PERÚ | Ministerio del Ambiente | Instituto Geofísico del Perú

Ciencia para protegernos
Ciencia para avanzar

INSTITUTO GEOFÍSICO DEL PERÚ

Climate research at IGP
e.g. El Niño and the mangrove ecosystem in northern Peru

Ken Takahashi

WCRP VAMOS/CORDEX Workshop on Latin-America and Caribbean
CORDEX LAC: Phase I - South America
Lima, Peru. Sep. 11-13, 2013


Amazon
Peru
Tropical glaciers
El Niño current
Humboldt current
Lima
Andes
Altiplano
Nazca plate
Subduction
Volcanos
Earthquakes
Atacama desert
US Dept of State Geographer
Image U.S. Geological Survey
© 2013 MapLink
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
378 km
Ecuador
Acre
Amazonas

EXAMPLES OF IGP CLIMATE RESEARCH IN THIS WORKSHOP

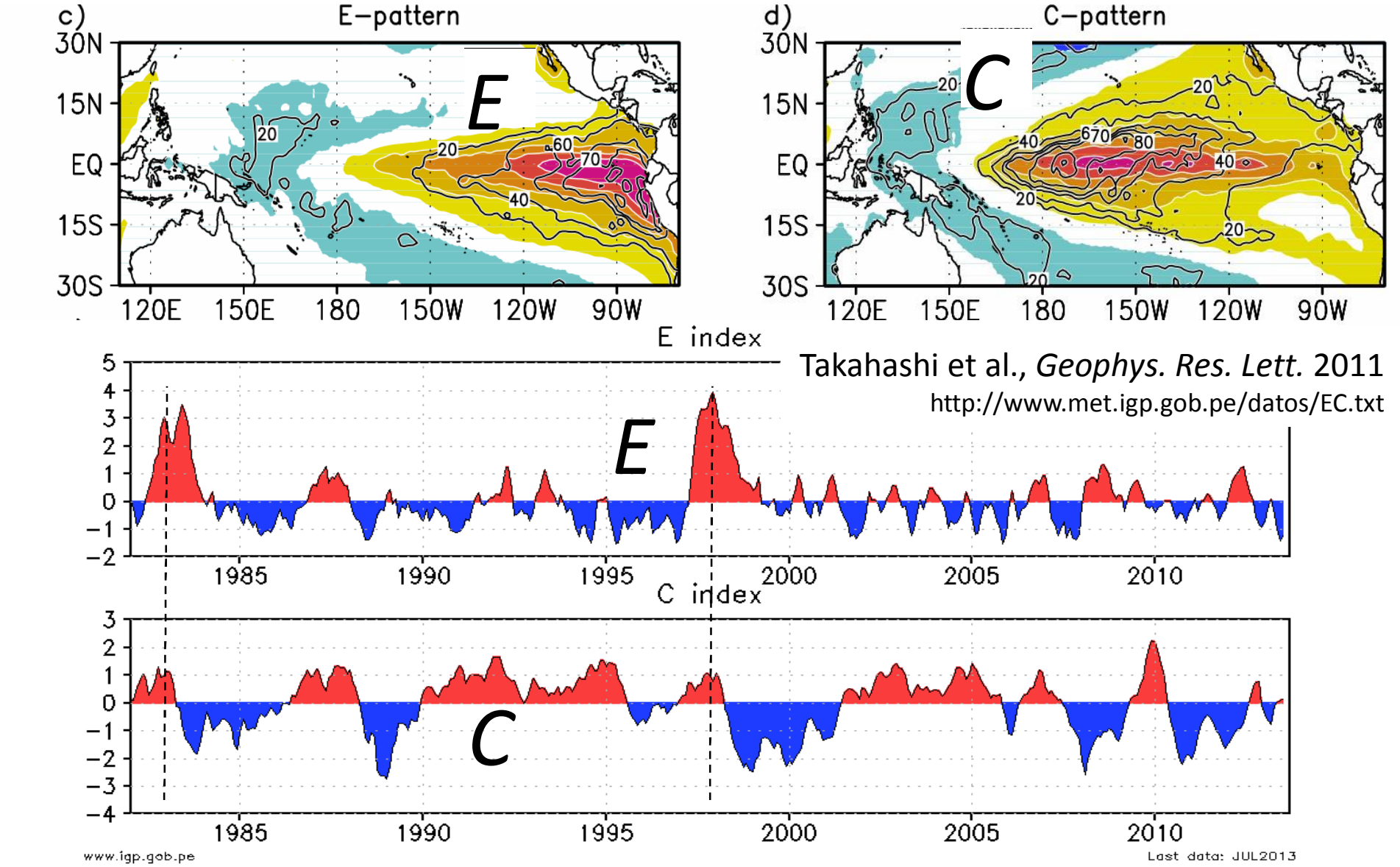
Amazon climate/hydrology
- Floods, drought, friajes (talk to Jhan Carlo Espinoza)

Andean climate variability/change
- Trends and decadal variability (poster by Yamina Silva)
- Mesoscale processes and modeling (talk by Clémentine Junquas)

Ocean-land-atmosphere interactions
- Coastal dust storms (poster by Julio Quijano)
- Regional ocean-atmosphere modeling (talk by Katerina Goubanova)

El Niño and tropical Pacific climate
- Extreme rainfall (talk by Yakelyn Ramos)
- ENSO dynamics, impacts on mangroves (see next...)

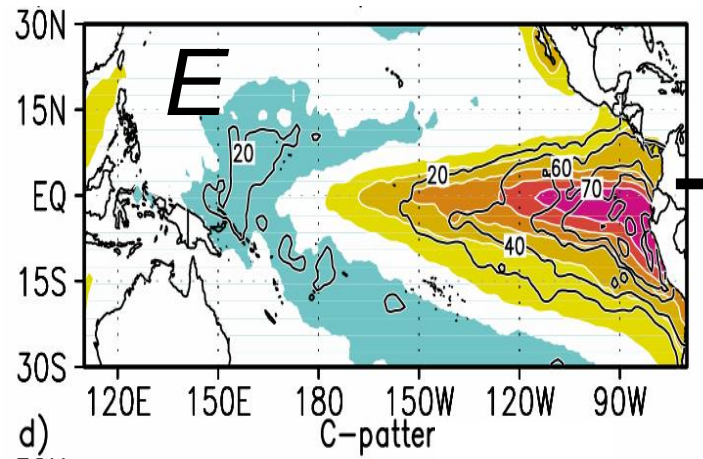
EL NIÑO INDICES
Characterizing ENSO diversity

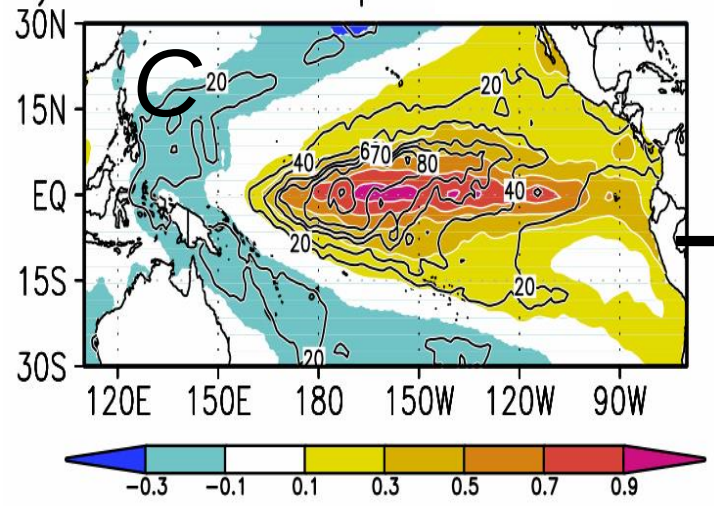


Takahashi et al., *Geophys. Res. Lett.* 2011

http://www.met.igp.gob.pe/datos/EC.txt

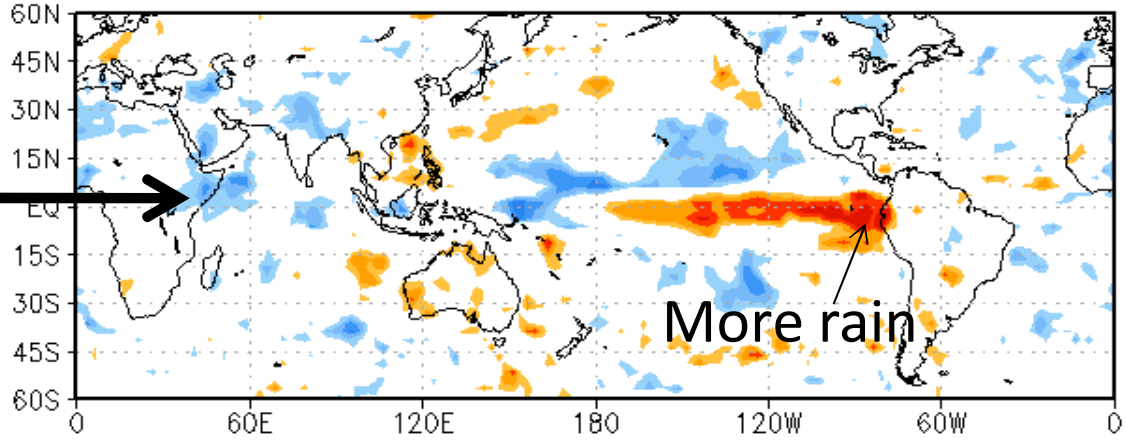
EL NIÑO INDICES
Opposing impacts on precipitation in Peru

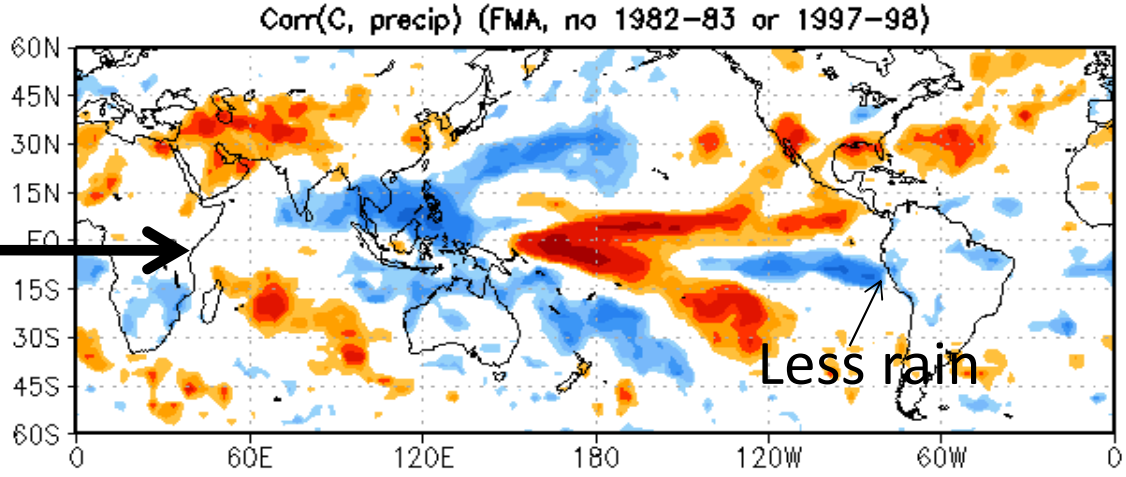




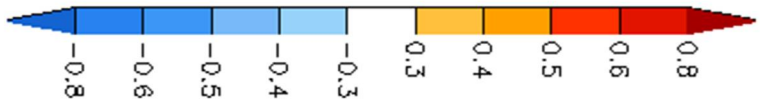
Colores: amplitud (° C); Contornos: % varianza

Correlation with satellite rainfall (Feb-Abr)





data: GPCP



ENFEN Committee (Peru)

ñ..neutral conditions persisted in the central equatorial Pacificò ñthe Coastal El Niño Index(ICEN) confirms the presence of **ñLa Niñaò off Peru**.

* ICEN is based on Niño 1+2 SST.

COMITÉ MULTISECTORIAL ENCARGADO DEL ESTUDIO NACIONAL DEL FENÓMENO EL NIÑO (ENFEN)

IMARPE SENAMHI IGP DHN INDECI ANA

6 de agosto, 2013

COMUNICADO OFICIAL ENFEN N° 07 - 2013

SE CONFIRMA LA PRESENCIA DE "LA NIÑA" EN LA COSTA PERUANA

El Comité encargado del Estudio Nacional del Fenómeno El Niño (ENFEN) se reunió para analizar y actualizar la información de las condiciones meteorológicas, oceanográficas, biológico-pesqueras e hidrológicas. Se determinó que en el mes de julio de 2013 en el océano Pacífico ecuatorial central persistieron las condiciones neutrales; mientras que a nivel local, el Índice Costero El Niño (ICEN) viene indicando condiciones frías por tres meses consecutivos, por lo que se confirma la presencia de "La Niña" en el mar peruano.

National Weather Service

Climate Prediction Center

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EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION

issued by
CLIMATE PREDICTION CENTER/NCEP
and the International Research Institute for Climate and Society
8 August 2013

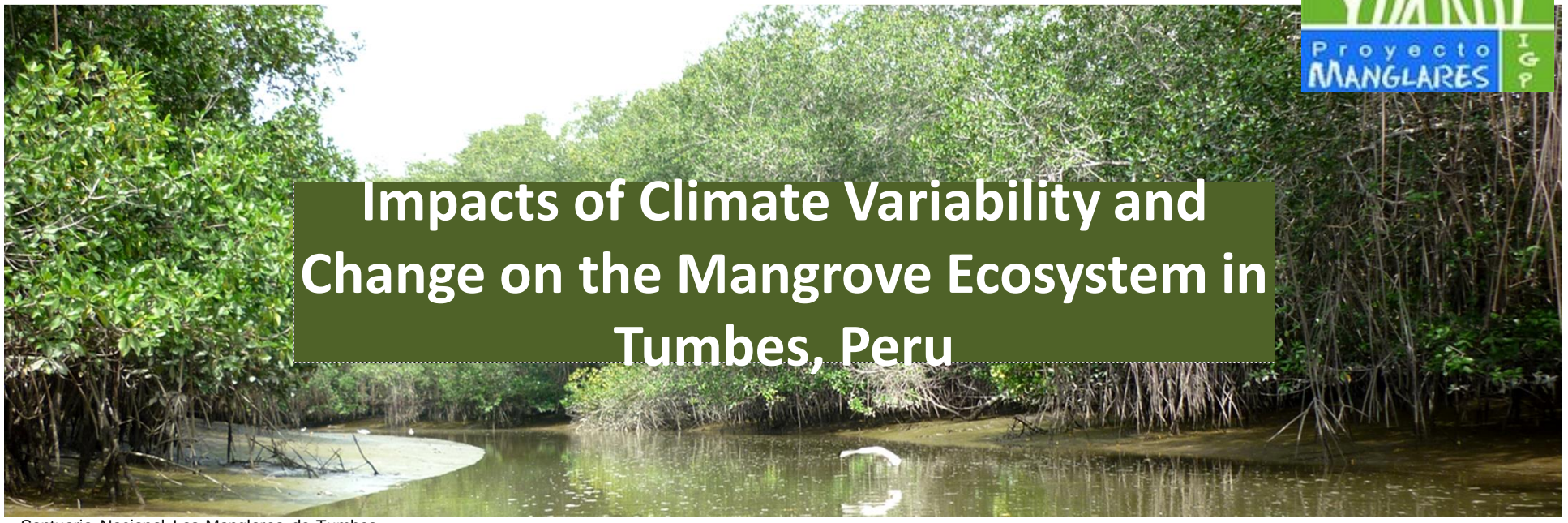
ENSO Alert System Status: Not Active

Synopsis: **ENSO-neutral is favored into the Northern Hemisphere fall 2013.**

NOAA (USA)

ñ**ENSO-neutral conditions** persisted during July 2013, as reflected by near-average sea surface temperatures (SSTs) across the central and east-central equatorial Pacific...ò

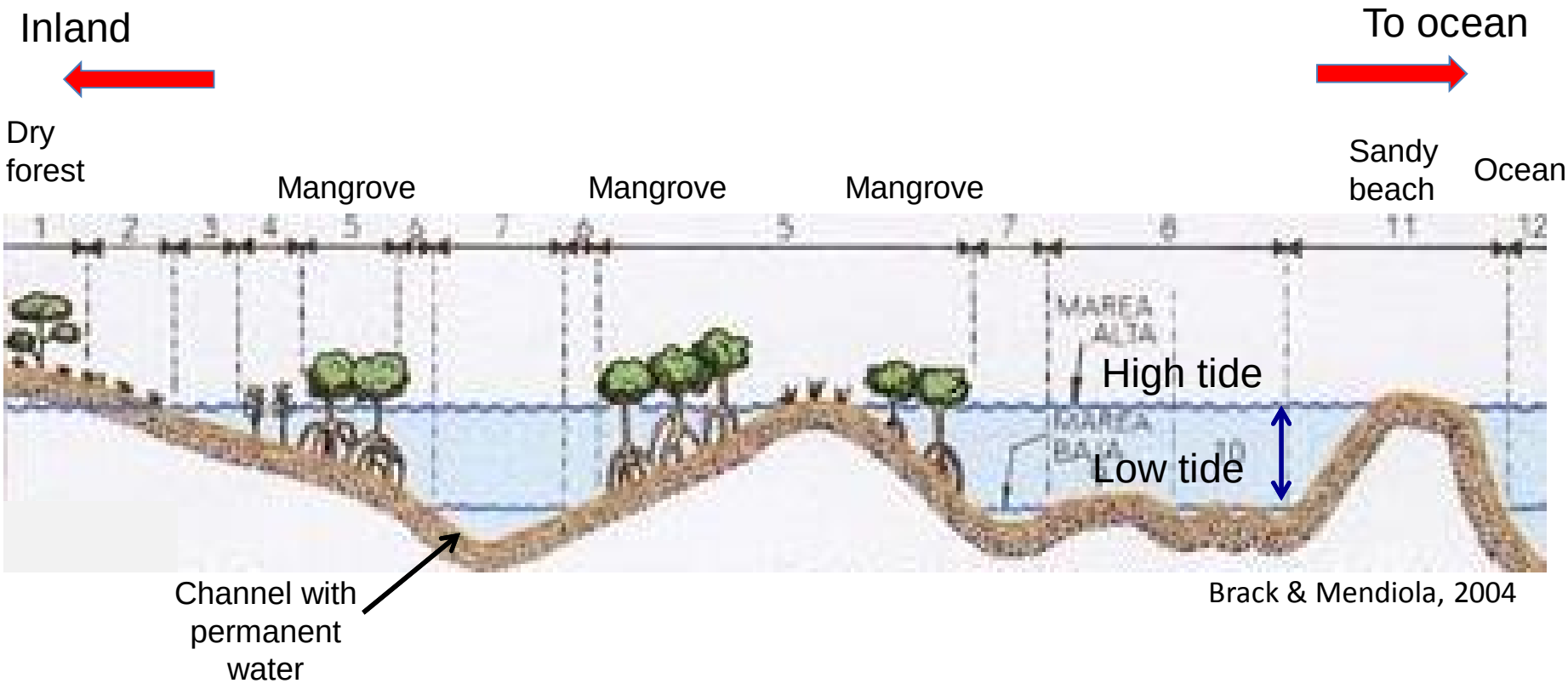
Impacts of Climate Variability and Change on the Mangrove Ecosystem in Tumbes, Peru



Santuario Nacional Los Manglares de Tumbes

Funding: IDRC CRDI

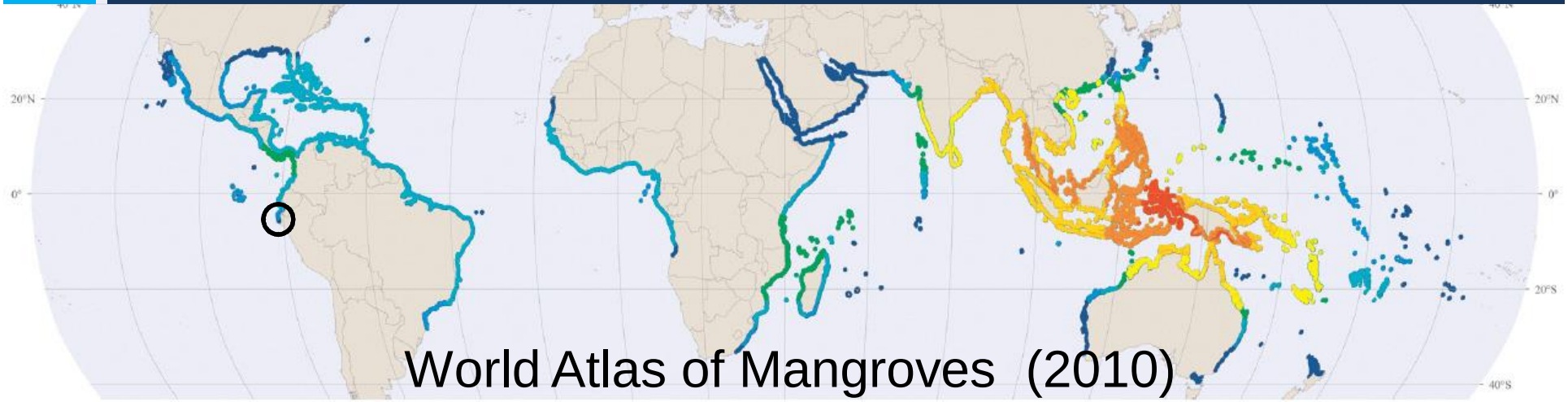
MANGROVES PROJECT
Typical mangrove configuration in Peru

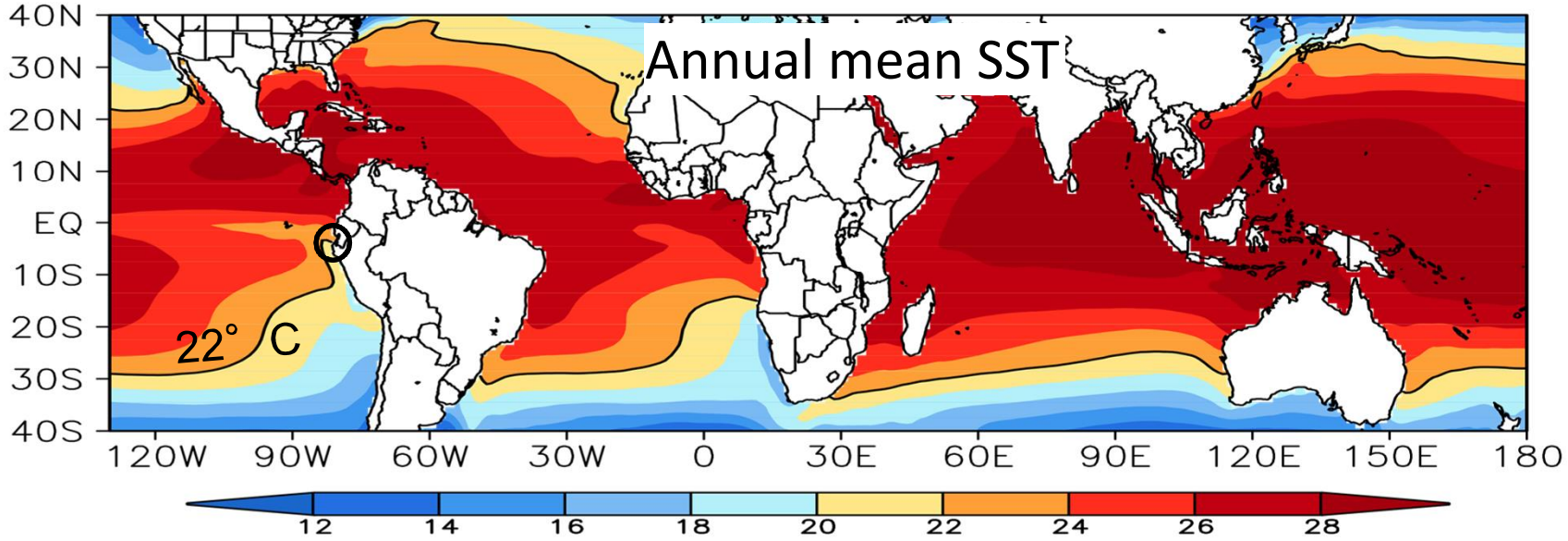


Mangrove ecosystems are located where rivers meet the sea. Tidal dynamics and river variability are key components of the environment.

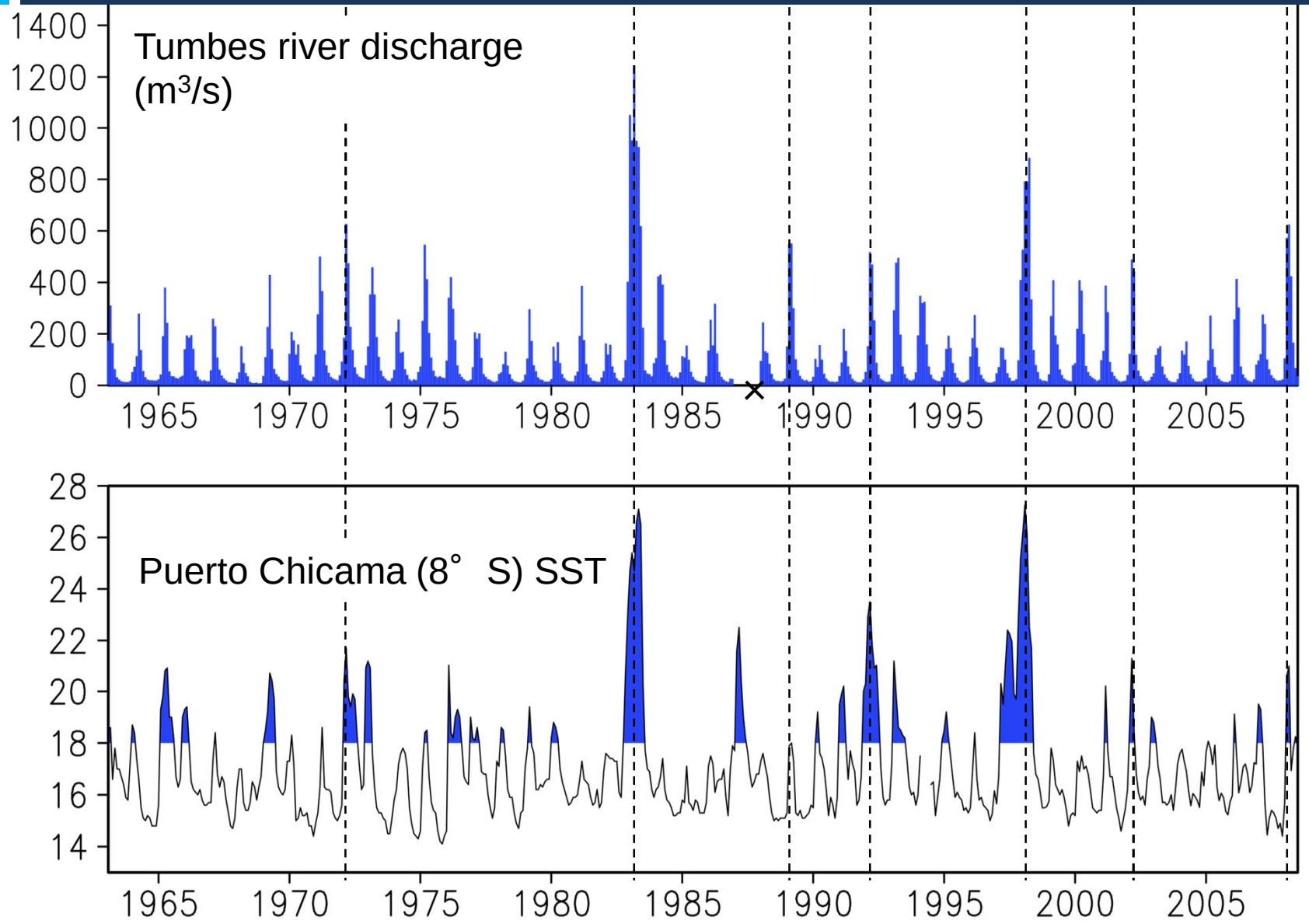

Ceviche
Extracting black conch
(*Anadara tuberculosa)*

MANGROVES PROJECT
Mangroves and SST



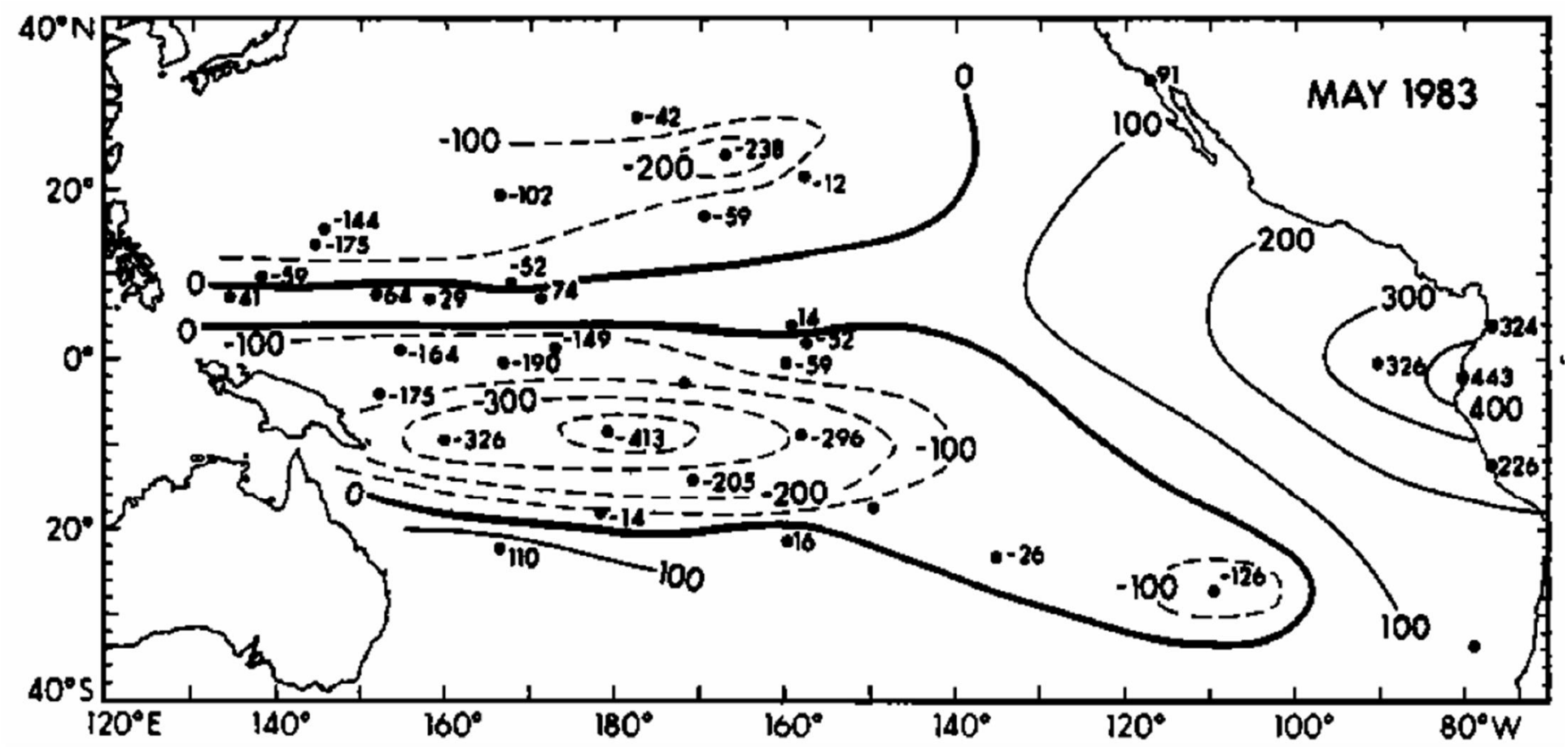


MANGROVES PROJECT
Seasonal/interannual variability



MANGROVES PROJECT
Sea level during El Niño

Sea level anomaly (mm) during the 1982-83 El Niño



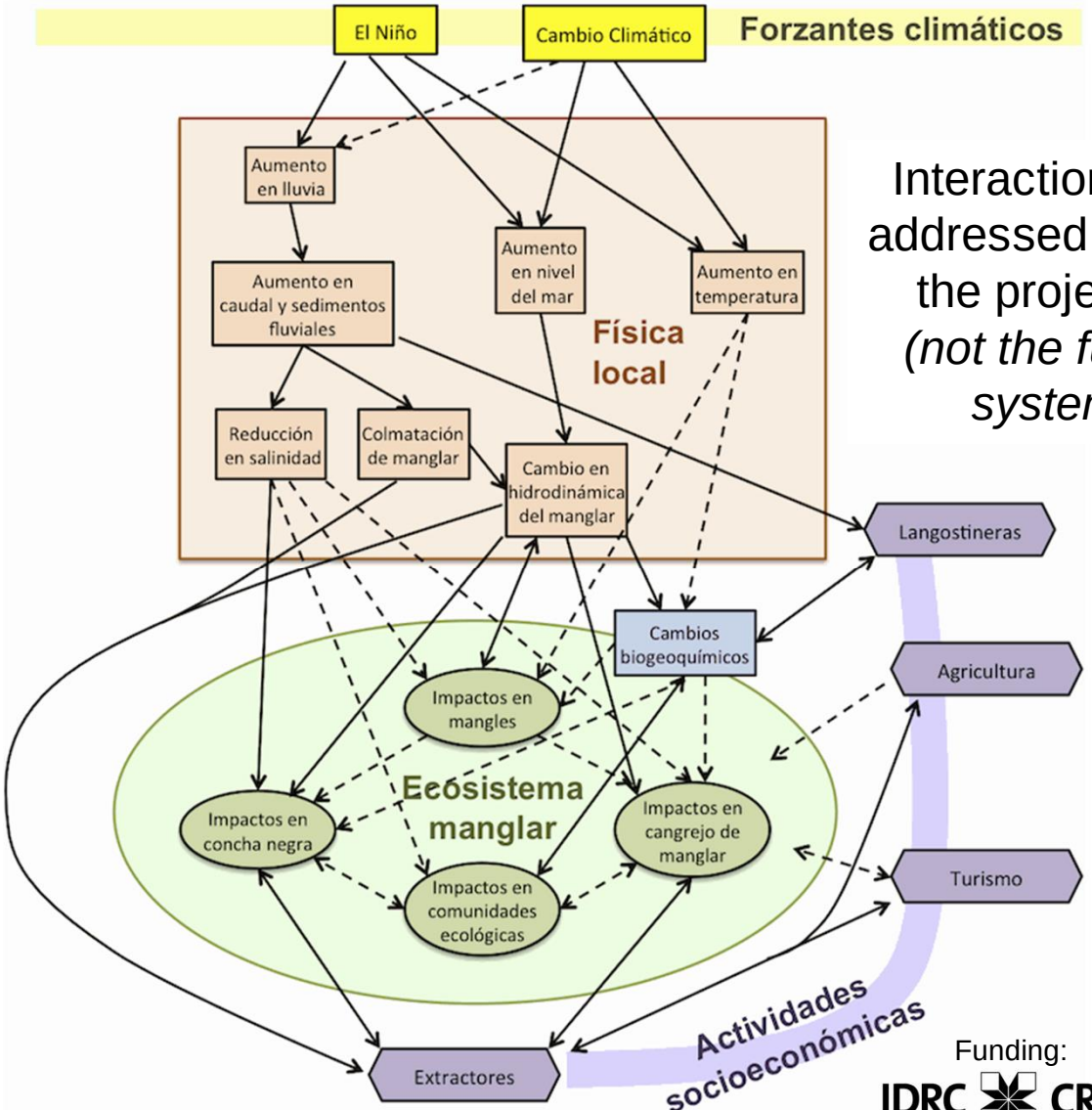
Wyrtki, 1985

MANGROVES PROJECT
Multidisciplinary study

Project "Impact of Climate Variability and Change in the Mangrove Ecosystem of Tumbes" (2012-14)

PI: K. Takahashi

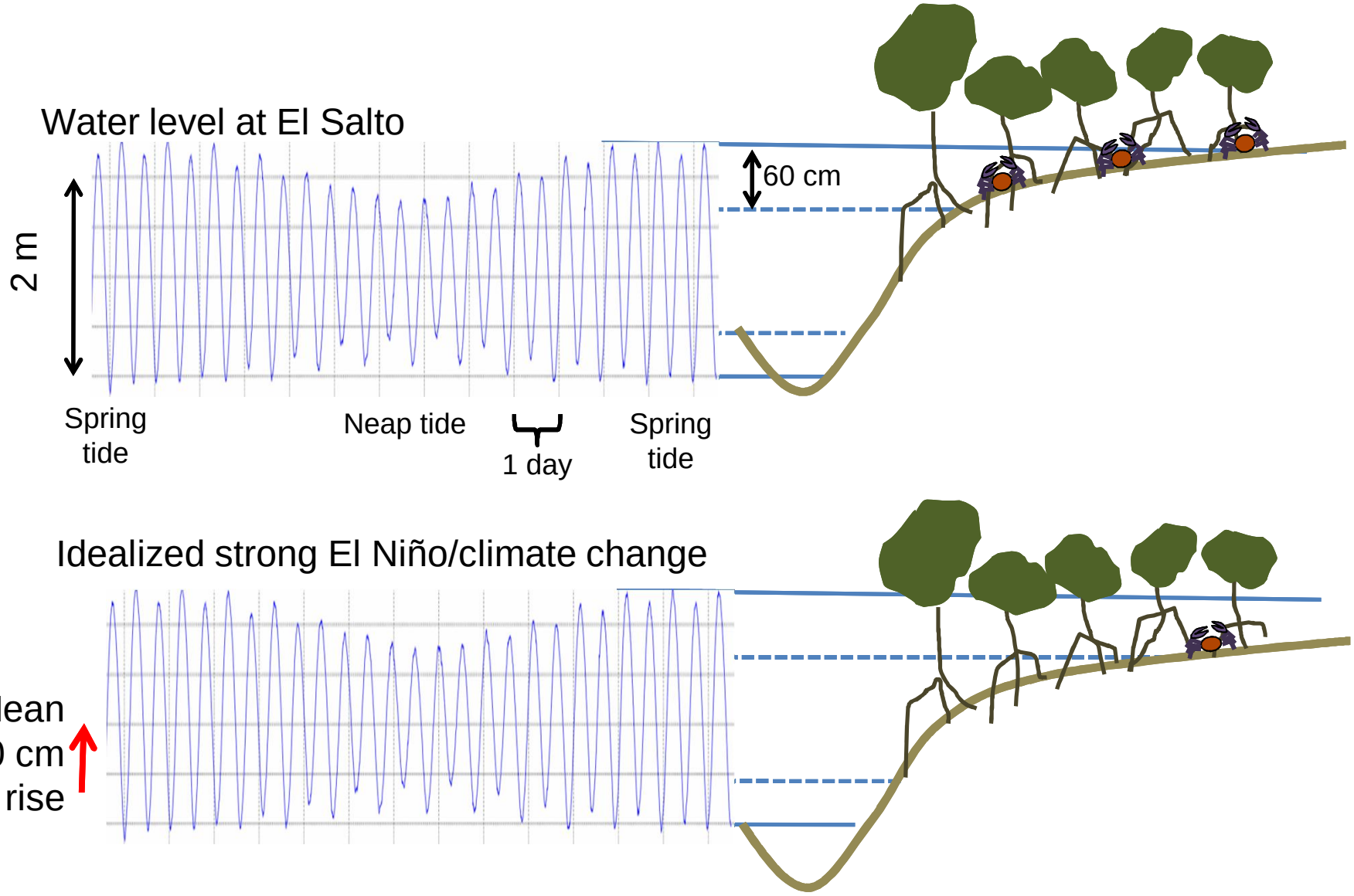
Main objective:
Strengthen the capacity for adaptation to climate variability and change in the mangrove ecosystem in Tumbes, northern Peru



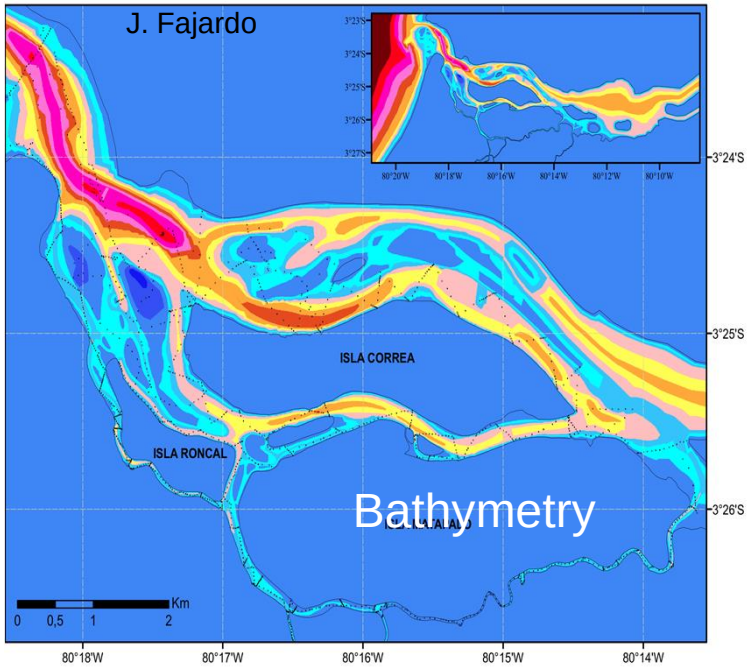
Interactions addressed in the project *(not the full system)*

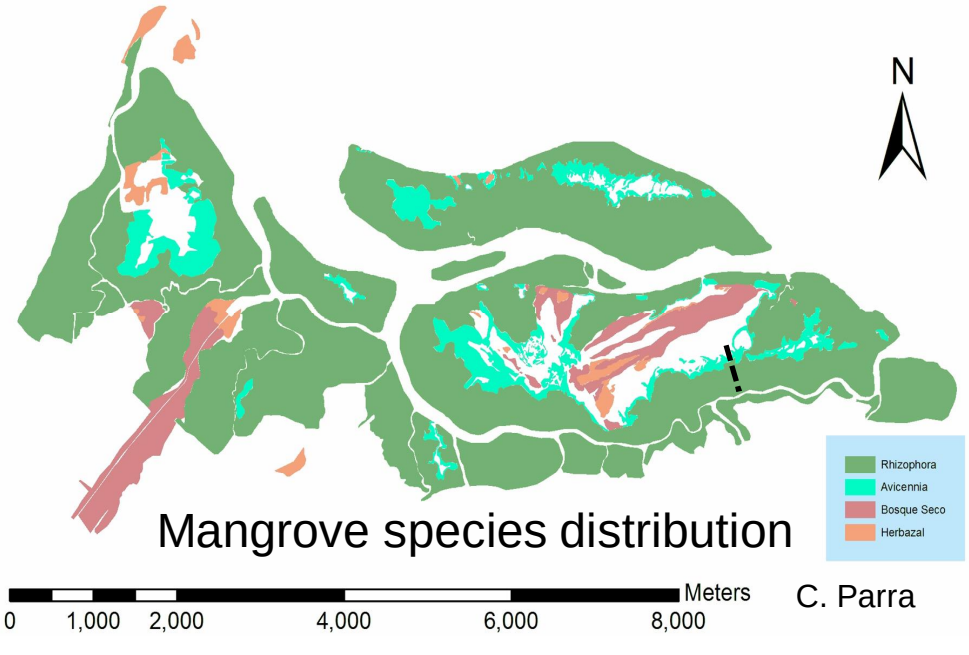
Funding:
IDRC CRDI

MANGROVES PROJECT
Tides and sea level change



MANGROVES PROJECT
Flooding and forest

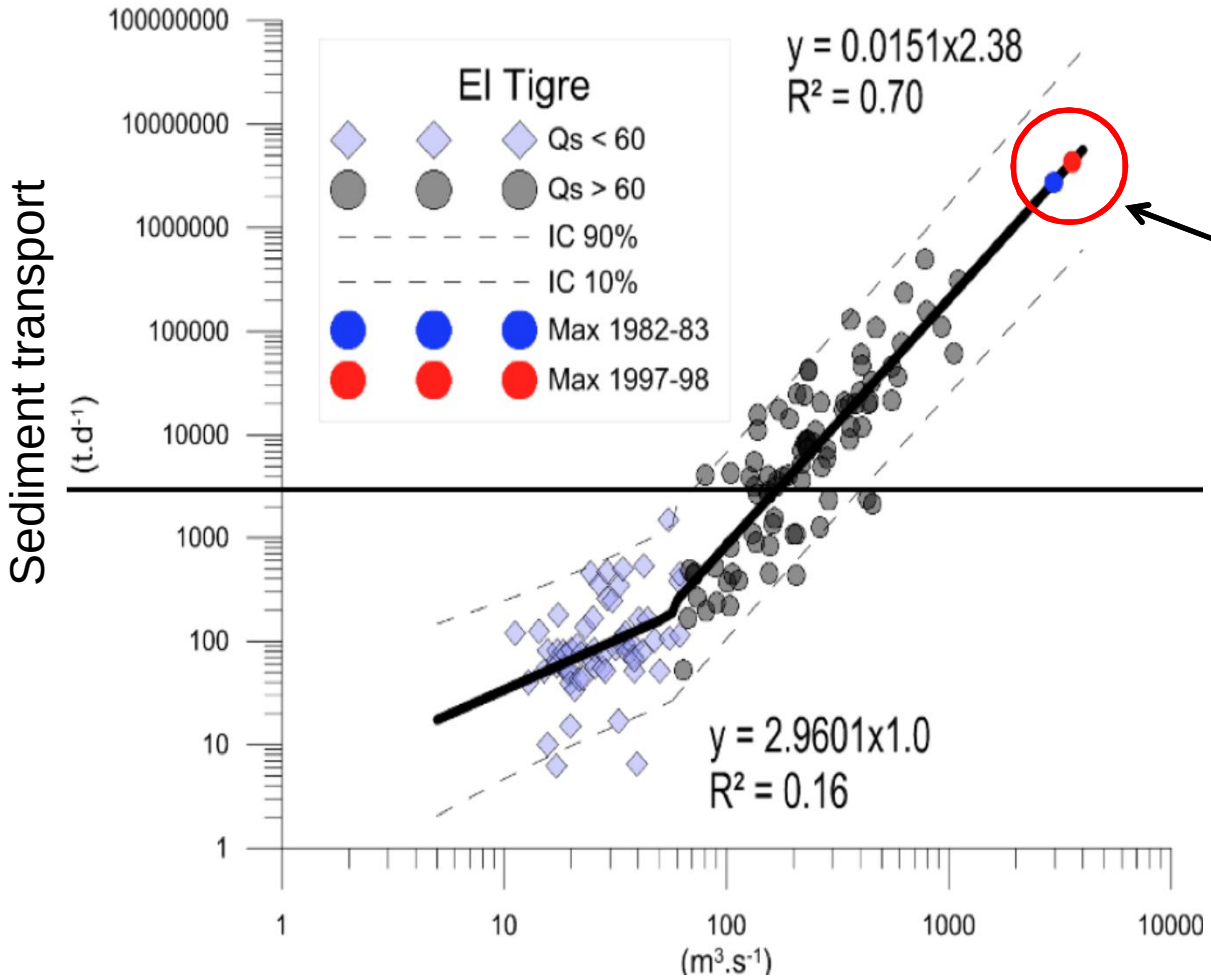




Hydrodynamical modeling will help to assess possible changes in the flooding patterns in the future.

Topography (proxy for tidal flooding frequency) is a first order determinant of distribution of species.

MANGROVES PROJECT
River sediment transport in Tumbes



Data: IGP, ORE HYBAM, SENAMHI

Preliminary estimates indicate that the sediment transport during the 82-83 and 97-98 El Niño events was equivalent to 16 and 29 ñormalòyears, respectively.

Morera et al., in preparation

MANGROVES PROJECT
Biogeochemistry and hydrobiological resources

Basic research, particularly related to environmental effects, is being carried out in collaboration with IMARPE and universities.

E. Fernandez

Population structure and dynamics of mangrove crab (*U. occidentalis*)

J. Vitor

A. Perez

Communities and energy fluxes in sediment meiobenthos

MANGROVES PROJECT
Socioeconomical aspects

- Working with SERNANP to prepare new management plans (incorporating climate change) and establishing the new monitoring procedures
- Analyzing the socioeconomical dynamics of the conch and crab extractors to better manage the ecosystem.
- Studying the potential and limitations of tourist activities
- Assess the evolution of the relation between shrimp farming and the mangroves
- Analyzing the impacts (+ or -) of agriculture in the buffer zone


Workshop with crab extractors


Interviews in the field

MANGROVES PROJECT
Some outstanding questions

- What can we say about future hydrology under climate change (Y. Ramos talk) and plans for large hydraulic projects?
- What will be the recurrence period of extreme El Niño events with climate change?
- What are the key sensitivities and interactions of the ecosystem to environmental changes? (including not experienced)
- How will climate variability and change interact with other stressors (e.g. overexploitation, pollution)?
- Is it possible to modify the practices and institutionality (e.g. extractor associations) in order to preserve the ecosystem while allowing the population to improve their standard of living?

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