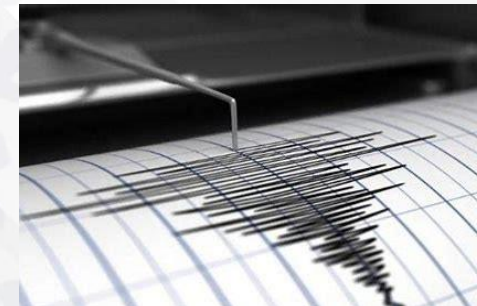
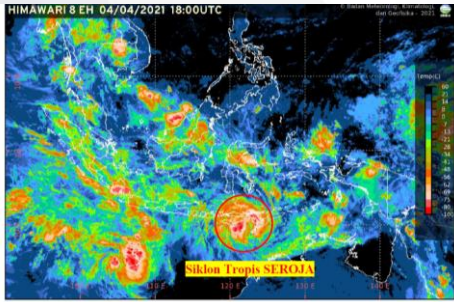


# Strengthening Indonesia Ocean Observation to Enhance the Accuracy of Early Warning System



**Dr. Nelly Florida Riama**

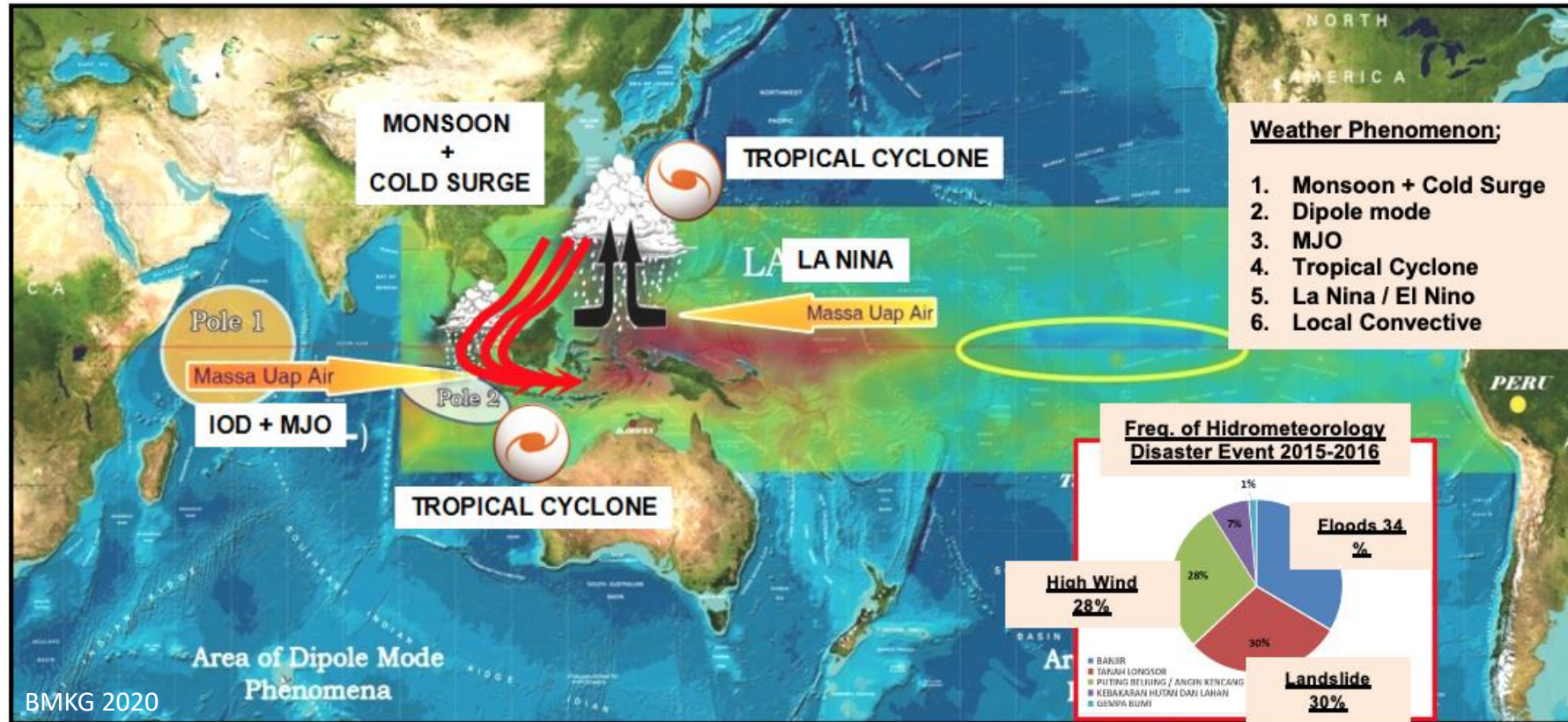
**The Agency for Meteorology, Climatology, and Geophysics of The Republic of Indonesia (BMKG)**

**CLIVAR-GOOS Workshop: From global to coastal: Cultivating new solutions and partnerships for an enhanced Ocean Observing System in a decade of accelerating change**

***15-17 August 2022, Trieste, Italy and online***



# COMPLEXITY OF ATMOSPHERIC-OCEANIC



Landslide



Floods



Beluung



Strong Wind



Land Fire

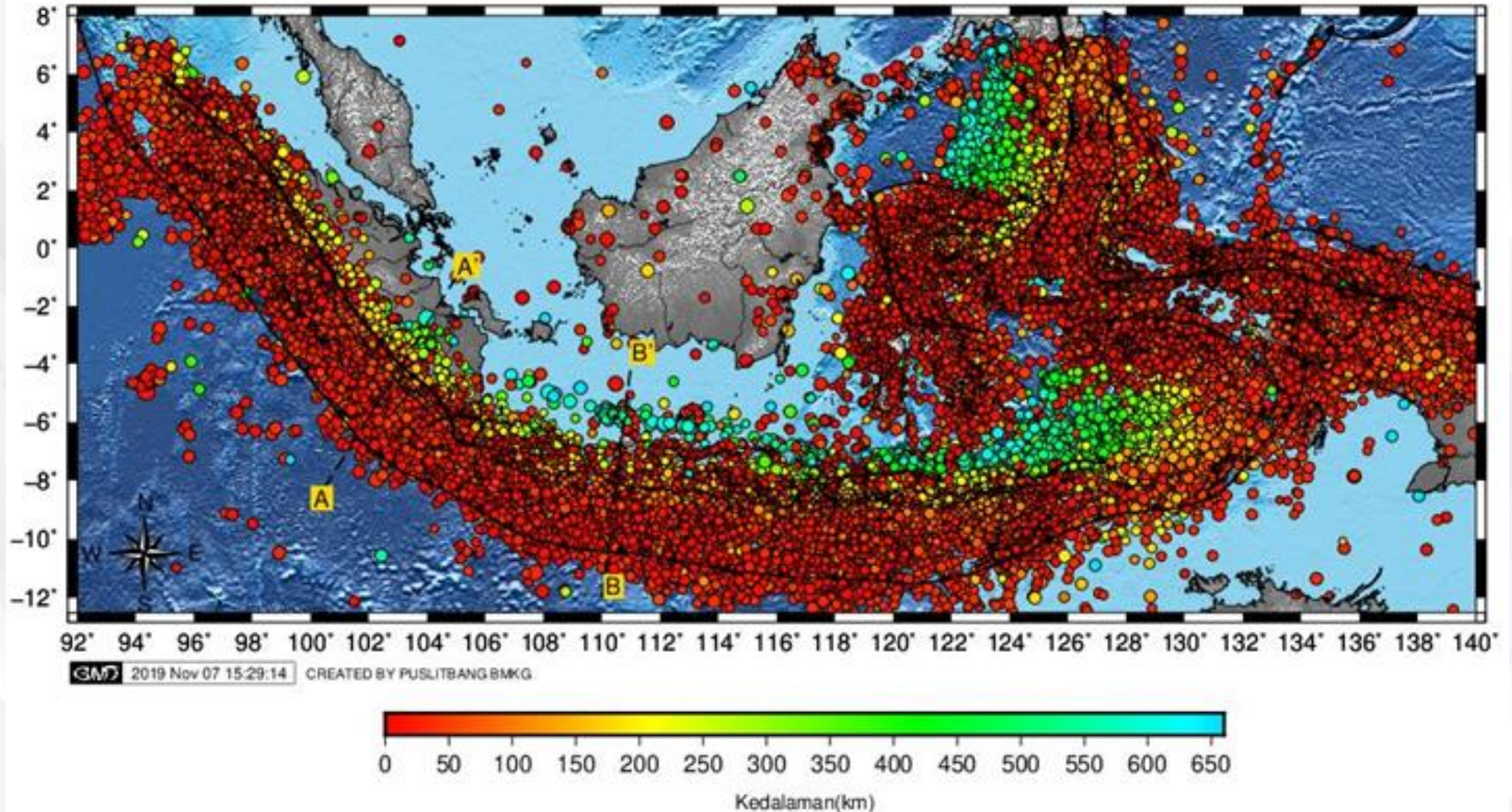


Rough Sea





# SEISMICITY OF INDONESIA (1973-2019)

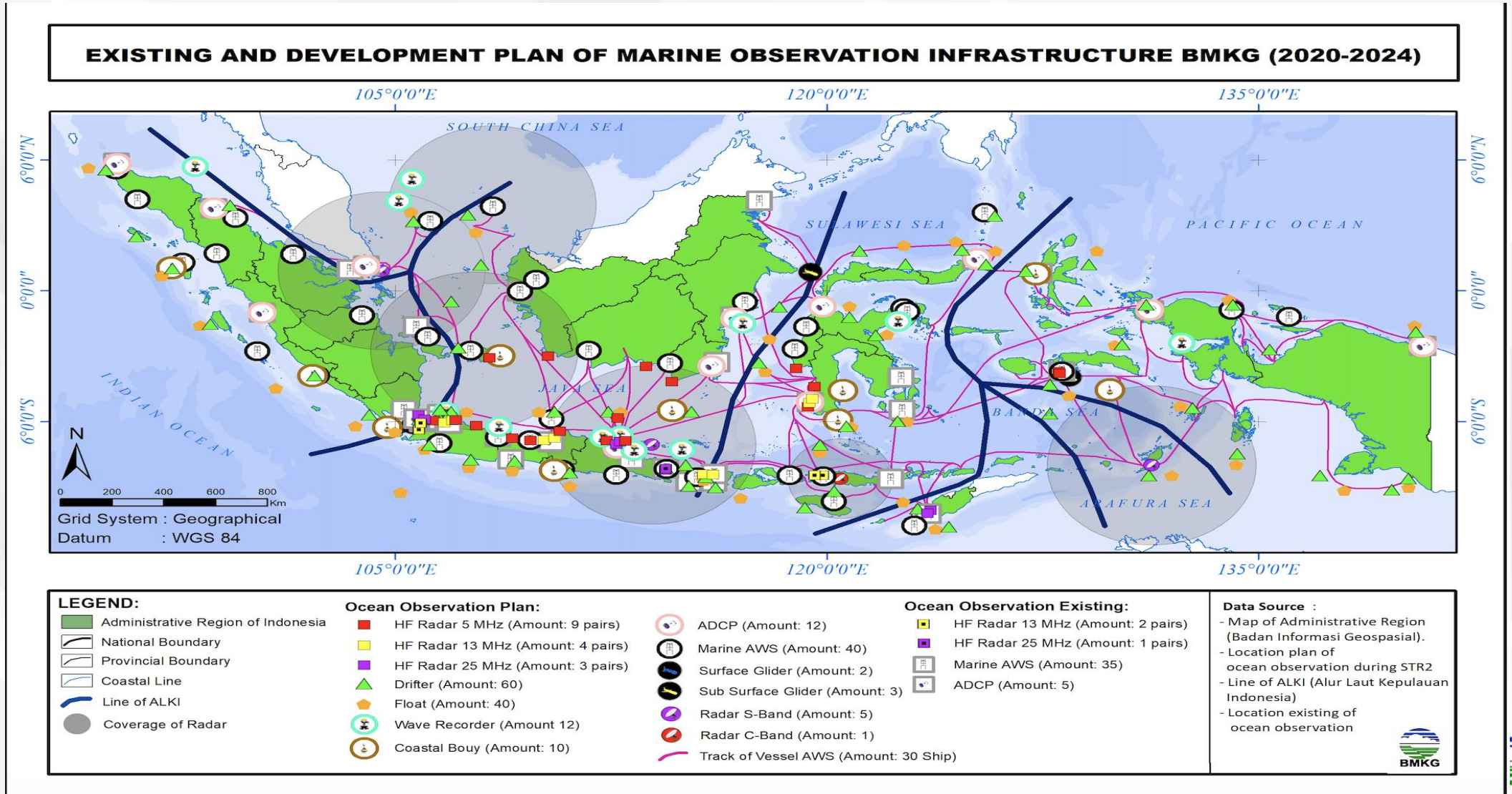


# IMPROVEMENT OF THE MET-OCEAN MONITORING SYSTEM



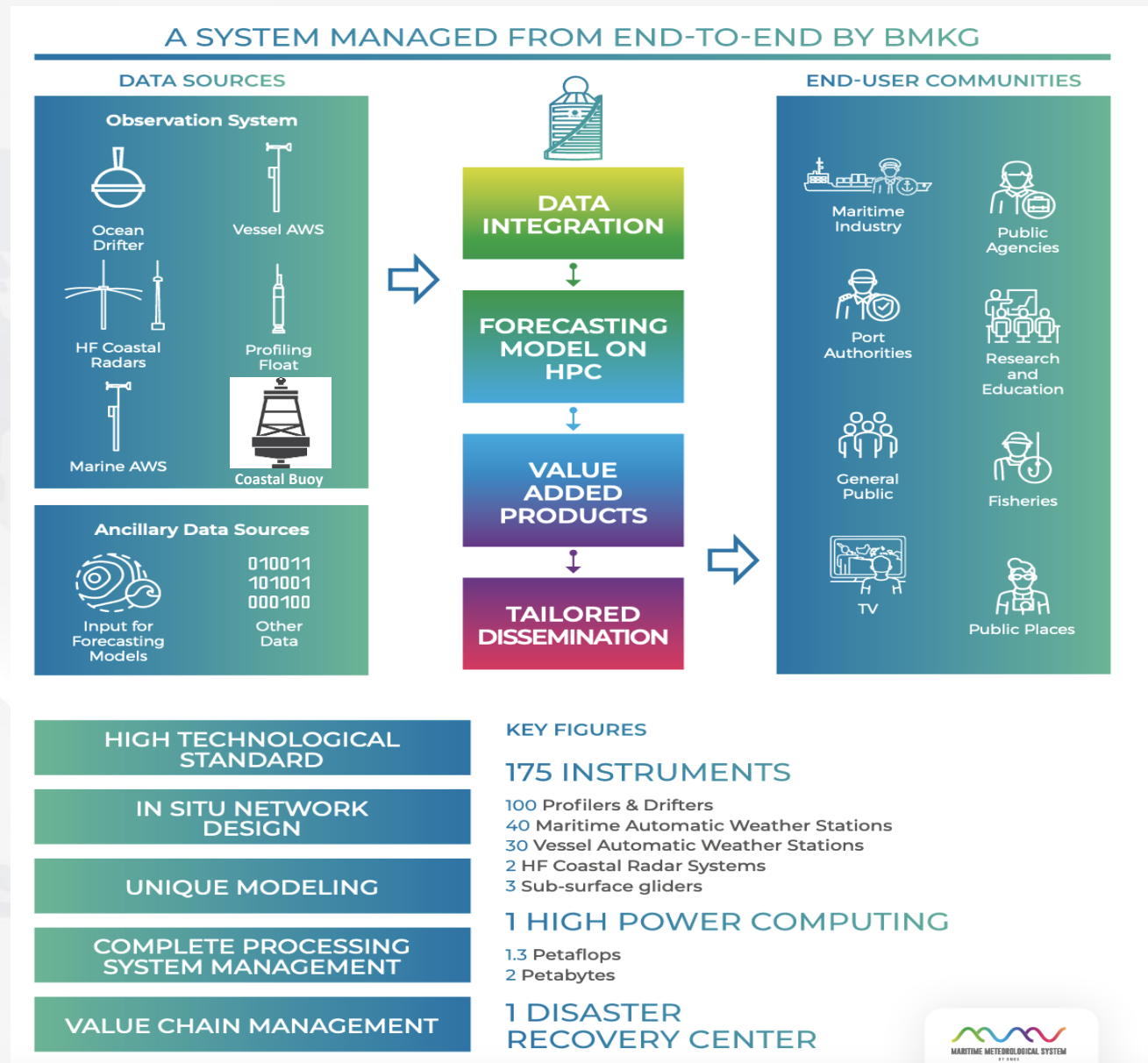


# Development of Maritime Observation Infrastructure Through Marine Meteorology System (MMS) Project



# MMS Project

1. MMS Project Improved observation network to cover phenomena related to air-sea interactions to providing more accurate weather and climate information;
2. Increasing the maritime meteorological observation network to support the safety and efficiency of various national marine activities (transportation, fisheries, natural resource exploration, tourism, conservation, research, etc.);
3. Increasing the accuracy of the information and early warning of marine weather through the implementation of an impact-based forecast system;
4. Increased dissemination and socialization of maritime meteorological information services.



# STRENGTHEN OCEAN RESEARCH CAPACITY





# 1. Indonesia PRIMA (Indonesia Program Initiative on Maritime Observation and Analysis)

- Follow-up the cooperation between Indonesia (BMKG) with America (NOAA) related to maritime.
- Center of Marine Meteorology's activity to support *Global Ocean Observing System (GOOS)*.
- Support the government priority program in developing maritime meteorology, such as Marine Observation "**MARINE OBSERVATION**"

## OBJECTIVE:

1. Conduct of weather, ocean and air quality observation over Indian ocean;
2. Utilization of ocean observation data to improve weather and climate information in Indonesia;
3. Maintenance of particular RAMA buoys;
4. Capacity building in ocean instrumentation and data analysis



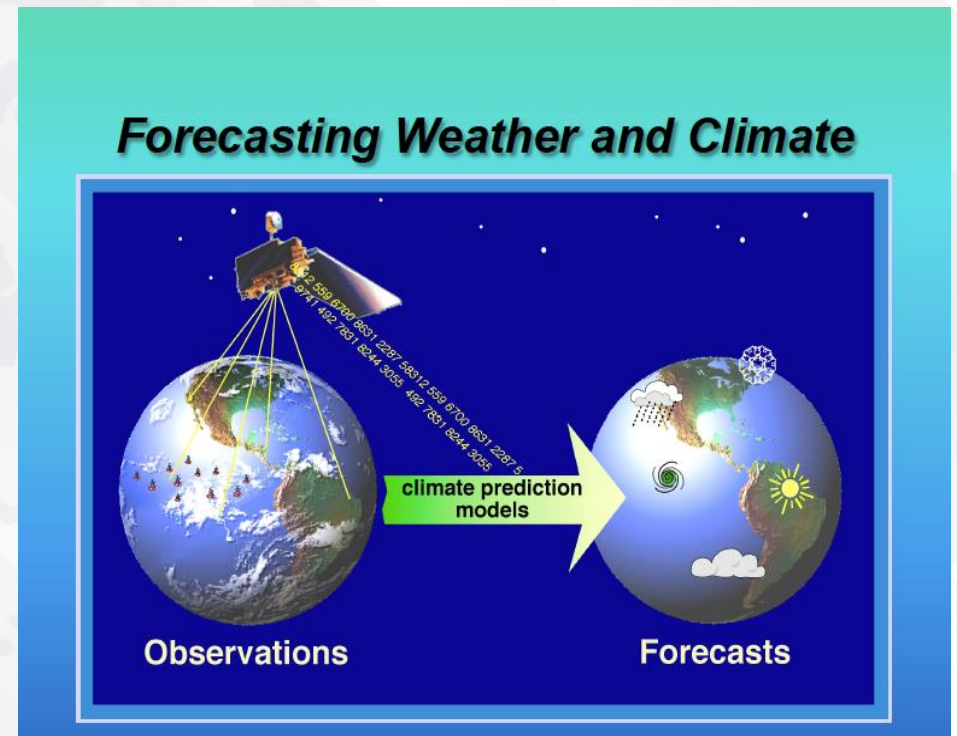
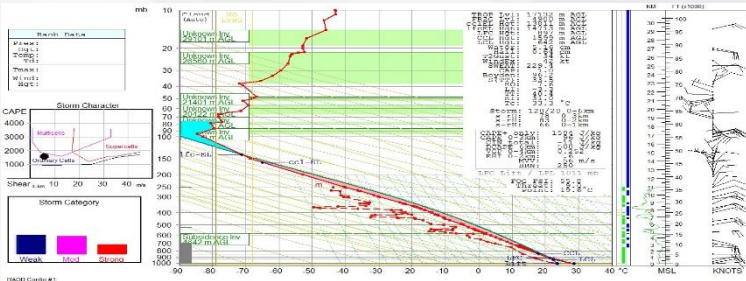
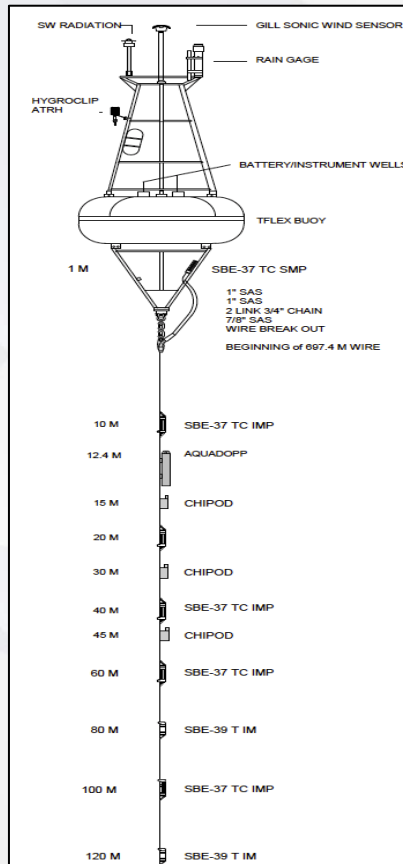
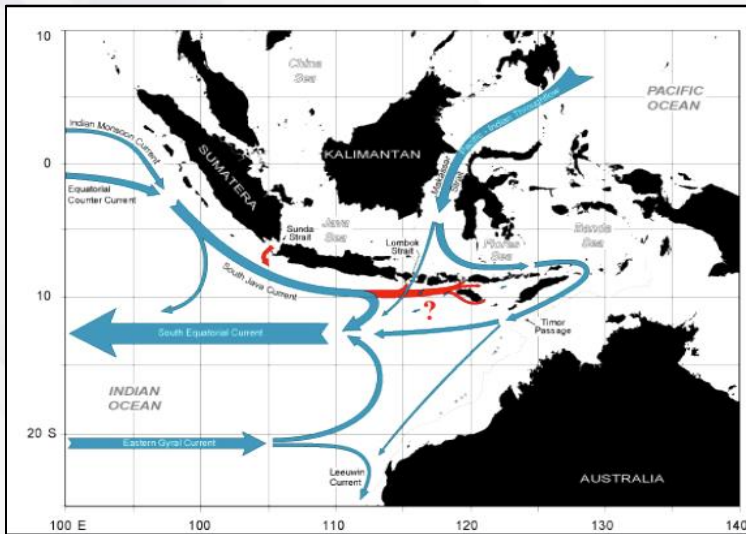


# Indonesia PRIMA Activites

1. Collecting marine meteorology  
Observation data

2. Maintaining Buoy  
RAMA

3. Validating the model of  
*Ocean Forecast System*  
developed by Marine  
Meteorology Center



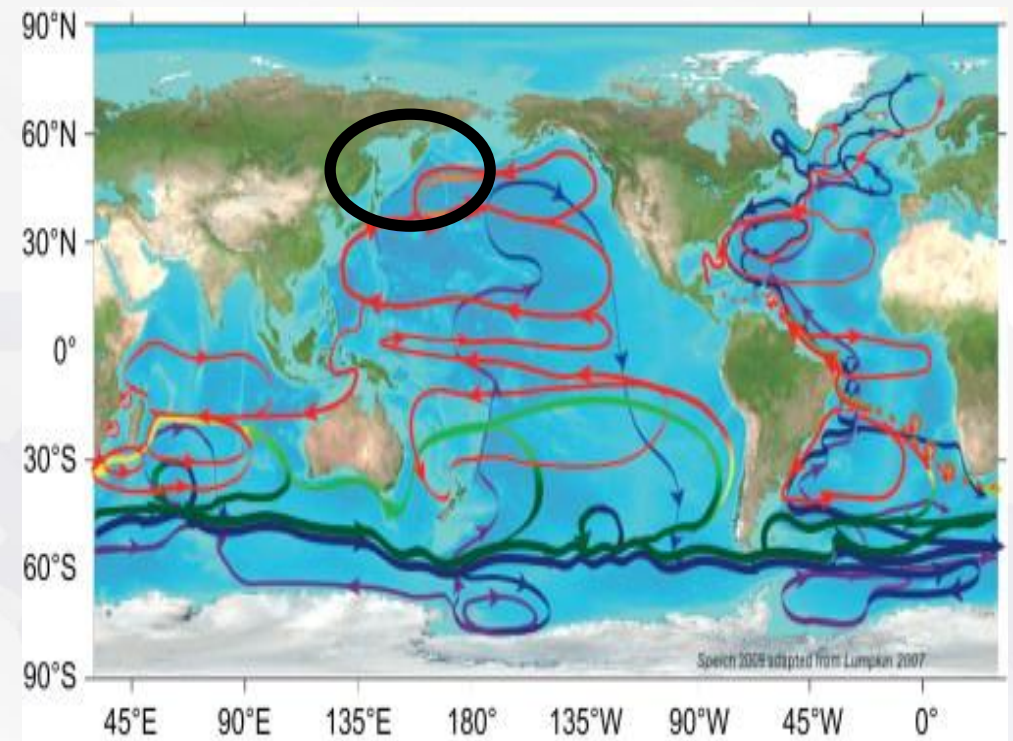
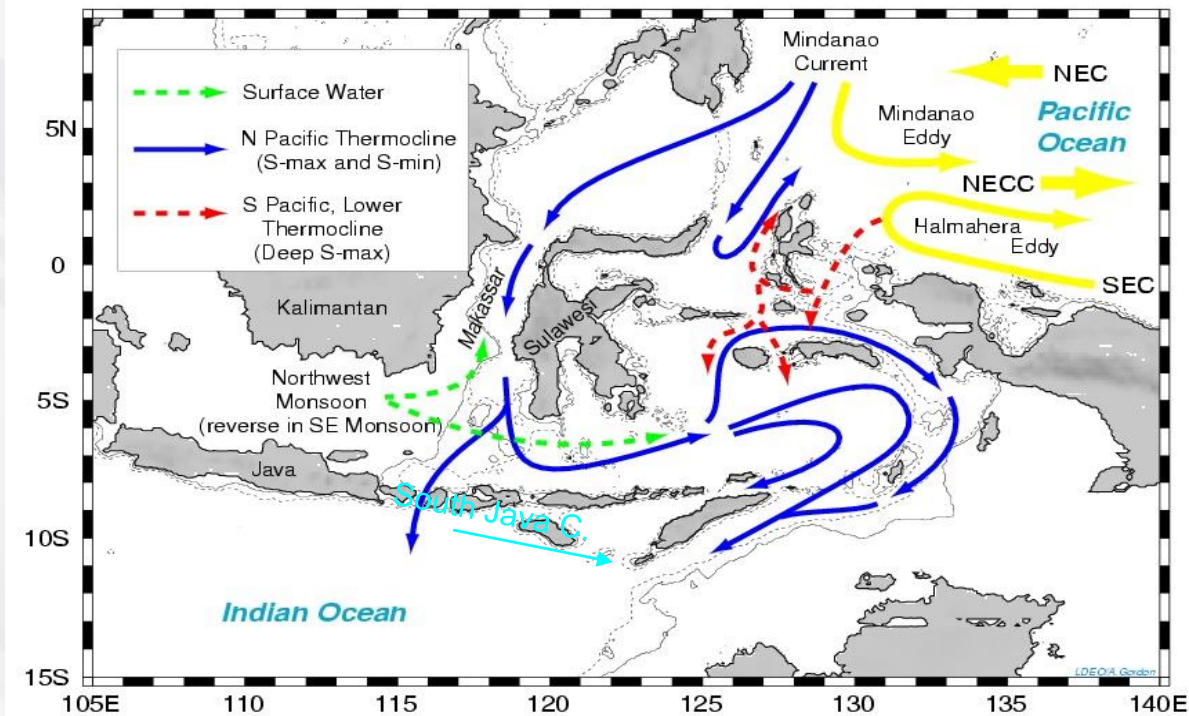
## 2. Measuring and Modelling the Indonesian Throughflow International Experiment (MINTIE): an International Collaborative Study

- MINTIE will enhance understanding of the oceanic processes in the Indonesian region.
- The international MINTIE observational effort is a novel combination of a three-year deployment of a transport and water mass resolving mooring array within the major ITF passages and simultaneous observations from profiling and mixing floats in the interior seas.
- These observations, commencing in 2023, and a series of high-resolution model simulations will be used to investigate the drivers and dynamics of the ITF.





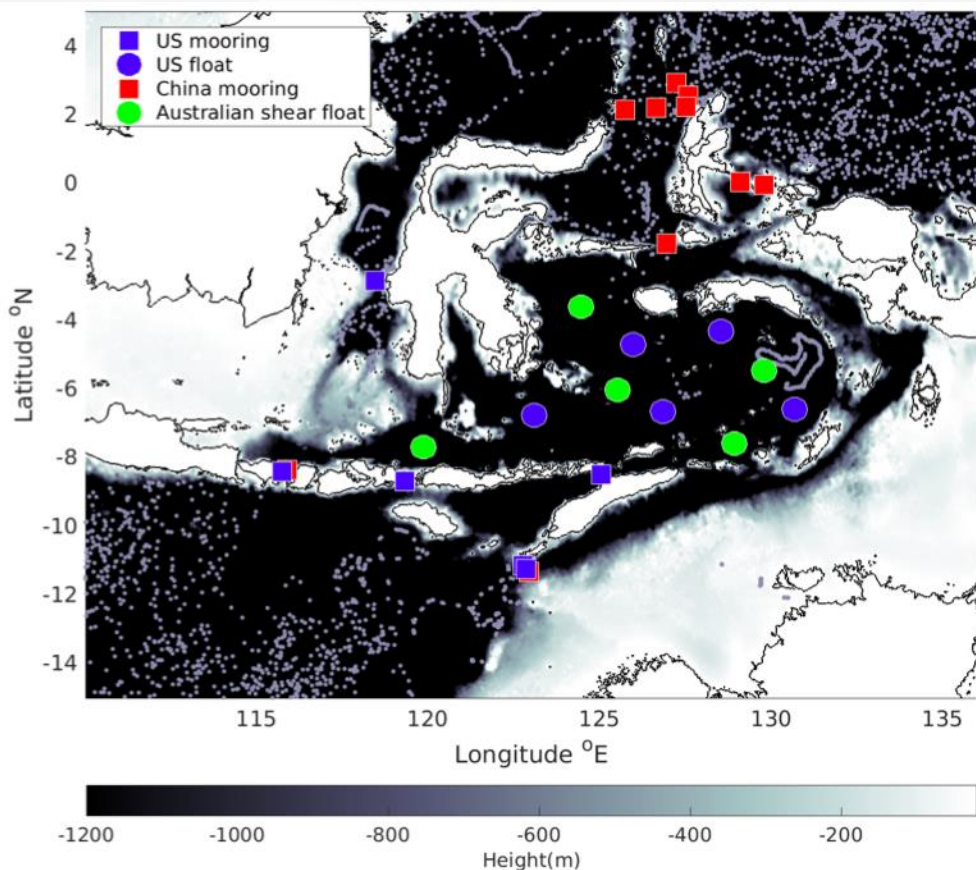
# The Indonesian Throughflow (ITF)



- System of surface currents flowing from the Pacific Ocean to the Indian Ocean through the Indonesian Seas.
- Transfer of heat affects the rain (or lack of rain) and fire seasons of Northwest Australia and Southeast Asia, thus is a large environmental and economic factor
- Without ITF, region would be colder and drier



# MINTIE: the field campaign



## Investigators

- USA: NSF – WHOI (Wijffels), SIO (Sprintall), LDEO (Gordon), Rutgers University (Wilkin and Zavala), U. Washington (Riser, Yang)
- Indonesia: BMKG (Nelly Florida) and partners
- Australia: CSIRO/CSHOR (Sloyan and Pena Molina)
- Coordinated with China's IOCAS (D. Yuan), FIO (Zexun)

## 3 years activities:

1. Collecting ocean data over Indonesia Through Flow zone (Transport fluctuation, salinity, temperature)
2. Simultaneous internal storage/hydrography via an array of profiling floats

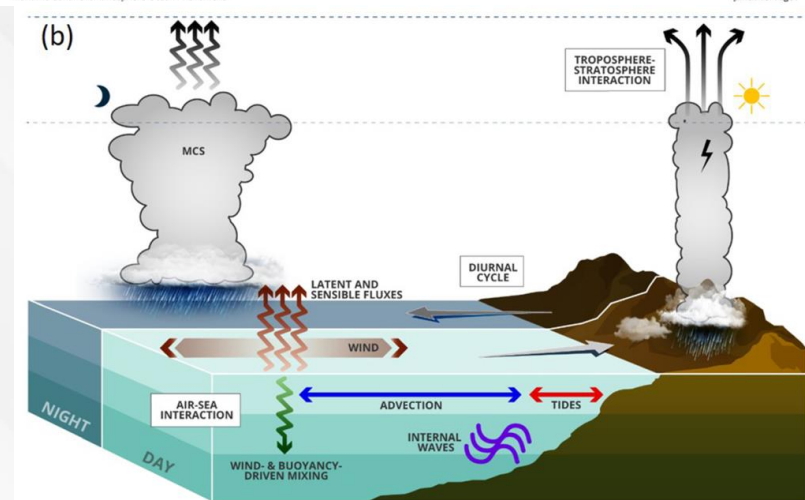
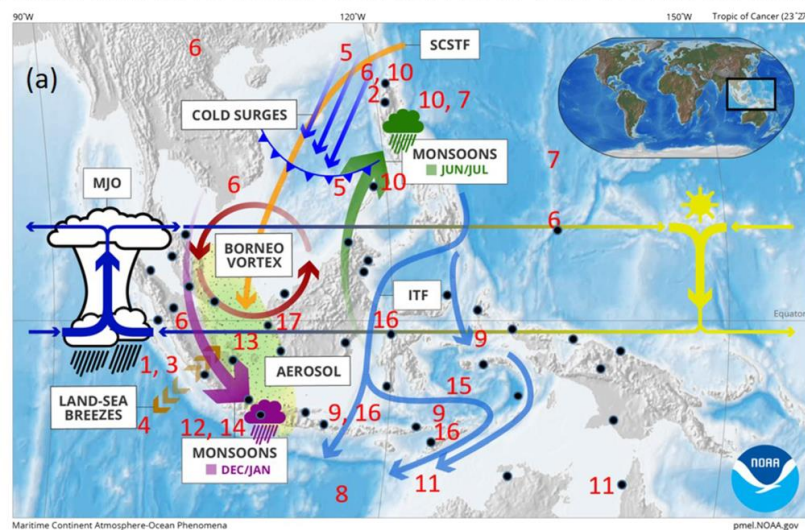




# 3. Years of the Maritime Continent

- YMC is a multiyear international program to study the weather climate system of the Indo-Pacific Maritime Continent and its global impacts.
- Systematic biases in regional rainfall produced by numerical forecast and climate models and incomplete knowledge of the regional weather climate system motivated this program. This program conducts field campaigns to collect atmospheric and oceanic observations.
- Its preliminary results reveal new information that encourage further researches by combining observations with numerical models.
- Scientific Issues : Diurnal Cycle, Synoptic Systems, Intra seasonal Oscillations, Monsoons, Oceans, Air-Sea Interactions, Troposphere-Stratosphere Interactions, Aerosol, Prediction Improvement

MARITIME CONTINENT ATMOSPHERE-OCEAN PHENOMENA



## 4. The Equatorial Line Observations (ELO) project

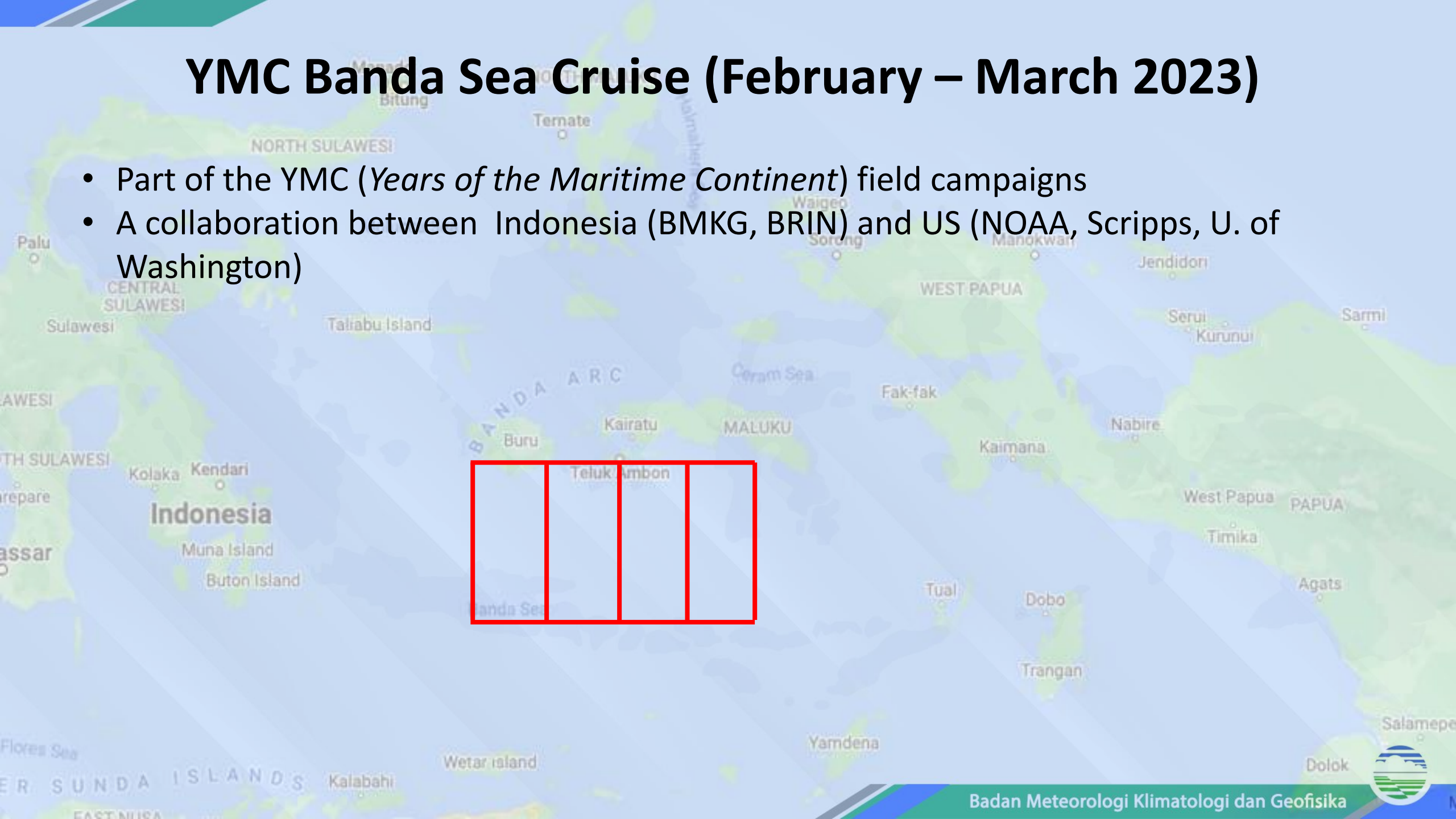
- In this project, the interactions within atmospheric equatorial convectively coupled Kelvin waves (CCKWs), the leading modes of eastward moving convection on time scales between several days and three weeks, will be investigated. CCKWs and other equatorial waves form the “building blocks” of the active phase of MJO.
- Plan to deploy buoys at Karimata Strait
- Pending program because of the pandemic





# YMC Banda Sea Cruise (February – March 2023)

- Part of the YMC (*Years of the Maritime Continent*) field campaigns
- A collaboration between Indonesia (BMKG, BRIN) and US (NOAA, Scripps, U. of Washington)



# YMC Banda Sea Cruise (February – March 2023)

- **Motivation 1:** The Banda Sea is one of the least observed ocean basins in the world.
- **Motivation 2:** The Banda Sea may hold the key to understanding the barrier effect of the Maritime Continent on the Madden-Julian Oscillation (MJO).
- **Objective:** Observing the air-sea transition zone (the upper ocean, air-sea interface, and marine atmospheric boundary layer) and the diurnal cycle during tropical intraseasonal oscillations.
- **Instrumentation:**
  - underway CTD
  - T-Limpet system
  - SST Snake
  - Skin SST Remote Ocean Surface Radiometer
  - IR and Solar Radiometers
  - Surface Meteorology system
  - Ceilometer
  - radiosondes





# CLOSURE

- **Sustain ocean observing system is a key especially for met service in order to give more accurate weather forecasting and climate prediction including early warning of geohazard;**
- **Based on the geographical uniqueness of this region that strongly influence weather, climate and oceanographic phenomenon therefore we need to strengthen our partnership on ocean observation, data management, information services, and research.**

