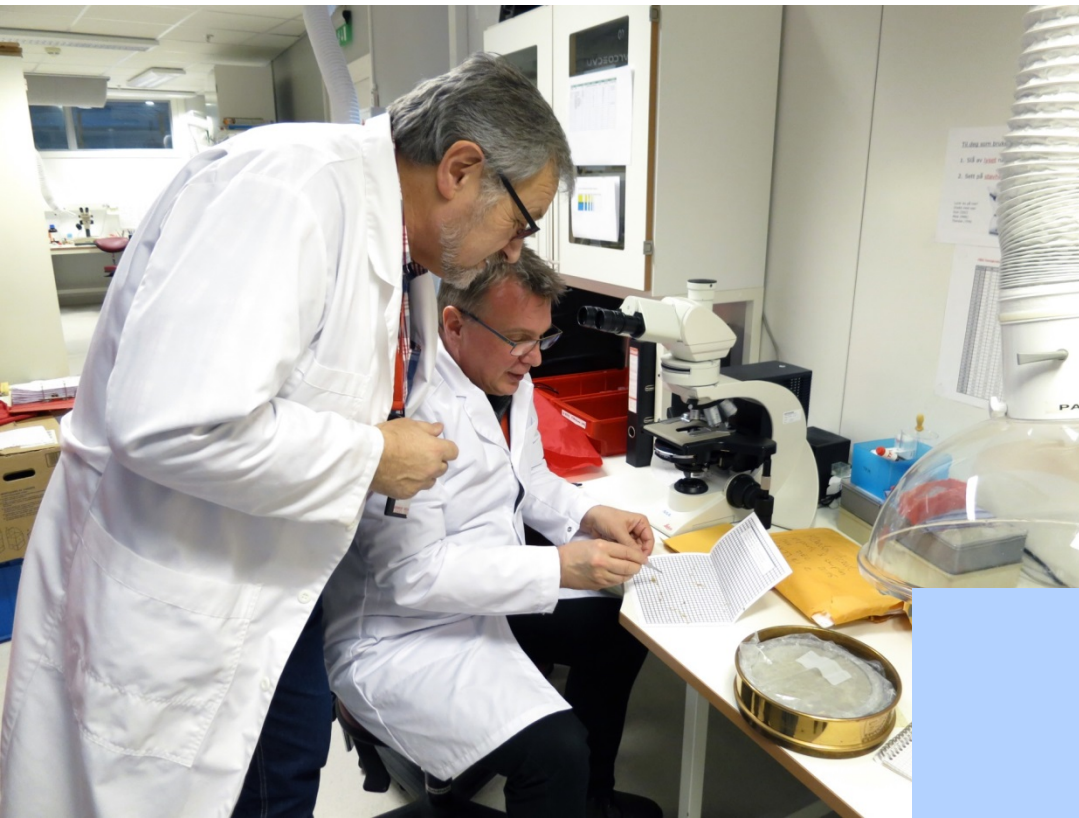


Time Dec 2015 Pressure 1000.0 mb



Time Jan 2016 Pressure 1000.0 mb





**Kai Sørensen and Bert van Bavel, NIVA**





# Passive sampler

Contact person:  
Ian Allan, NIVA



Photo Credits @KonTiki2 Expedition





Photo Credits @KonTiki2 Expedition

# December - February El Niño Conditions

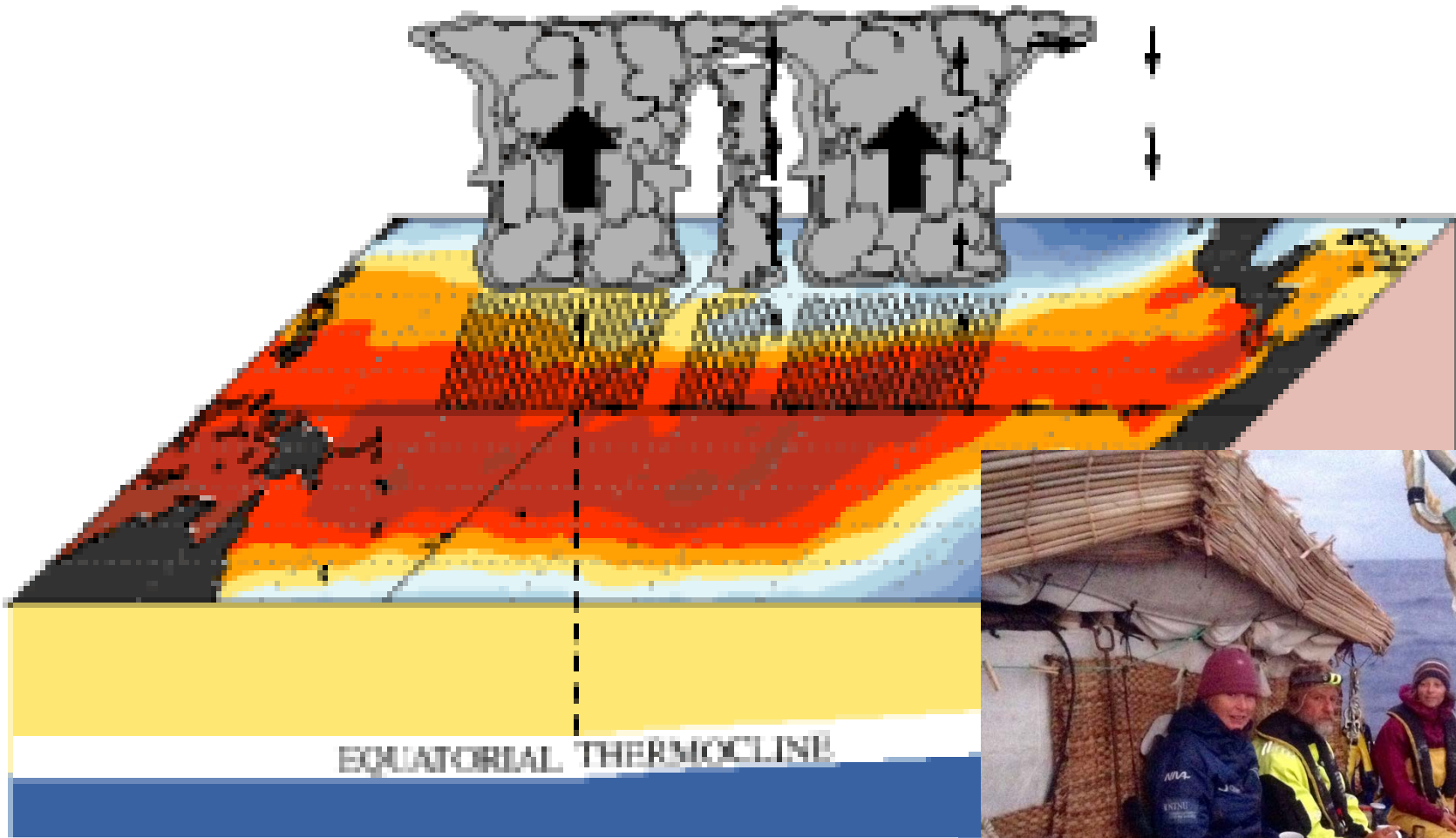
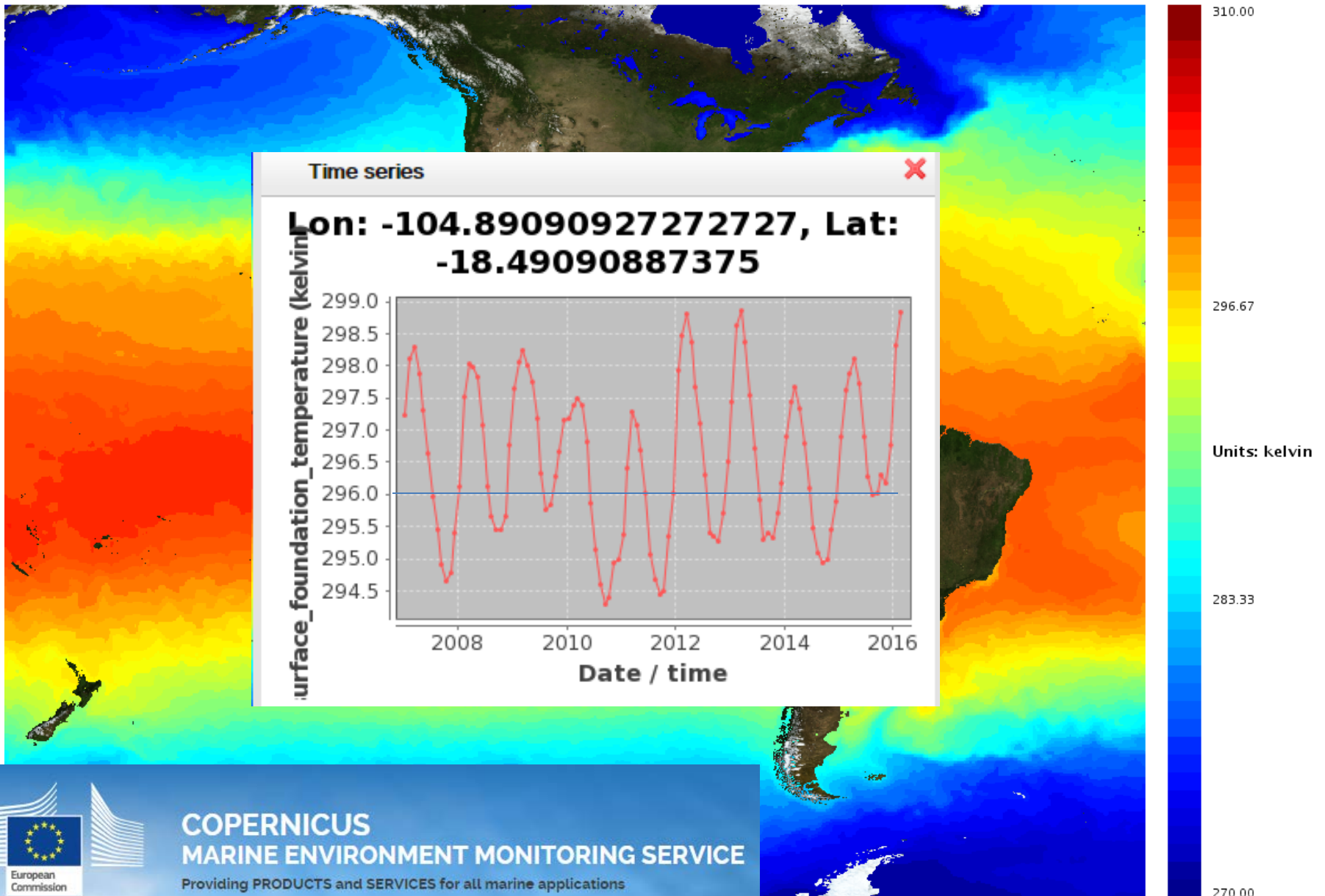


Photo Credits @KonTiki2 Expedition







Despite, or actually: because of, our humid and rainy condition on Rahiti Tane, the El Nino 2015 added to climate change to yield the warmest year on record:



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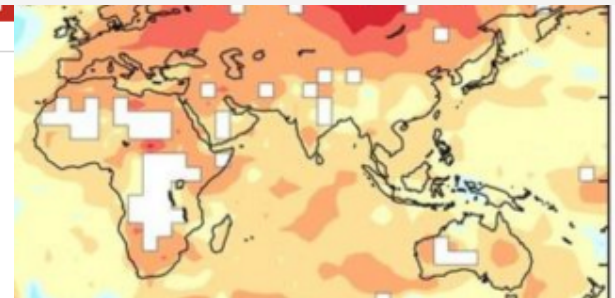
Download Now

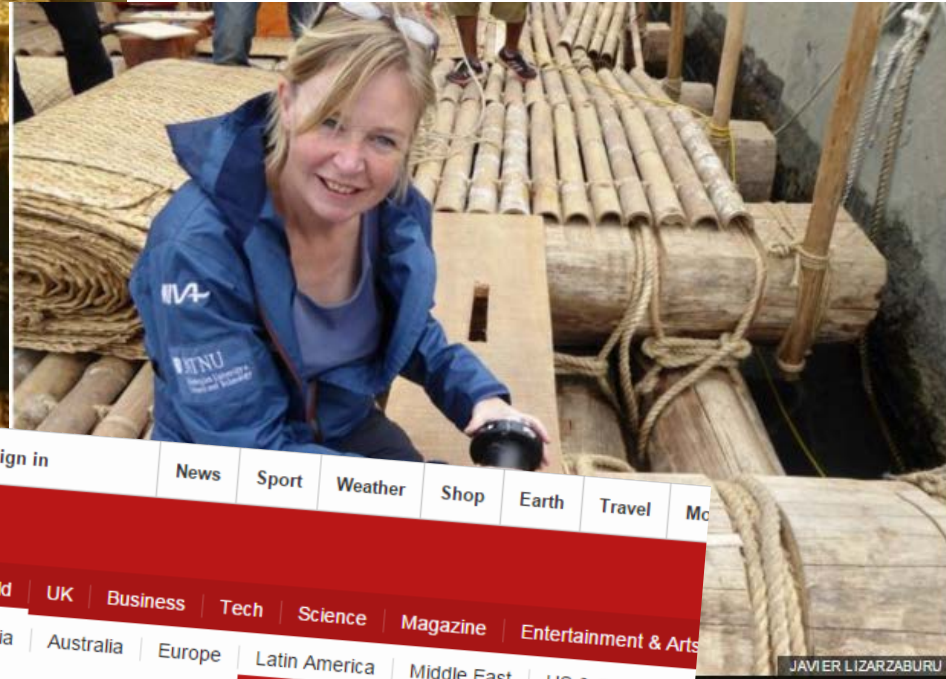
CLIMATE

# 2015 was hottest year ever, with records set around the globe

Energy and Environment

It's official: 2015 'smashed' 2014's global temperature record. It wasn't even close





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## Kon-Tiki2: Why would you cross the Pacific on a wooden raft?

Cecille Mauritzen, ...

"This is a chance to give oceans a voice."

Dr Mauritzen's work on the trip will focus on climate change, pollution from microplastics and the impact of the El Nino weather effect.

"The seas are also becoming more acidic, warmer and getting less oxygen," she explains. If oceans take 90% of the extra heat that humans produce, "they are protecting us for the time being - but for how much longer?"

To help the scientific work, the rafts have been fitted with top-notch transponders, beacons and satellite communications, courtesy of Norwegian technology companies.

tion," says Dr chief scientist.

JAVIER LIZARZABURU

s in the ocean

# Take-home messages:

- A full-scale state-of-the-art oceanographic research program can be performed with solar power only, and under very primitive conditions.
- **To reach broad and frequent coverage – which is especially important for emerging compounds in a changing environment - simple acquisition methods are strongly recommended.**
- These southeast Pacific data are important – **not many cruises that have collected litter&toxins from the region.** Is a «garbage patch» the right paradigm? The distributions are best understood in the context of the physical environment: currents and winds, El Nino, climate change
- The expedition was just the beginning – we're presently looking for funding for analysis & synthesis.