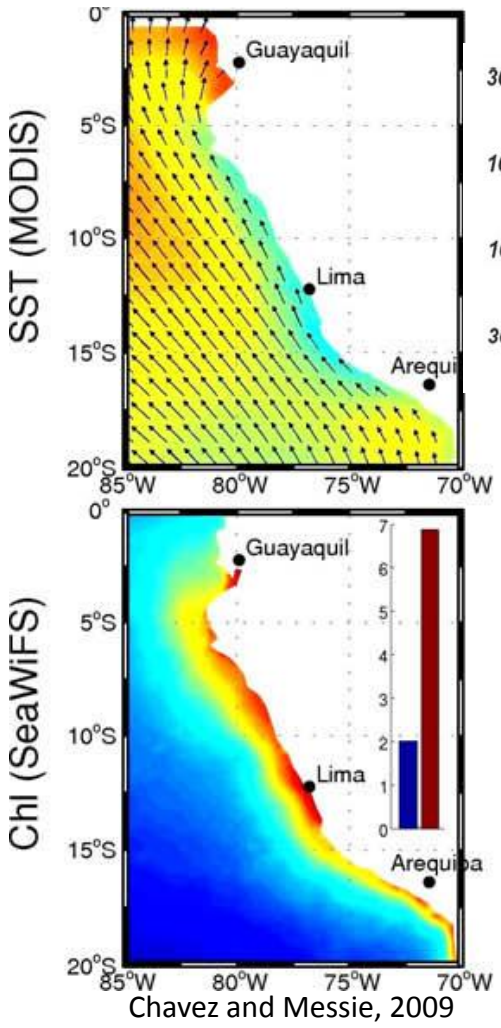
Steering Committee and Data Management Team Meetings
3 - 6 November, 2014
Recife, Brazil

INITIATIVES FOR SUSTAINED OCEAN TIME SERIES IN PERÚ

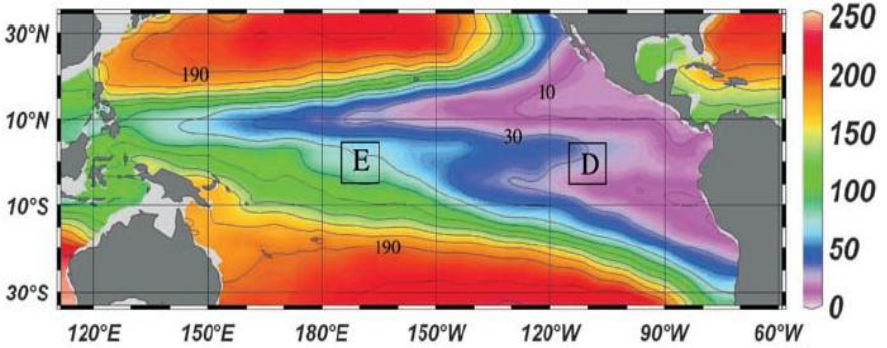
Carmen Grados and Dimitri Gutierrez
IMARPE (Perú)

I. MOTIVATION

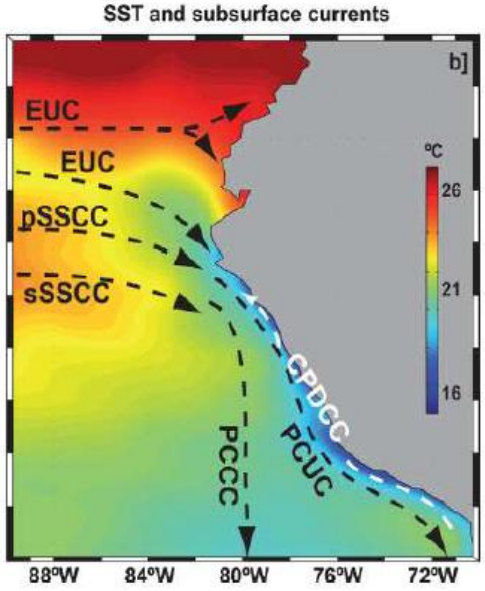
Wind forcing, productivity and oxygen deficiency in the TSEP



Chavez and Messie, 2009



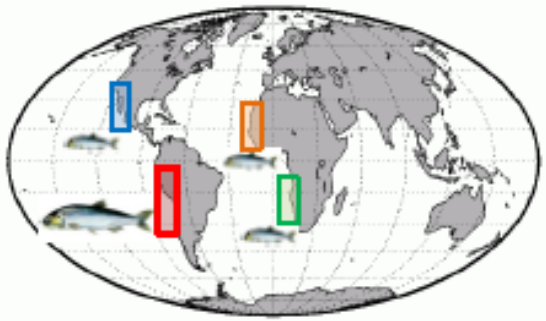
Climatological mean of dissolved oxygen concentrations (mmol kg−1) at 400 m (Stramma et al., 2008)

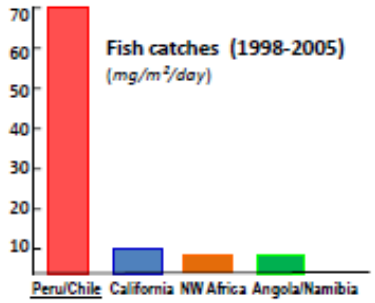


Mean annual SST (°C) and subsurface currents (Chaigneau et al., 2013)

<u>Socio-economic challenge</u>: Fisheries.

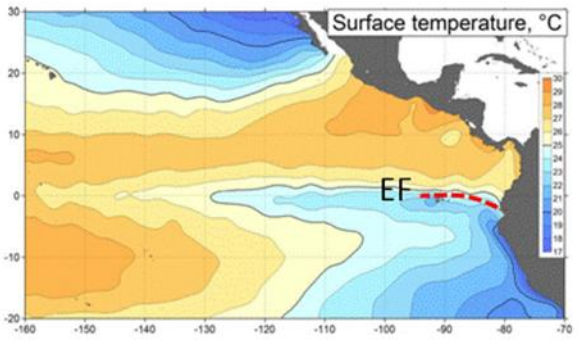
30% of world´s fish catches over less than 1% of world´s ocean (Gouvanoba, et al., 2013)

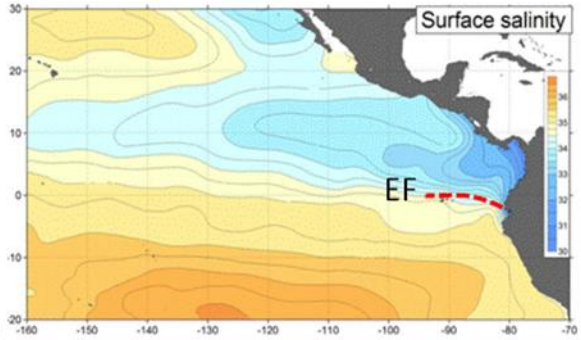




The ENSO cycle control the major attributes and biogeochemical processes in the TSEP (T/S fields, upwelling, productivity, subsurface oxygenation), all of which impact significantly on fisheries and biodiversity) and regional climate.

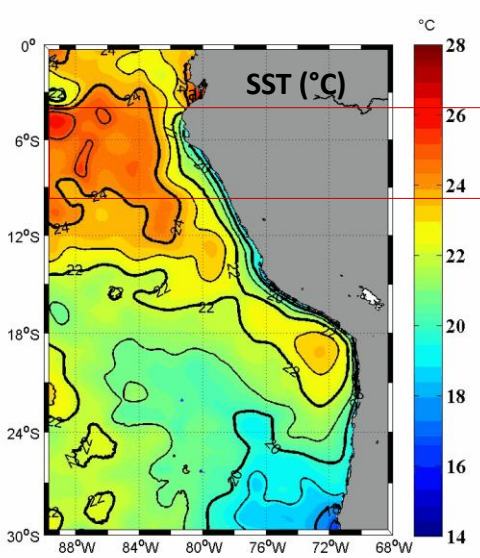
Intense meridional variability of the EF is related to the annual and ENSO cycles, and probably to other local processes that are poorly known.

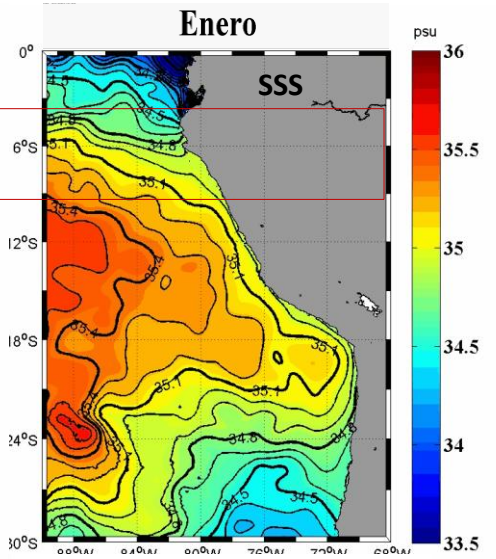




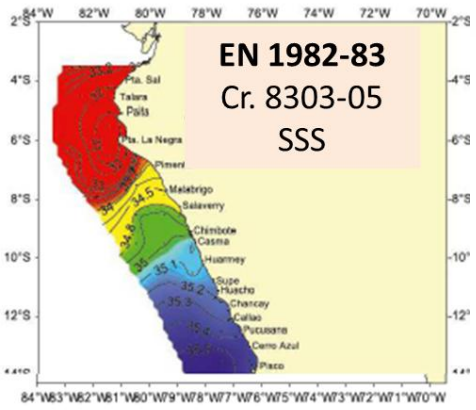
SST (°C) and SSS climatological monthly means for the period 1952-2010

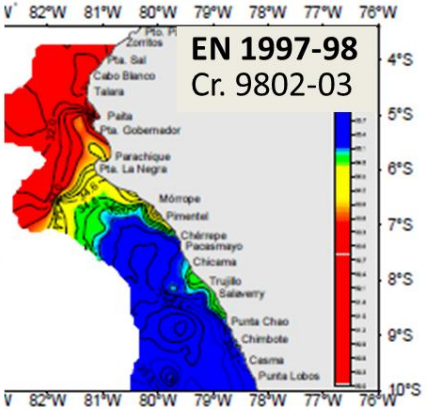
(Grados, C. et al., in prep)





Large southward displacements of the EF





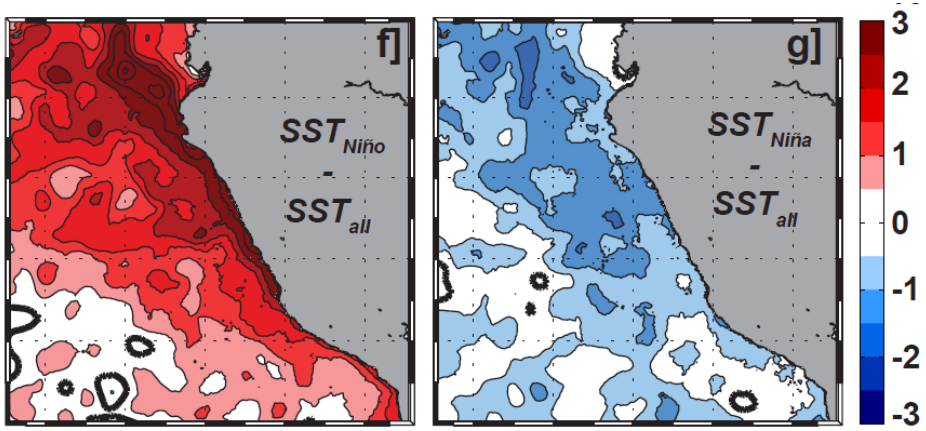
II. IMARPE: Instituto del Mar del Perú

IMARPE is dedicated to conduct scientific research of the Peruvian sea providing advise to the Peruvian Government on the sustainable use of the marine ecosystem, particularly for fishing and aquaculture, conservation of biodiversity, prevention of climatic hazards and protection of aquatic environment.

The **Department of Oceanography and Climate Change** (DGIOCC) conducts five research programs on coastal circulation, upwelling, coastal oceanography, fisheries oceanography, climate change modelling and adaptation.

IMARPE/DGIOCC runs an **ENSO monitoring program (PPR068)** to study and follow up the effects of ENSO in the Peruvian marine ecosystem. The program involve:

1. Monthly bio-oceanographic monitoring in northern Peru
2. Daily monitoring of biological indicators of fisheries
3. Study of the impact of CTW on the productivity of the system
4. Dissemination/information service



Mean impact of ENSO on SST (°C) anomalies are relative to the mean fields computed over 1950-2010. (Grados et al., in prep)

II. IMARPE, the ENFEN Committee and CPPS

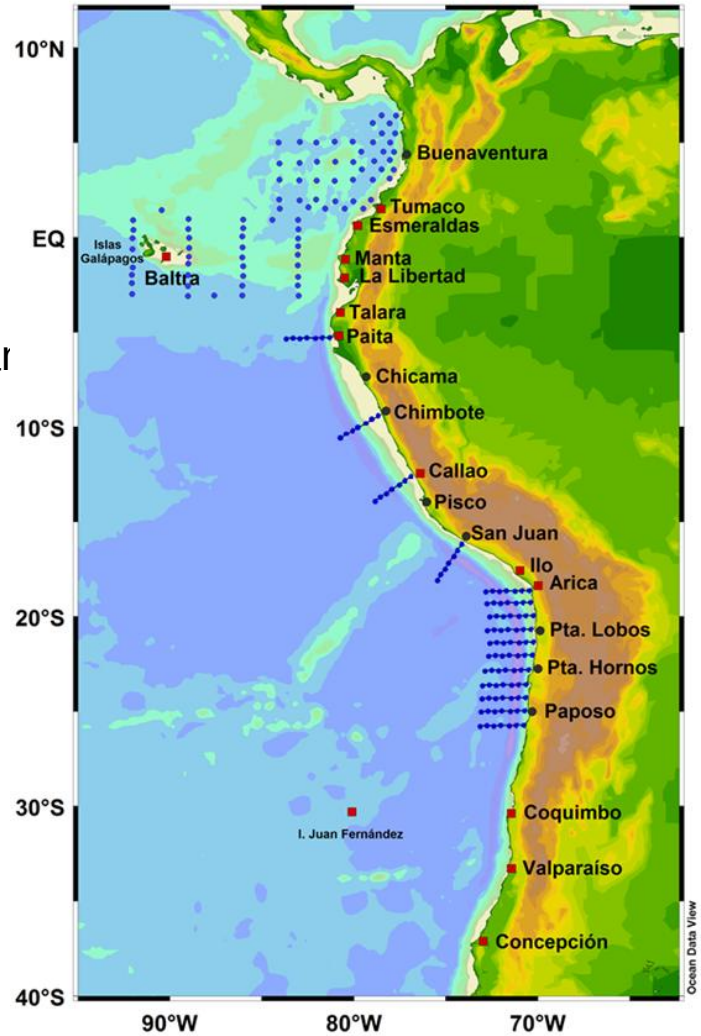
Comité Multisectorial encargado del Estudio Nacional del Fenómeno El Niño

ANA Autoridad Nacional del Agua · Senamhi · Instituto del Mar del Perú · IGP Instituto Geofísico del Perú · INDECI Instituto Nacional de Defensa Civil

IMARPE chairs the ENFEN Committee since 1976. ENFEN is composed of the four main national institutions and services for oceanic and atmospheric research and two risk assessment governmental organizations.

ENFEN delivers monthly reports to the Peruvian Government and society on ENSO status. This information feeds the regional SEP-Comisión Permanente del Pacífico Sur (CPPS) Climate Alert Bulletin (BAC).

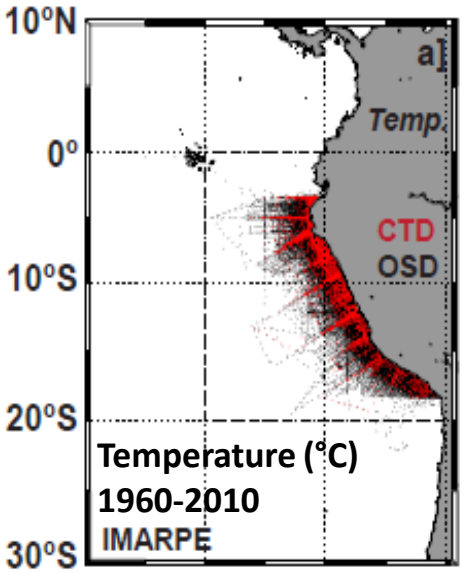
IMARPE chairs the Peruvian component of the SEP-CPPS Regional Oceanographic Survey.

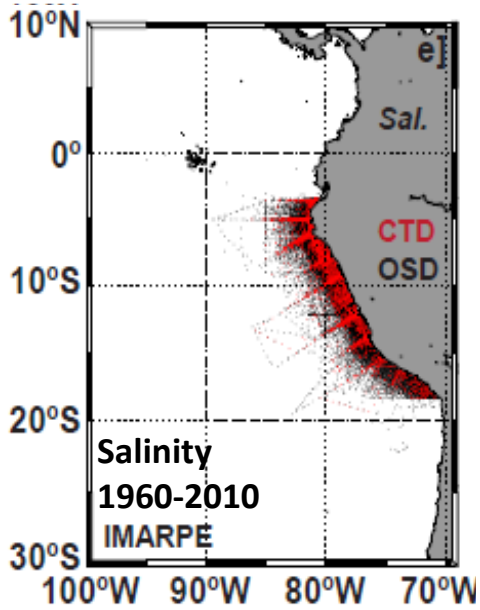


SEP Coastal stations network (red squares) and oceanographic stations (blue dots) in the main transects of the SEP Oceanographic cruise which is executed in a yearly basis under CPPS coordination

Comisión Permanente del Pacífico Sur · CPPS

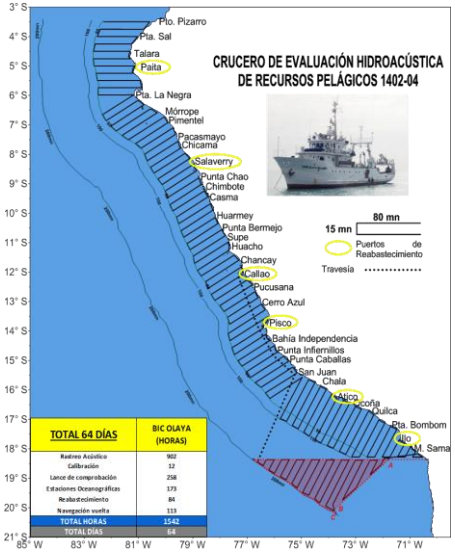
III. Oceanographic monitoring and ENSO

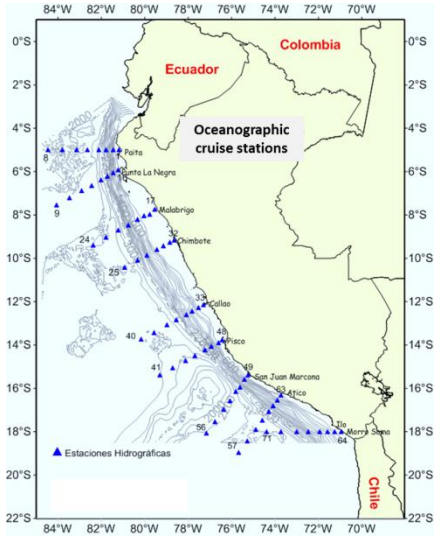


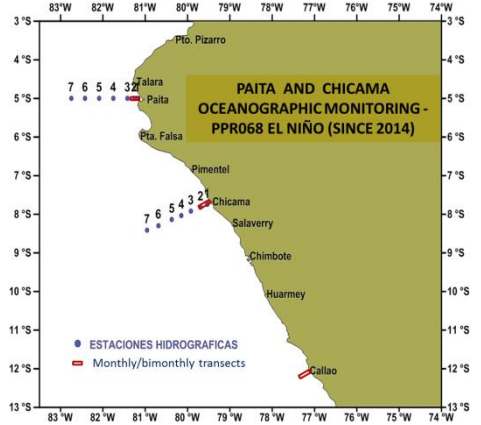


C. Grados, et al., in prep

	PLATFORM	FREQUENCY	DOMAIN	PARAMETERS	PARTNERS
Long-term	Coastal stations	Daily (oldest since 1960)	8 coastal stations alongshore	SST	IMARPE - DHN (SST, SSH)
	National cruises	Seasonal (since 1960)	3.50 S - 21.5 S	T, S, O, Chl-a, nutrients, meteorology (0 m)	IMARPE
	SEP Regional cruises	Yearly	7°N - 30°S	T, S, O, Chl-a, nutrients, meteorology (0 m)	CCCP (Colombia), INOCAR (Ecuador), IMARPE (Perú), IFOP (Chile), CPPS
	Coastal transects (50-100 nm)	Monthly & bi-monthly (since 1990s)	Paita (5°S), Chicama (8°S), Callao (12°S)	T, S, O_2, Chl-a, nutrients, meteorology (0 m)	IMARPE
Experiments	AMOP mooring	2013	12°S, 180m	T, S, O_2, ADCP	IRD, IMARPE
	ARGO	2006-2007	5°S-37°S; 70°-80°W	T, S, O_2	IRD, UdeC, GMMC, IMARPE
	SVP drifters	2008-2009, 2012-2013	5°S-15°S; 6°N-17°S	SST, SV	IMARPE, INOCAR, CCCP, IRD, NOAA/AOML
	Gliders	2008 (VOCALS Rex), 2009 (Pisco Sour)	13°S	T, S, Chl-a, Turbidity	IRD, INSU, IMARPE

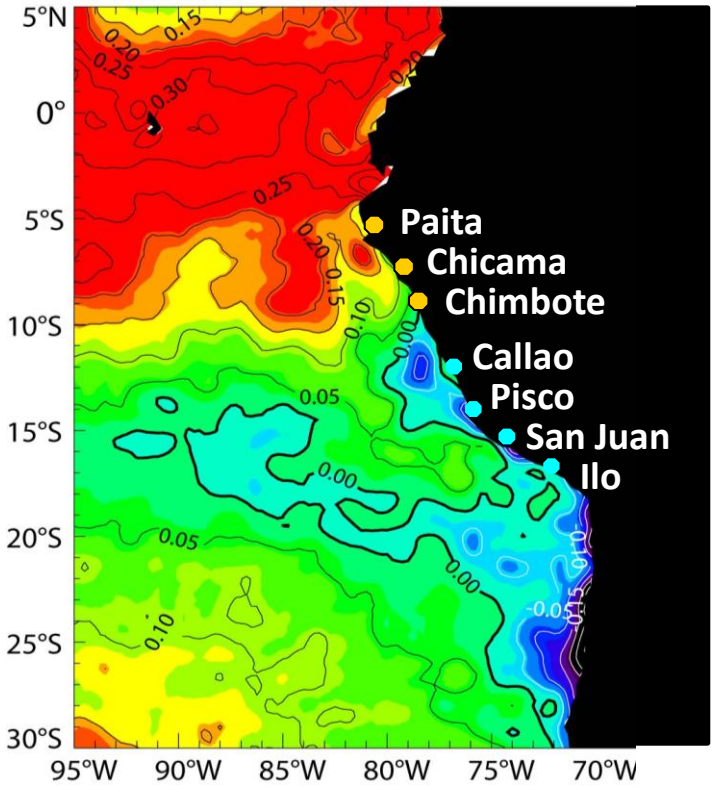




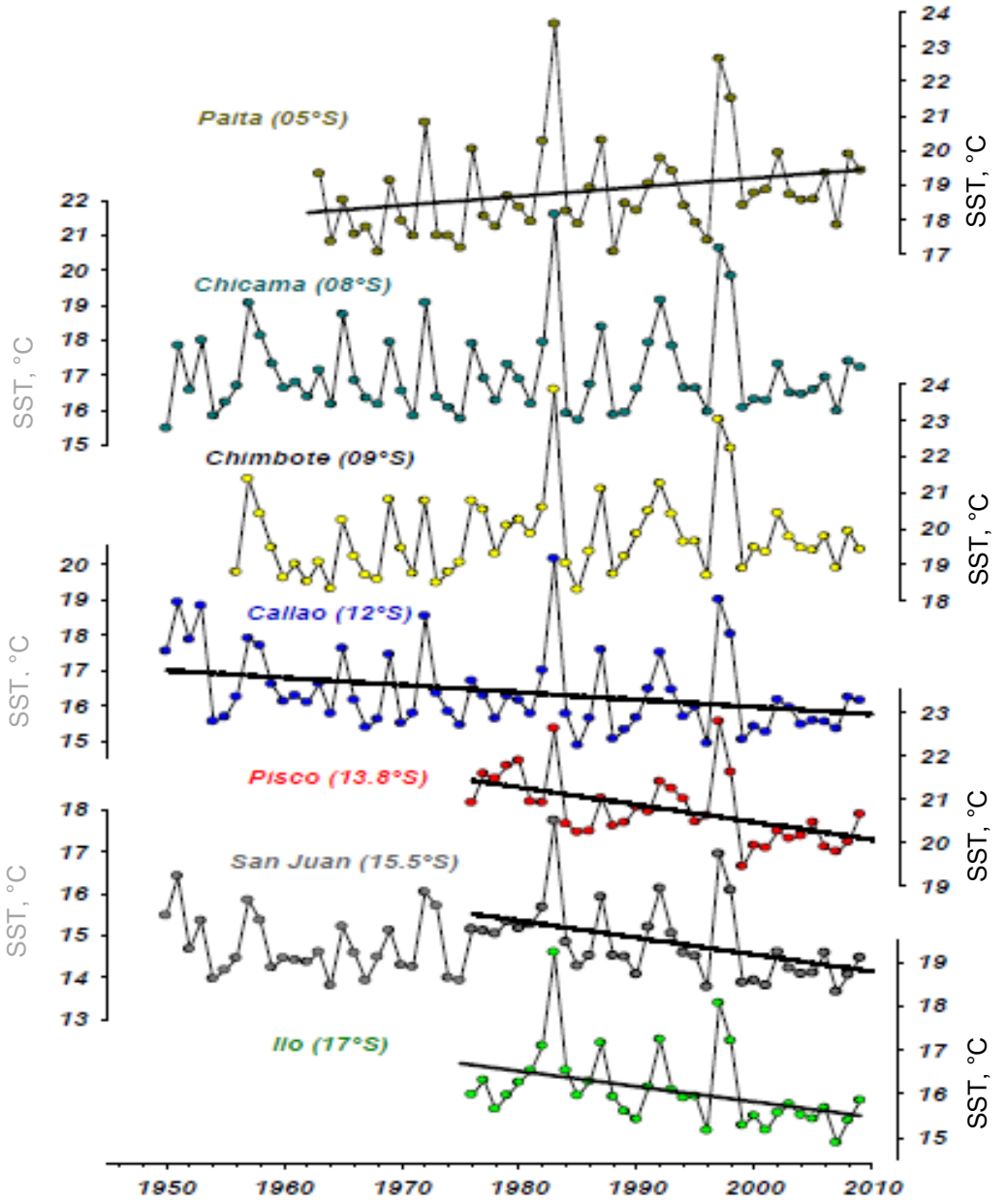


Observed trends in SST (°C) in the NHCS (Gutiérrez et al., 2011)

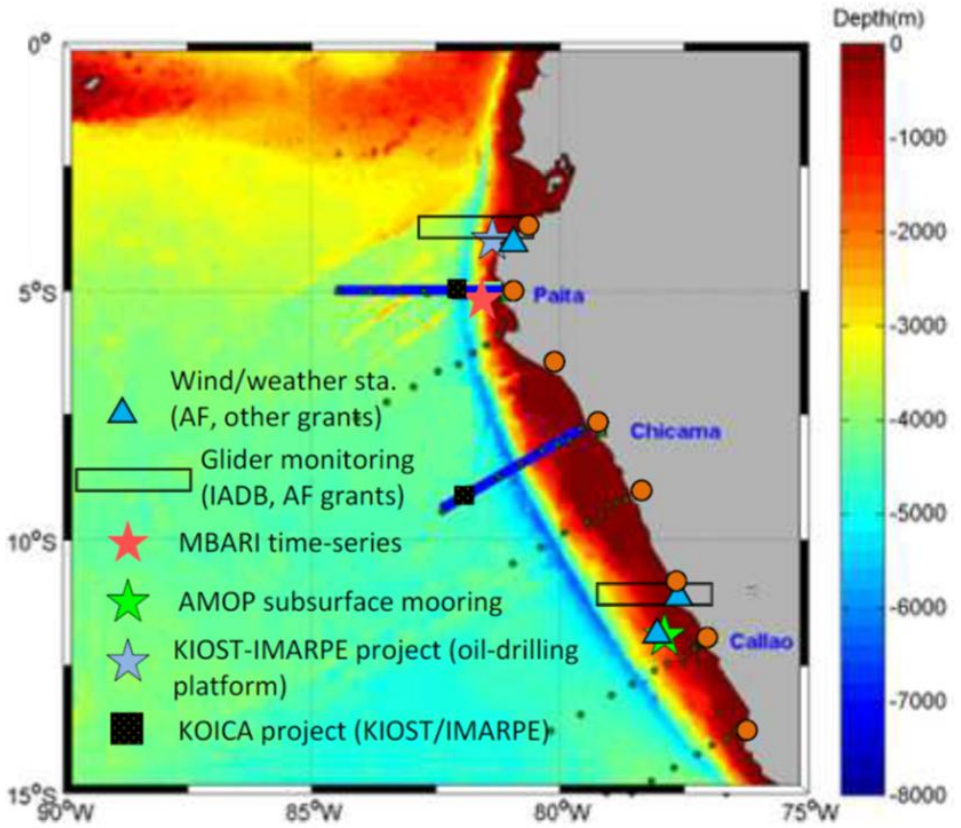
SST (daily) lineal trend in °C/decade during 1/01/1984- 31/05/2010. Data obtained from Reynolds ¼° gridded resolution [*Reynolds et al., 2007*].



Decreasing trend in intense upwelling regions (central/south) (0.2- 0.3°C/decade; p<0.05). Reversal trend in northern stations.



IV. IMARPE and OceanSITES



Objectives:

- Collection of high-quality and consistent long-term records of key regions in the Northern Humboldt Current System.
- Articulation of local monitoring platforms to the OceanSITES network.

NATIONAL IMPORTANCE OF LONG-TERM TIME SERIES OBSERVATIONS

For research:

- Sensitivity of the upwelling and current systems to ENSO and the associated biogeochemical cycling (oxygen regime, productivity, pH, N-cycling, etc.).
- Meridional variability of the equatorial front.
- OMZ/pCO2 and pH changes driven by high/low frequency variability.
- Decadal/multidecadal variability and impacts / teleconnections. Climate Change driven manifestations and impacts.
- Changes in foodwebs and biodiversity of the Peruvian Upwelling ecosystem.
- Improve prediction skills, also at intraseasonal scales.

For delivery information and data services:

- To improve the quality and timeliness of data delivery and information to the Peruvian Government through ENFEN (El Niño National Committee) for prediction and early warning to prevent mitigation and adaptation plans (e.g. adaptive management of Peruvian fisheries).
- Improve the IMARPE climate information service disseminated to the society and the media.

National and potential TSEP applications

- Capacity building and training needed.
- Improve national (ENFEN) and regional (ERFEN/CPPS) capabilities.

V. INITIATIVES

Project: Capacity-building of predictions of climate variability in Peru and its impact on the Marine Ecosystem

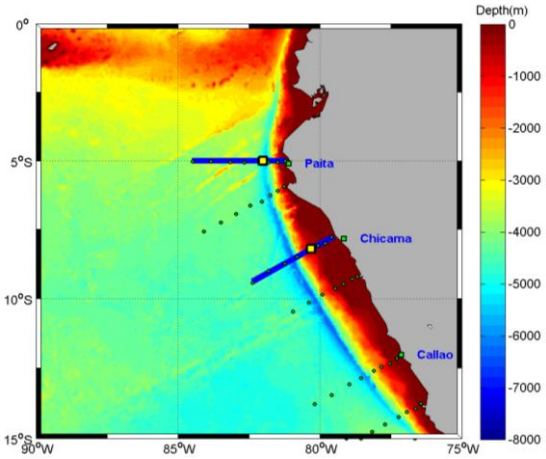
Objective: To improve the scientific and technological capacities of Peru for the surveillance and prediction of El Niño and its impacts, particularly on the marine ecosystem, in order to contribute for the sustainable development of Peru.

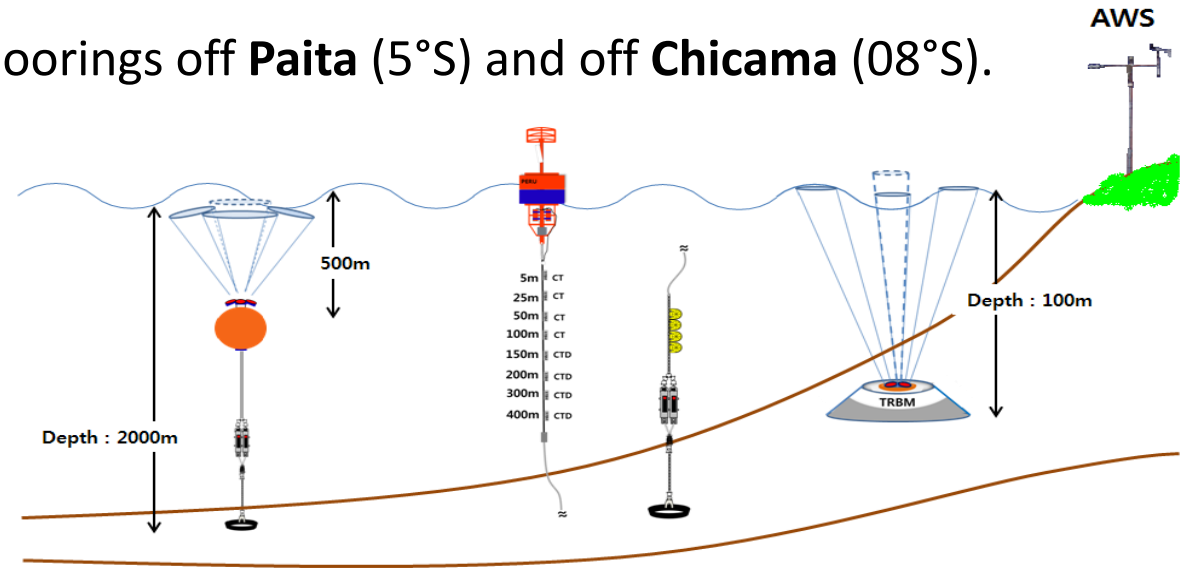
Main components:

i) Capacity building for oceanic observation

ii) Improvement of prediction and warning of climate variability at regional level.

Observations: Two sets of moorings off **Paita** (5°S) and off **Chicama** (08°S).

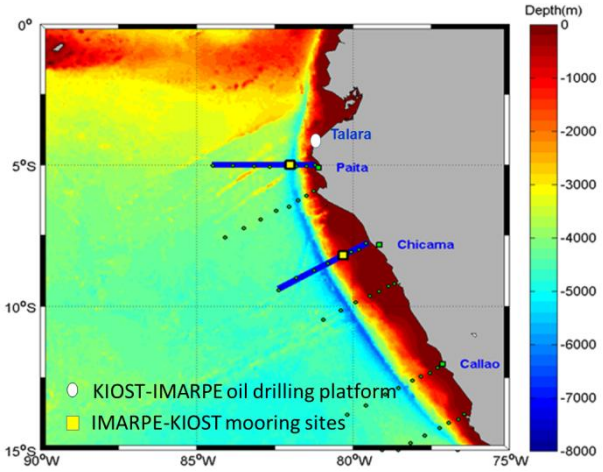




Total Cost: US$ 7.000.000 (Korean Side) Duration: 2016 - 2019

Project: “Monitoring of the equatorial front off the northern peruvian coast”

Main Goal: To characterize the temporal dynamics of the Equatorial Front off Northern Peru, in relation to remote and local forcings.



Specific Objectives:

1. To implement a near real-time ocean observation system using oil platforms to characterize and monitor the temporal and spatial variability of the EF.
2. To analyze the response of the EF to ENSO and ITCZ changes.
3. To analyze the response of the EF to alongshore coastal winds and the northward projection of the Peruvian upwelling waters (the ‘cold tongue’).

Observations: *in situ* observations at 1 to 2 oil platforms (50, 100 m): winds, vertical temperature profiles, CTO at several water depths, currents, and tides.

Current RV capabilities: RV Humboldt

- **Size** (Dimensions, Tons)
  75.20 m length, 12.6 m width, 60.0/1.731 Tons Net/Gross registered tonnage

- **Mooring capacity** (cranes, A-frames, etc)
  Currently being implemented.

- **Capabilities**
  - Science labs and oceanographic equipment, trawling fishery nets, specialized hydroacoustic fishery echosounders.
  - Other devices (co-axial cablery, meteostation, ADCP) are planned to be implemented in 2015.

- **Geographic region and schedule of operations**
  Peru EEZ, Antarctica, planeed for use in the TSEP (TPOS-2020)

- **Time window availability**
  April-July, October-December

- **Ship-time cost**: Ca. 10-12 kUSD/day