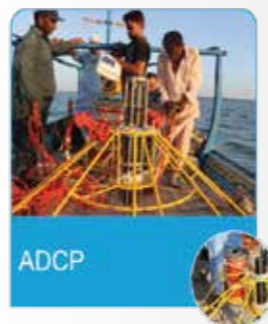
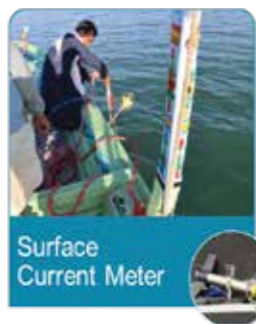
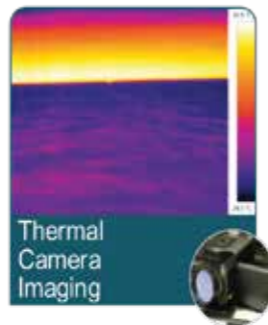
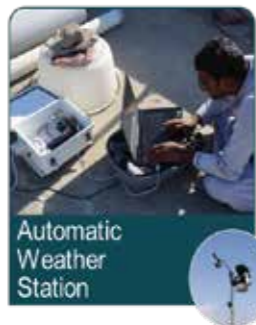
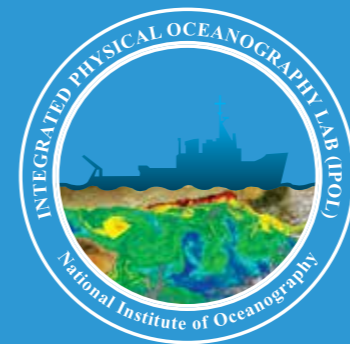




Our instruments are extensively used in field surveys, facilitating efficient data collection and ensuring the highest standards of instrumental calibration. With a primary focus on quality assurance, our instruments enable accurate data acquisition and retrieval for robust modeling and analysis purposes.

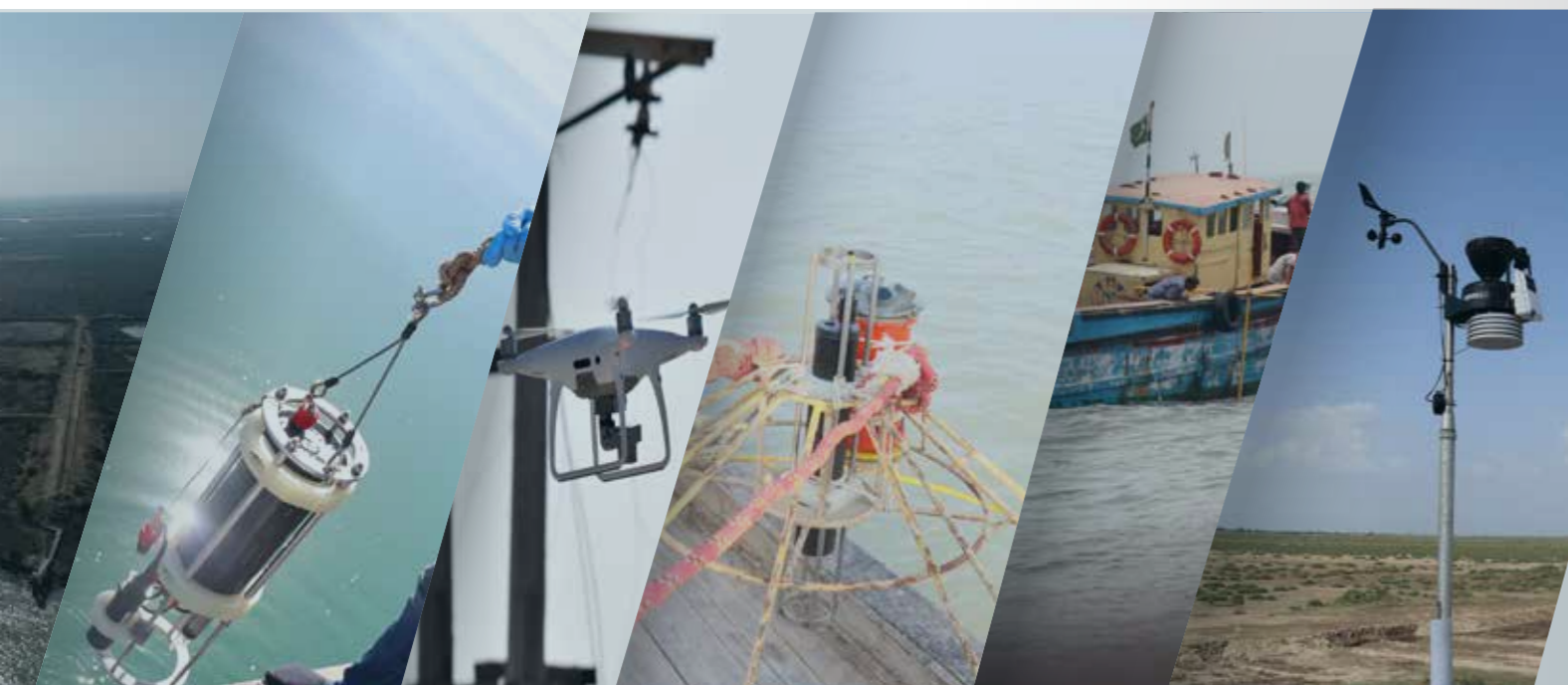


Integrated Physical Oceanography Lab produces a Quarterly Weather Bulletin under the Sea Water Intrusion project (PSDP) illustrating the key weather parameters being logged at the Automatic Weather Stations installed across Pakistan Coast at NIO Stations.



# IPOL

## INTEGRATED PHYSICAL OCEANOGRAPHY LAB



IPOL: Mapping the seas, marking the blue limits, and unleashing insights into Pakistan's waters by harnessing the power of Physical Oceanography, Data Science, Remote Sensing, GIS, and Big Data.

**Dr. Ibrahim Zia**  
Project Director/ Principal Scientific Officer,  
National Institute of Oceanography, Pakistan

+92 21 99251172-78

Monday - Friday  
7:30am - 3:30pm

ipol.niopk@gmail.com  
niopk.gov.pk@gmail.com

Integrated Physical Oceanography Lab,  
National Institute of Oceanography,  
ST-47, Block-1, Clifton, Karachi





## Mission Statement

IPOL is a state-of-the-art laboratory for the advancement of physical ocean science and technology, aiming to understand and predict processes for sustainable resource utilization, protection and management.

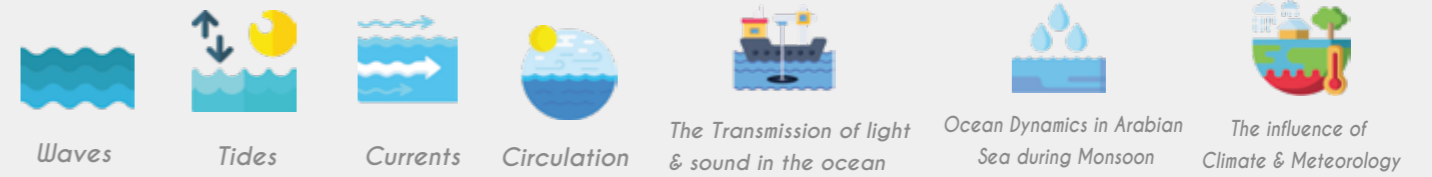
## Vision

The Integrated Physical Oceanography Lab (IPOL) will serve as a hub where all physical parameters and their corresponding data will be collected and studied using the most advanced technology available.

This comprehensive facility will create a national system for monitoring coastal waters, ocean-basins on both local and regional levels, and will monitor physical, biological, chemical, and geological oceanographic variables.

The IPOL at the National Institute of Oceanography will serve as a coordinating entity to integrate data from all stakeholders at the centralized facility.

The Integrated Physical Oceanography Lab (IPOL) at the National Institute of Oceanography (NIO) specializes in the complex dynamics of physical oceanography, integrating physical oceanography, data science, electronics, and geospatial sciences for research and analysis.



## Fields of Research

- Sea level changes and coastal water dynamics.
- Distribution & structure of oceanic fronts in the shelf seas.
- Analysis of oceanic and tidal currents.
- Tidal predictions for ports along Pakistan Coast.
- Spatial and temporal variations in coastal processes.
- Numerical modelling.

## IPOL Work Domain



### Marine RS & GIS

Aerial and Satellite data and advanced GIS techniques are utilized to monitor and map various oceanographic parameters. This section contributes to the understanding of ocean dynamics, coastal processes, and marine ecosystems through the integration of remote sensing and GIS technologies. This section also deals with WebGIS Mapping and modelling.



### Numerical Modelling

The Numerical Modelling Section within the lab employs advanced computational models and simulations to investigate and predict complex physical ocean processes. Simulation of currents in coastal and open waters are modelled. This section also produces Tidal constituents for Tide Prediction.



### Data Science

This section focuses on the collection, processing, and analysis of oceanographic data from various sources. This section employs cutting-edge data science techniques, including machine learning and big data analytics, to extract meaningful patterns and trends from vast ocean datasets. Networking and server handling is also part of data science section.

## Facilities



E-Lab



Networking & Server



Workstations



Conference Room

## PUBLIC SECTOR DEVELOPMENT PROJECT

Monitoring of Sea Water Intrusion Sea Level Rise, Coastal Erosion & Land Subsidence along Sindh & Balochistan Coast

To investigate the target objectives of the PSDP "SWI", different instrumental facilities are built across Pakistan Coast networked at NIO's stations under Integrated Physical Oceanography Lab in order to monitor land subsidence, tidal levels, ground water tiers and weather parameters across the coastal areas of Pakistan.

### Objectives

- To investigate Sea Water Intrusion along the coastal zone of Pakistan through scientific observations to assess rate of Sea Level Rise and Land Subsidence.
- To find out causes of erosion through scientific observations and relevant data for assessing its impacts on coastal areas.
- To develop mitigation strategy for countering Seawater Intrusion and Coastal Erosion.

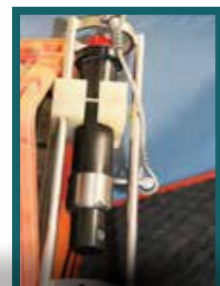
The Integrated Physical Oceanography Lab has collaboration with SUPARCO, PCRUR and Pakistan Navy under Ministry of Science & Technology, Pakistan.



## Instrumental Capability



Automatic Weather Station



Mini CTD



DJI Phantom 4 Pro V2.0



Total Station



Acoustic Doppler Current Profiler



Surface Current Meter



Thermal Camera



Tide Gauge



Sub Bottom Profiler



Earth Resistivity Meter



Piezometer



GNSS