A closer look of Inner Indonesian Seas through drifter buoys and float profilers deployment

by :
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WORLD METEOROLOGICAL ORGANIZATION

It is where all started …

Severe Tropical Cyclone Seroja

The death toll of this event in East Nusa Tenggara is 181 victims.

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Penampakan Pelabuhan Tanjung Emas Semarang Saat Terendam Banjir Rob

Aji Styawan/Antara Foto - detikNews

Selasa, 24 Mei 2022 08:22 WIB

6 komentar

BAGIKAN

Semarang - Banjir rob rendam kawasan Pelabuhan Tanjung Emas Semarang, Jawa Tengah. Banjir disebabkan oleh tingginya pasang air laut serta tanggul yang jebol di kawasan itu

Foto udara kawasan Terminal Petikemas Pelabuhan Tanjung Emas Semarang, Jawa Tengah, yang terendam banjir rob pada Senin (23/5/2022).

KMP Mutiara Persada II Kandas di Pulau Rimau Balak Dekat Pelabuhan Bakauheni

Antara - Jumat, 07 Juni 2019 - 12:36 WIB

Tide flood sinks the Tanjung Emas Port of Semarang

The sunken port and aground vessel lead the huge damage and loss of the shipping operational activities.

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Maritime and Offshore Oil-Gas Operations

The Indonesia's maritime activities significantly soar during the last couple years

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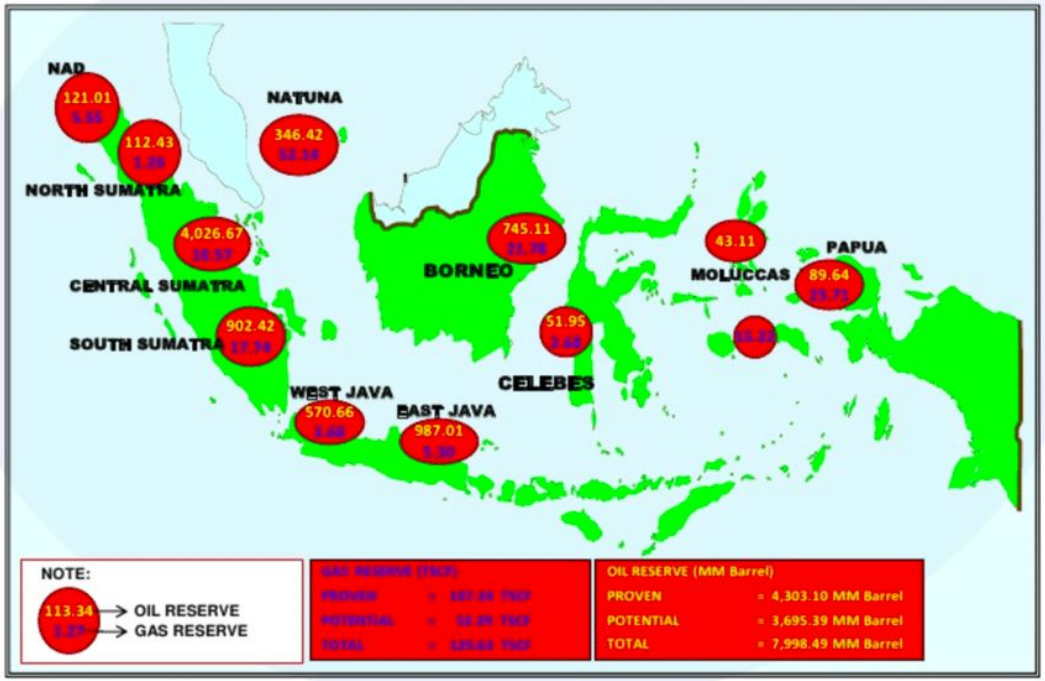

Maritime and Offshore Oil-Gas Operations

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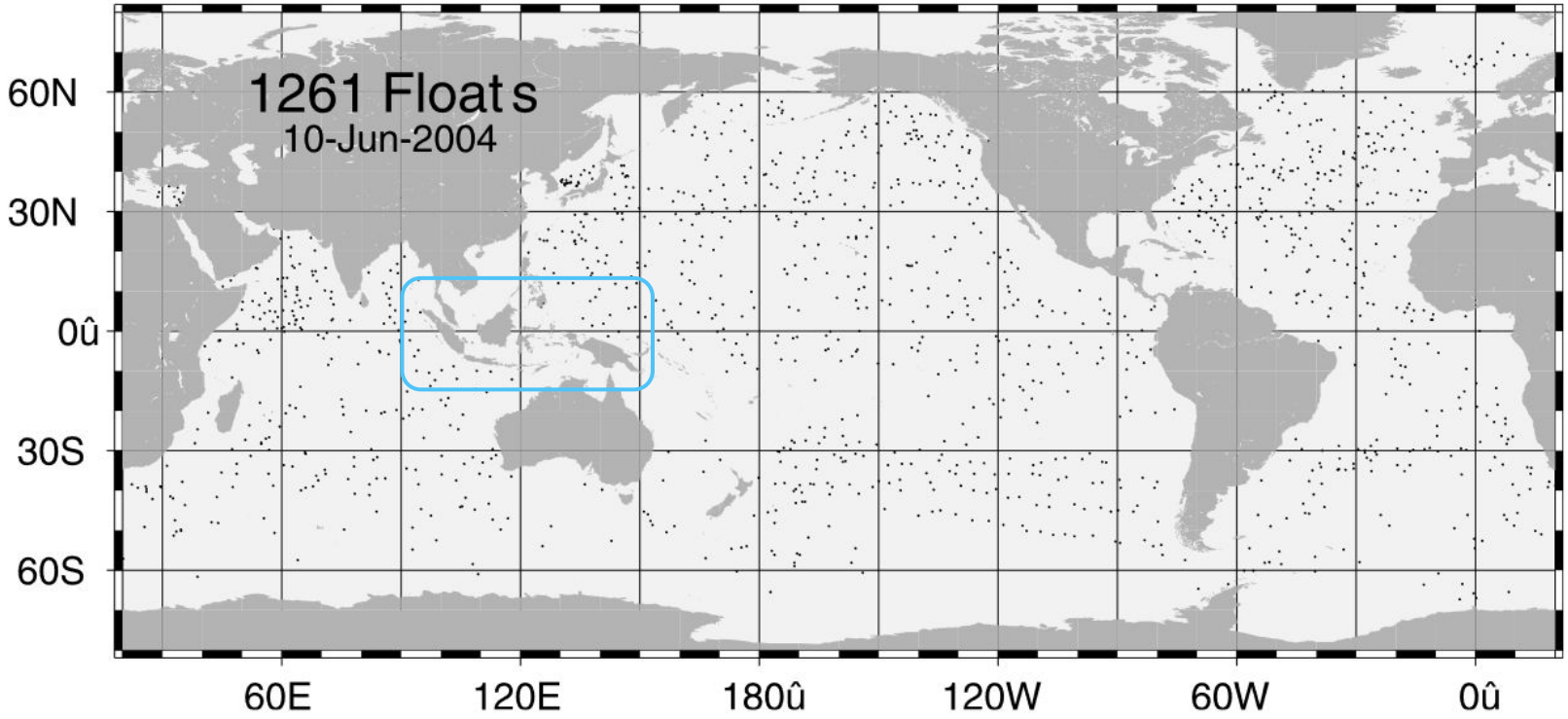
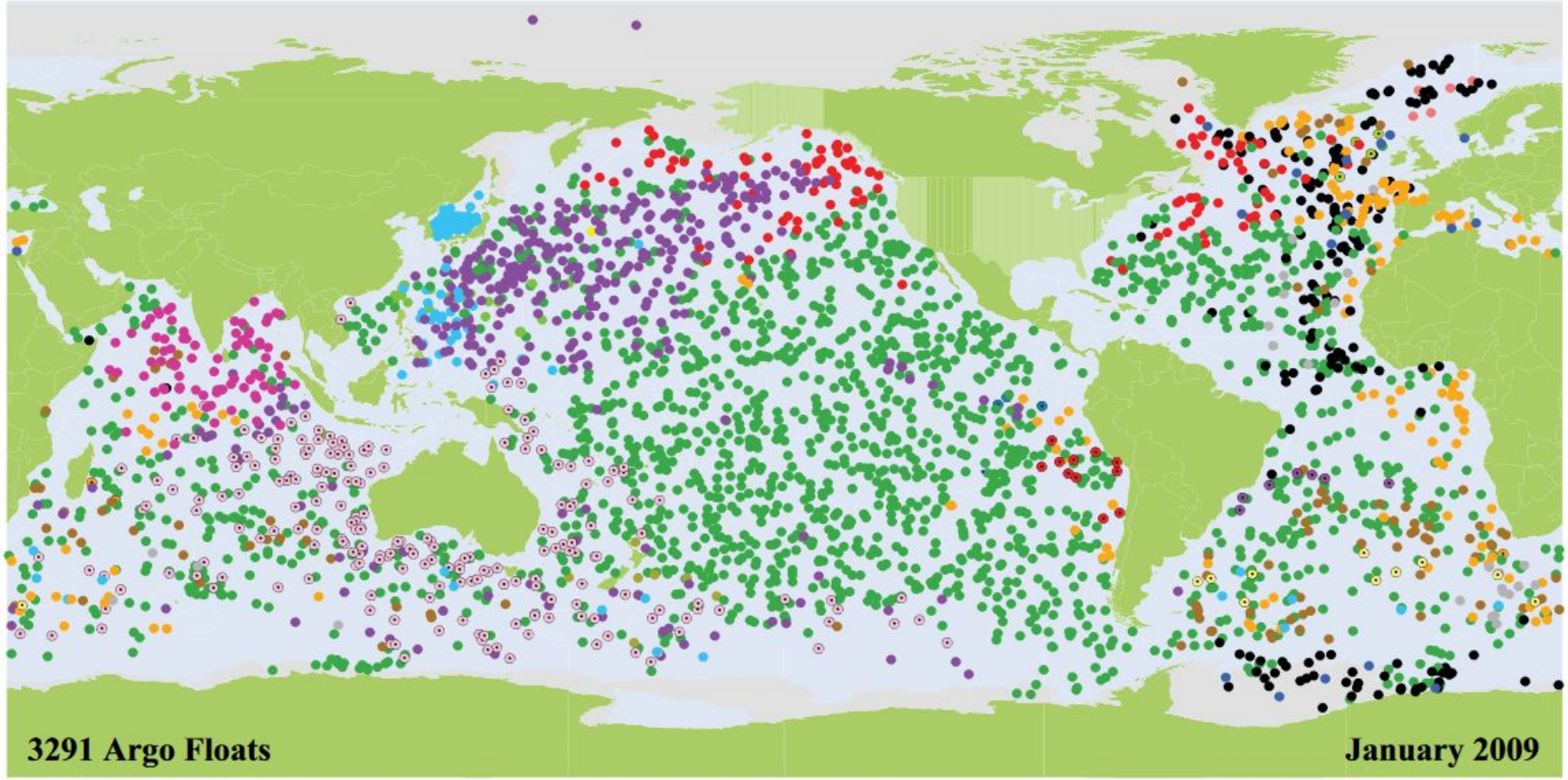
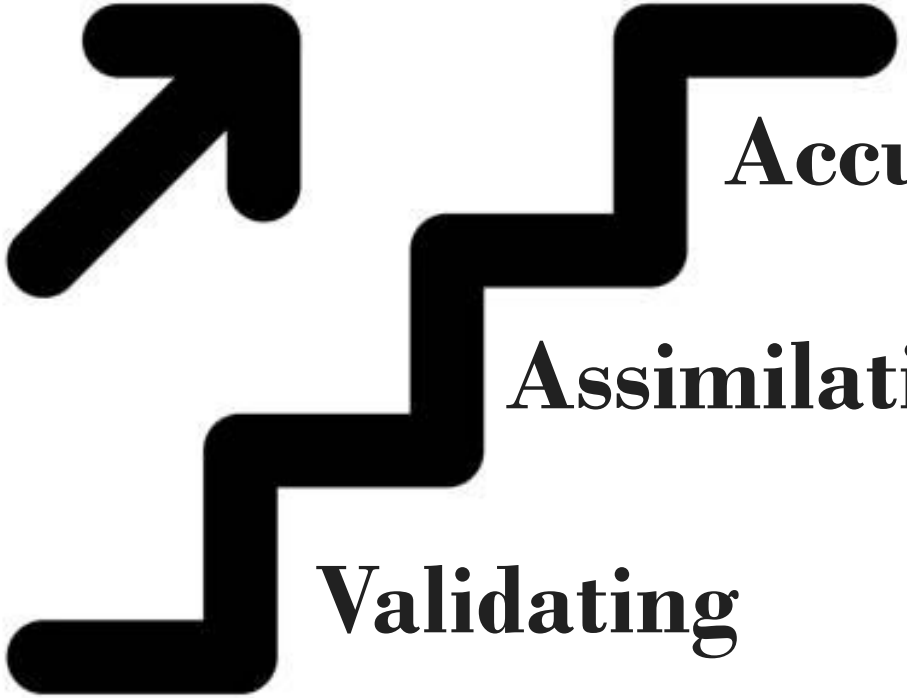


Global Floats Distribution

It is not entering and measuring inner Indonesian seas yet. (Figure courtesy: Roemmich et al., 2004)



- ARGENTINA (11)
- AUSTRALIA (214)
- BRAZIL (7)
- CANADA (108)
- CHILE (11)
- CHINA (22)
- ECUADOR (3)
- EUROPEAN UNION (19)
- FRANCE (157)
- GERMANY (184)
- INDIA (79)
- IRELAND (4)
- JAPAN (365)
- SOUTH KOREA (112)
- MAURITIUS (3)
- NETHERLANDS (25)
- NEW ZEALAND (7)
- NORWAY (5)
- RUSSIAN FEDERATION (1)
- SPAIN (1)
- UNITED KINGDOM (106)
- UNITED STATES (1847)



Accuracy improvement

Assimilating

Validating

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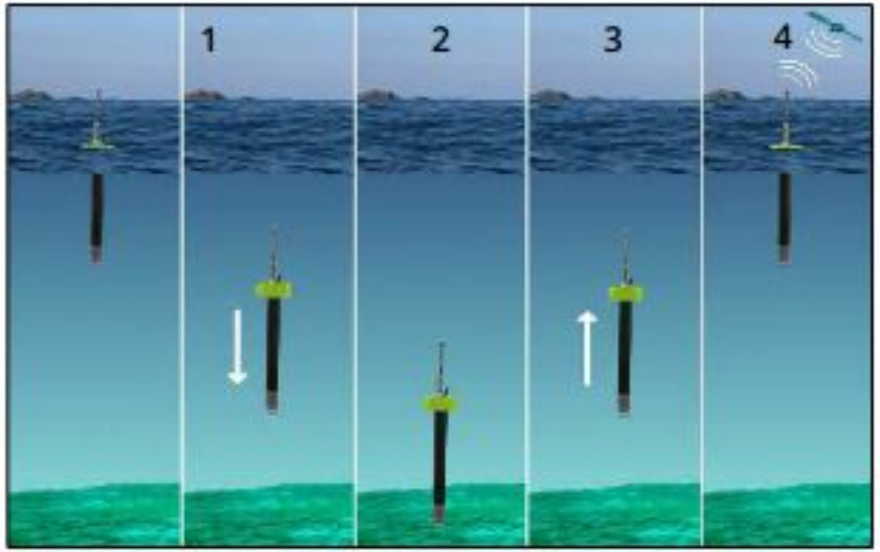
The drifting buoys and profiling floats explore the dynamics of our changing ocean. Figure courtesy: nke-instrumentation.com.

Afterward, we begin the deployment missions.

Profiling floats measure salinity, temperature, and pressure. ARVOR-C is designed to work on coastal area-depth and ARVOR-I is designed to measure in deep water.
The telemetry is IRIDIUM transmission and this device is able to operate until around 300 cycles and around 4 - 5 years in the ocean.

Typical ascent and descent of profiling float

1. Descent
2. Seabed standby
3. Ascend and measurements
4. Surface standby (data transmission, GPS positioning, (receive new parameters or remote control).



coutesy: nke-instrumentation.com

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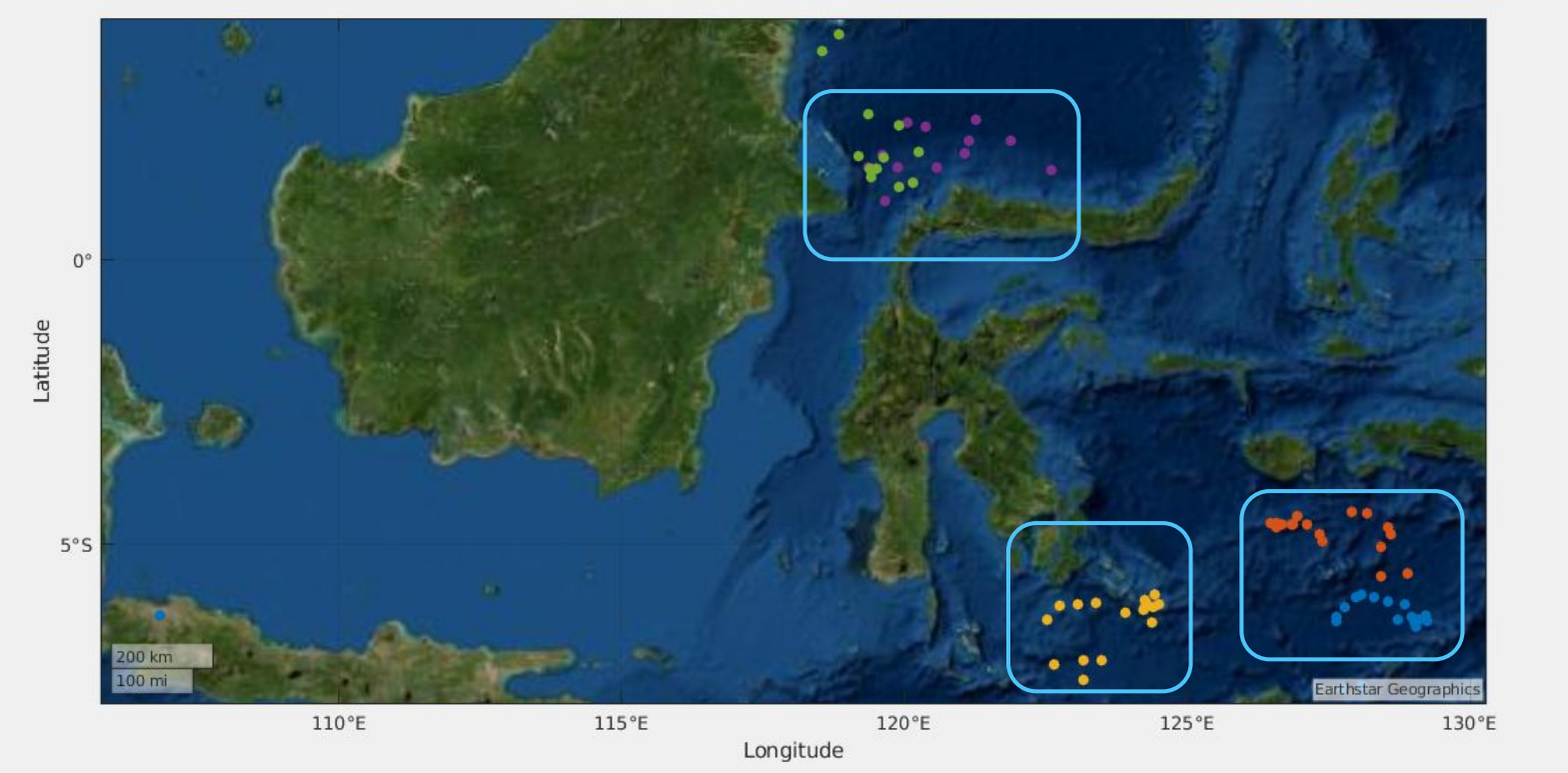
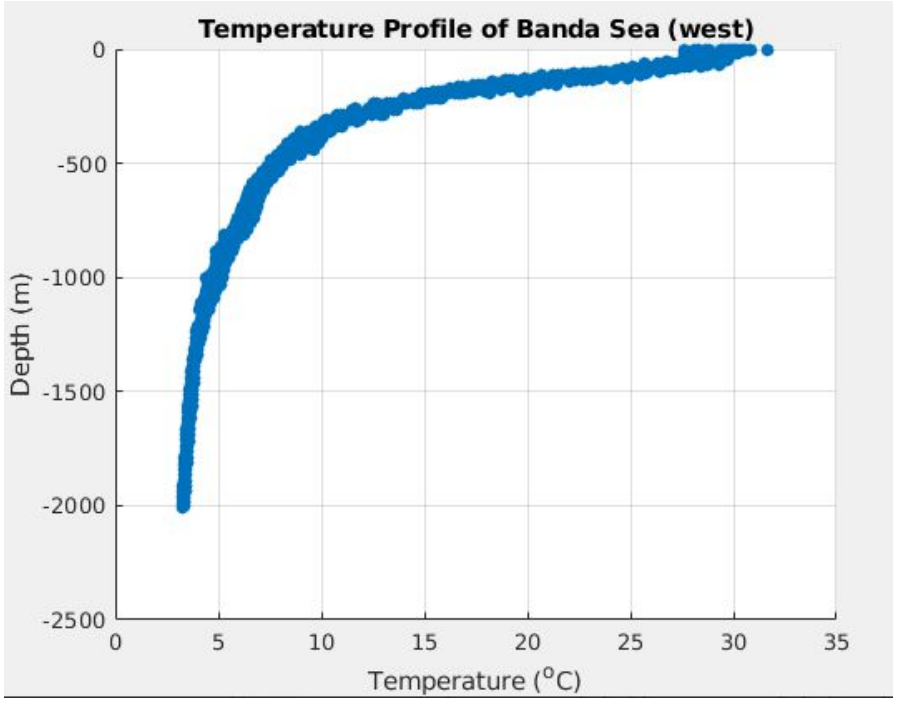
Executive Summary Drifter dan Float

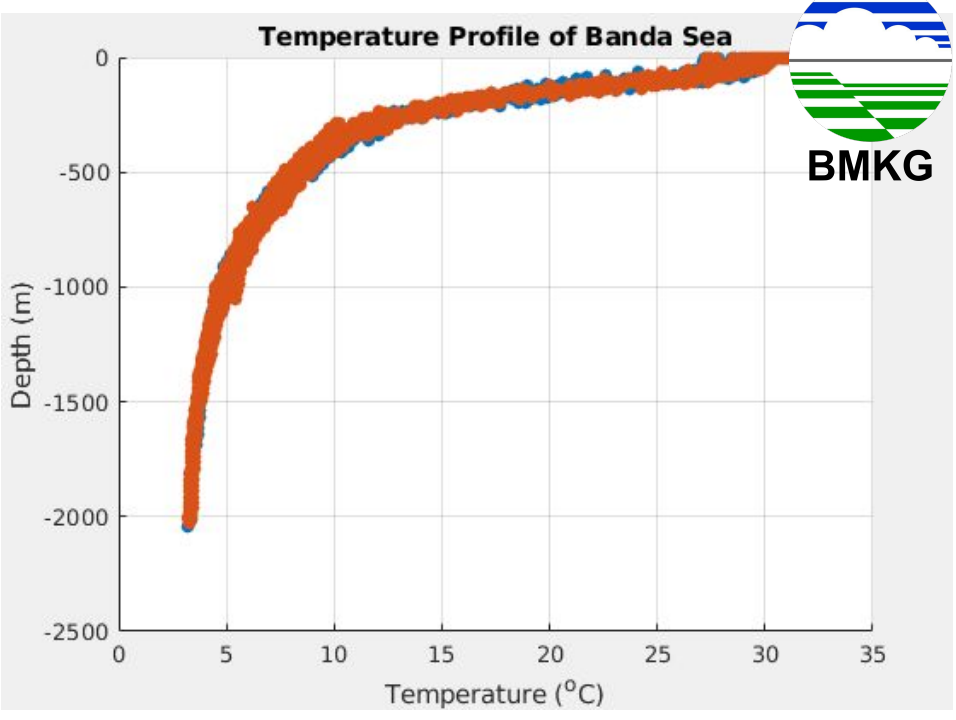
No	Instruments	Jumlah				Total
		OK	Stuck	Landed	No Data/Error	
1	Drifters	3	1	4	6	15
2	Coastal Floats	3	0	0	2	5
3	Ocean Floats	5	0	0	0	5



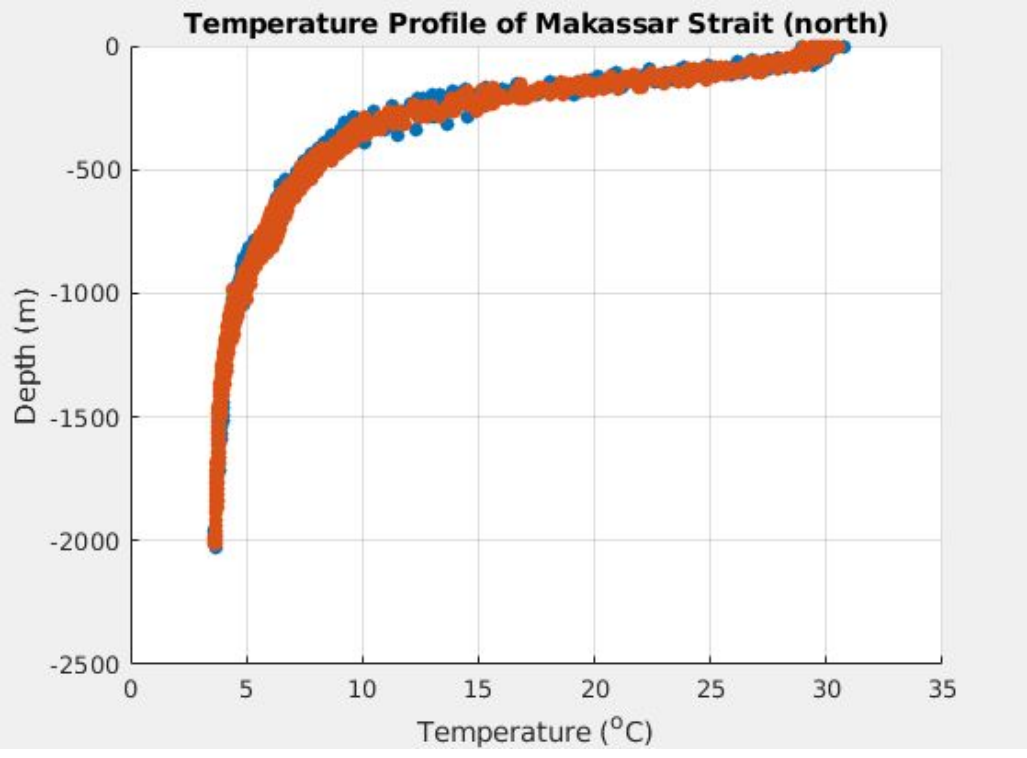
ARVOR-I Deployments Results

ARVOR-I Profiling Float deployments are distributed around North Banda Sea, West Banda Sea, and South Banda Sea to observe the ocean dynamics in Banda Sea which may affected by the Pacific Ocean through Molucca Sea, Halmahera Sea, the islands.





The BMKG is developing the next level of atmosphere-ocean simFWeloats C indicated the deployment of ARVOR-C and Floats O refers to ARVOR-I measurement in Indonesia's seas.



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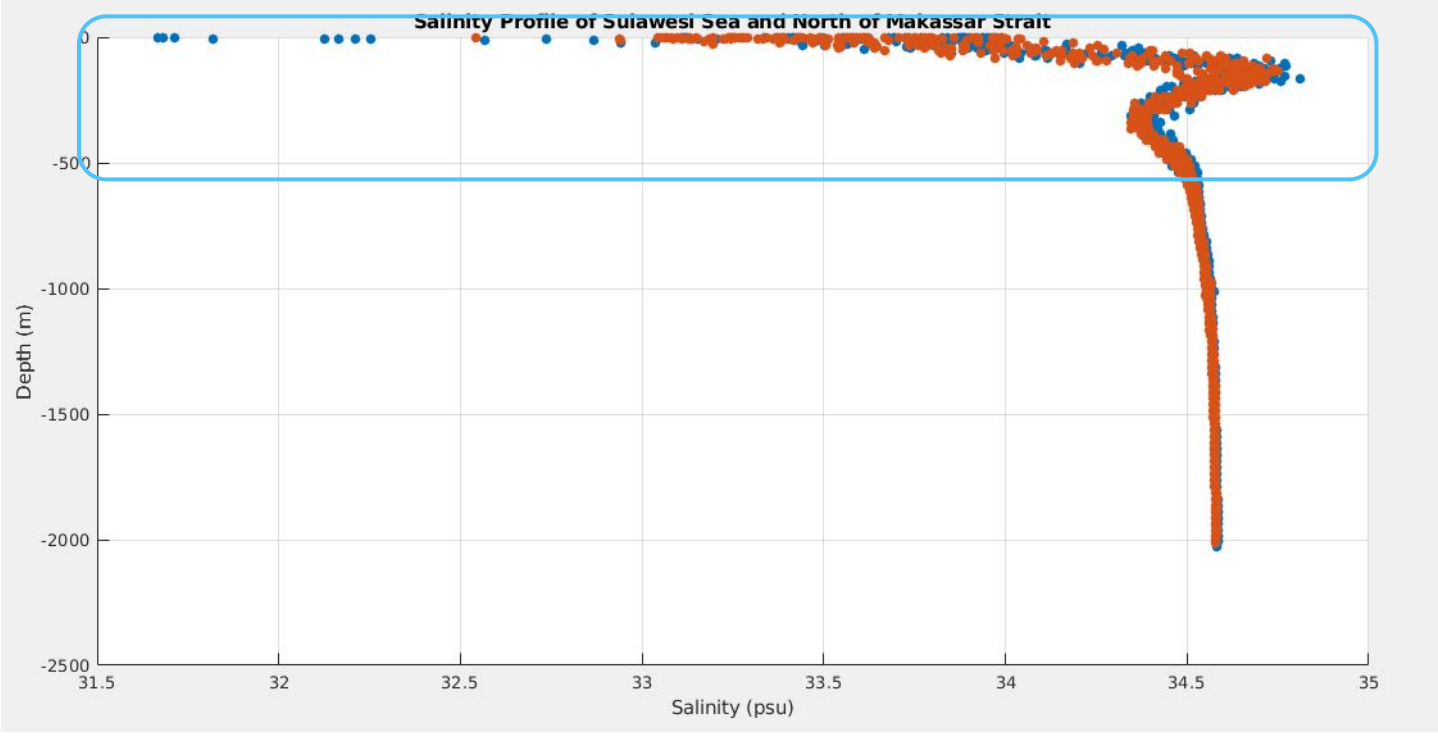
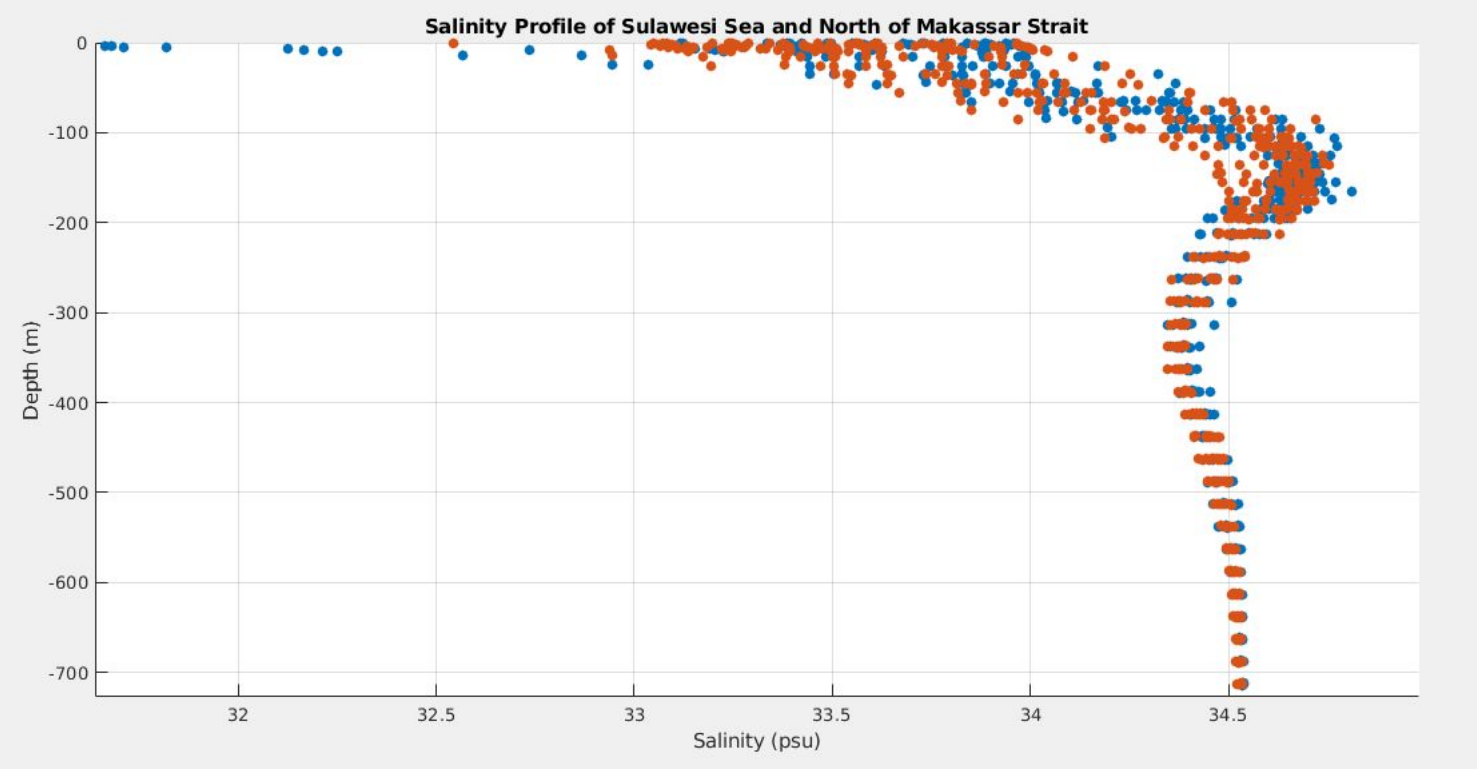


ARVOR-I Deployments Results

Salinity profile has been measure by the Float Profiling ARVOR-I since in the middle of the year. The results indicates Pacific Ocean waters properties dominates the Sulawesi Sea and northern part of Makassar Strait. Additionally,



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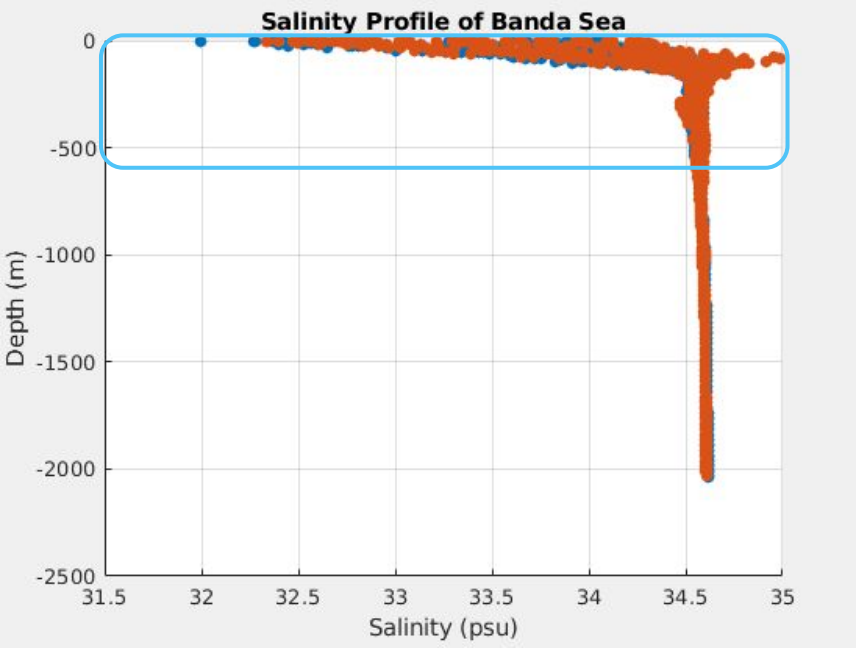

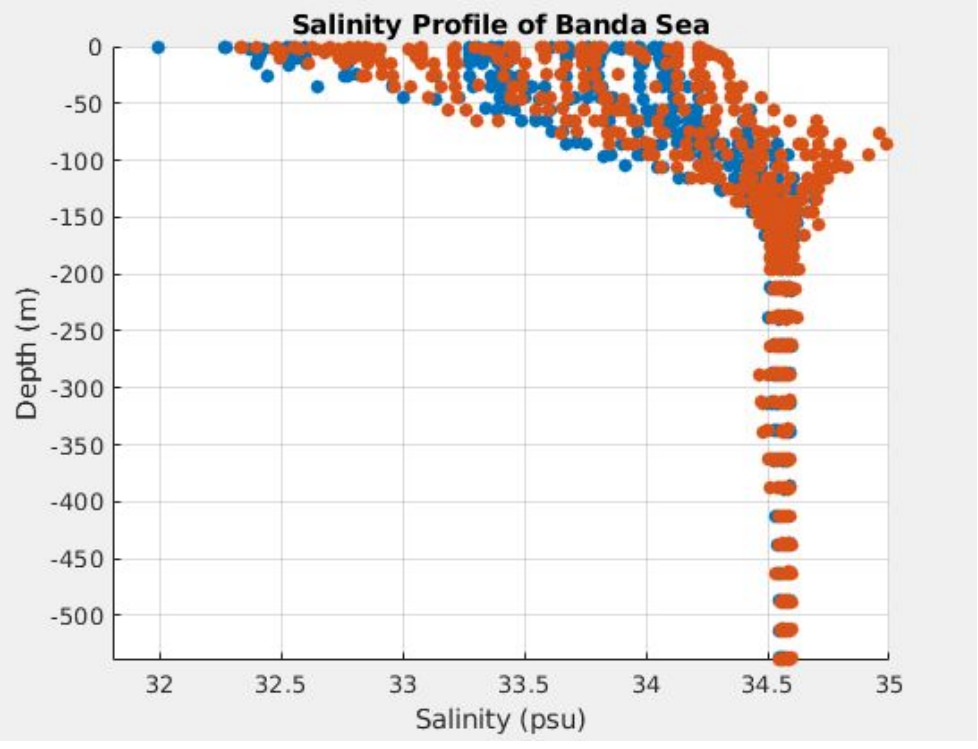

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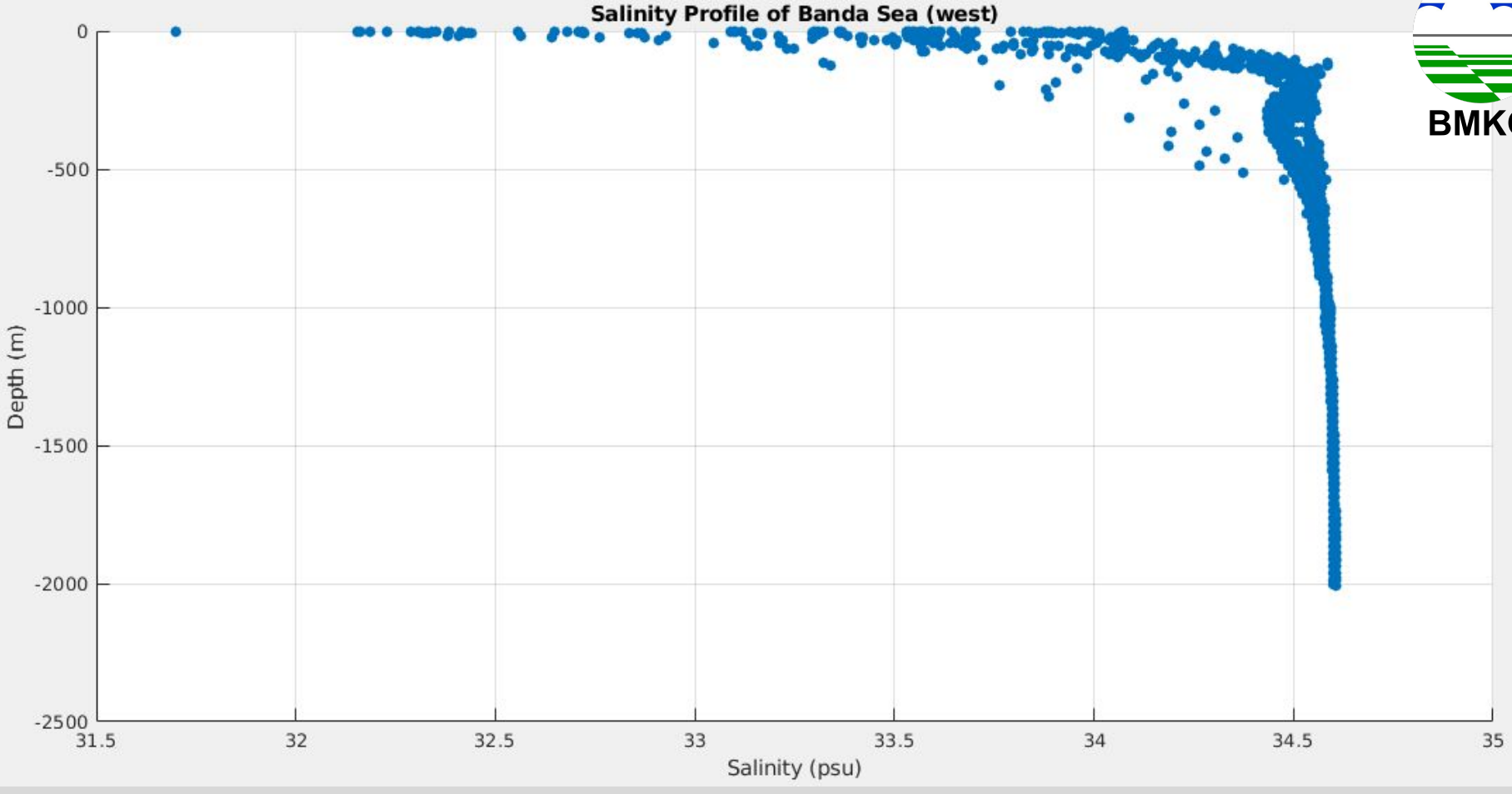
Salinity Profile of Banda Sea (west)
Depth (m)
0
-500
-1000
-1500
-2000
-2500
31.5
32
32.5
33
33.5
34
34.5
35
Salinity (psu)

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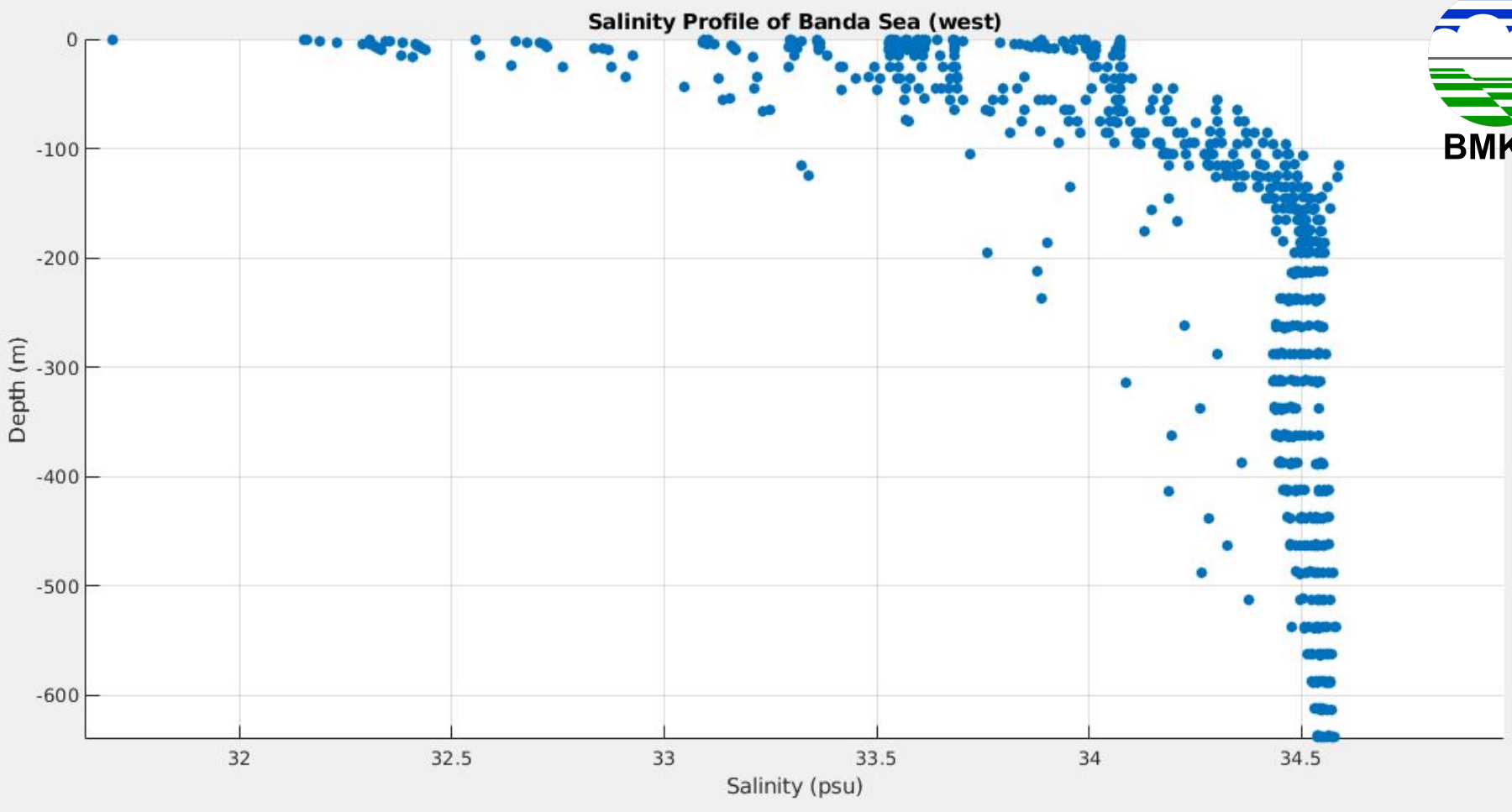
Salinity Profile of Banda Sea (west)
Depth (m)
0
-100
-200
-300
-400
-500
-600
32
32.5
33
33.5
34
34.5
Salinity (psu)

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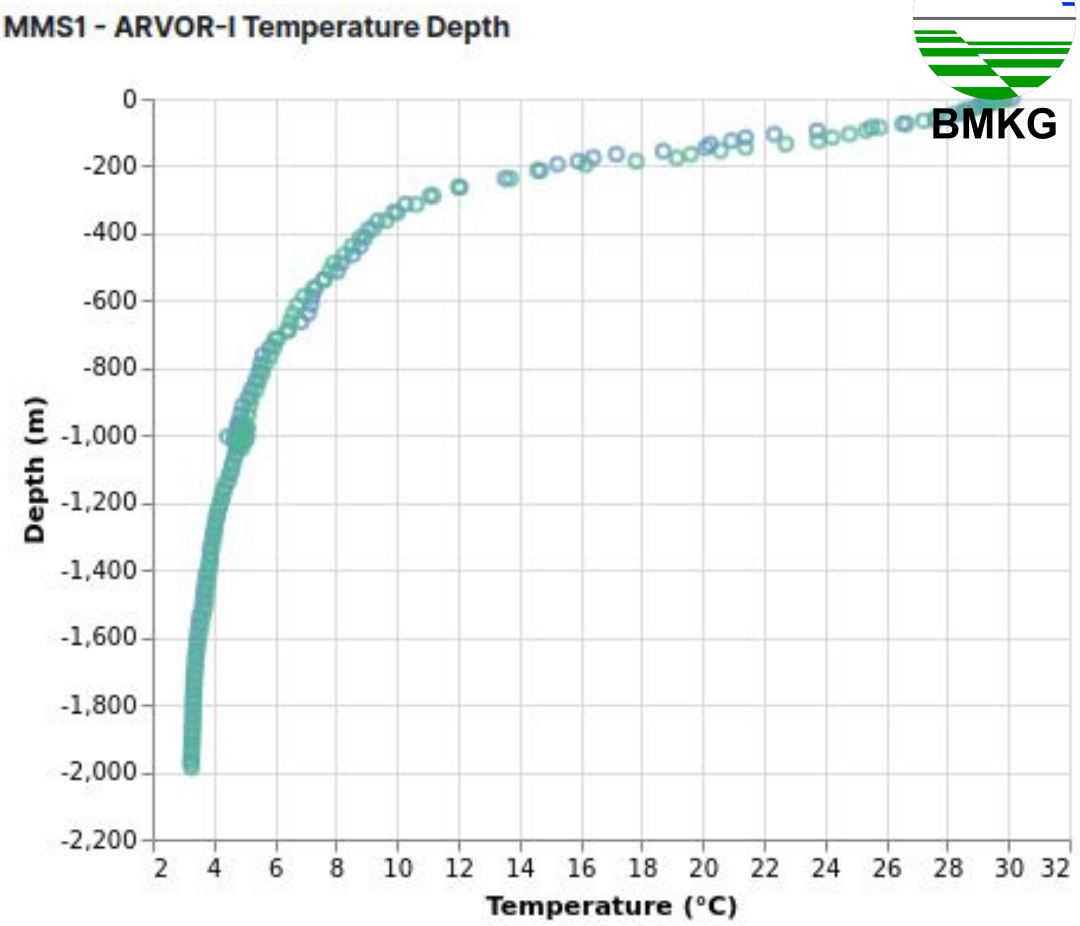
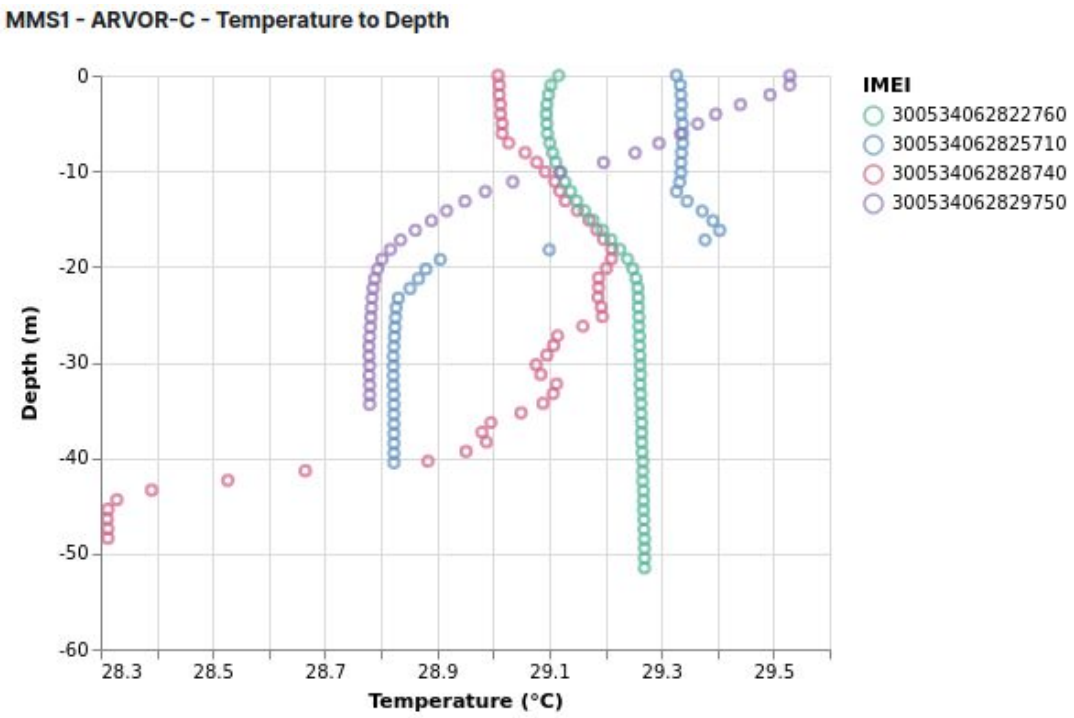
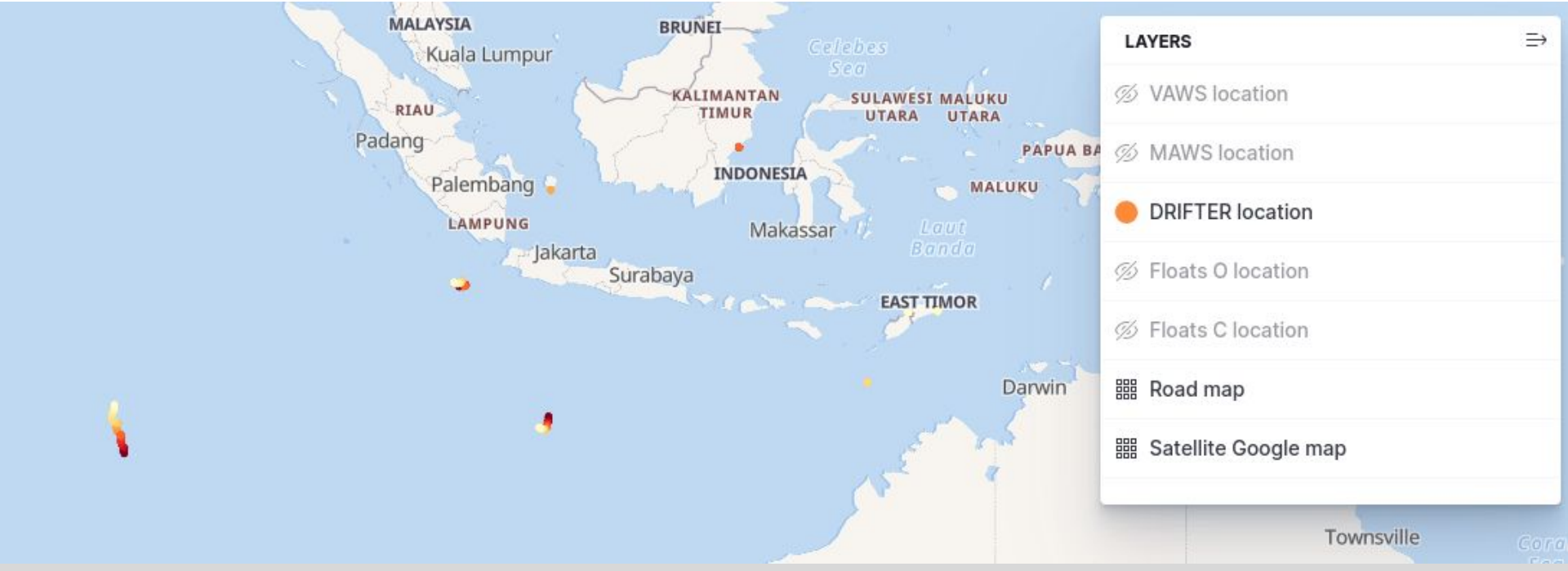
A temperature-depth graph shows the temperature profile over depth-layer in the open sea, Banda Sea. It indicates slight temperature as going deeper. Afterward, it drastically goes down to below 4oC.

This deep water temperature profile is differ to shallow water or coastal area.



A temperature-depth graph shows the temperature profile over depth-layer in the open sea, which is around Natuna Sea and Karimata Strait.

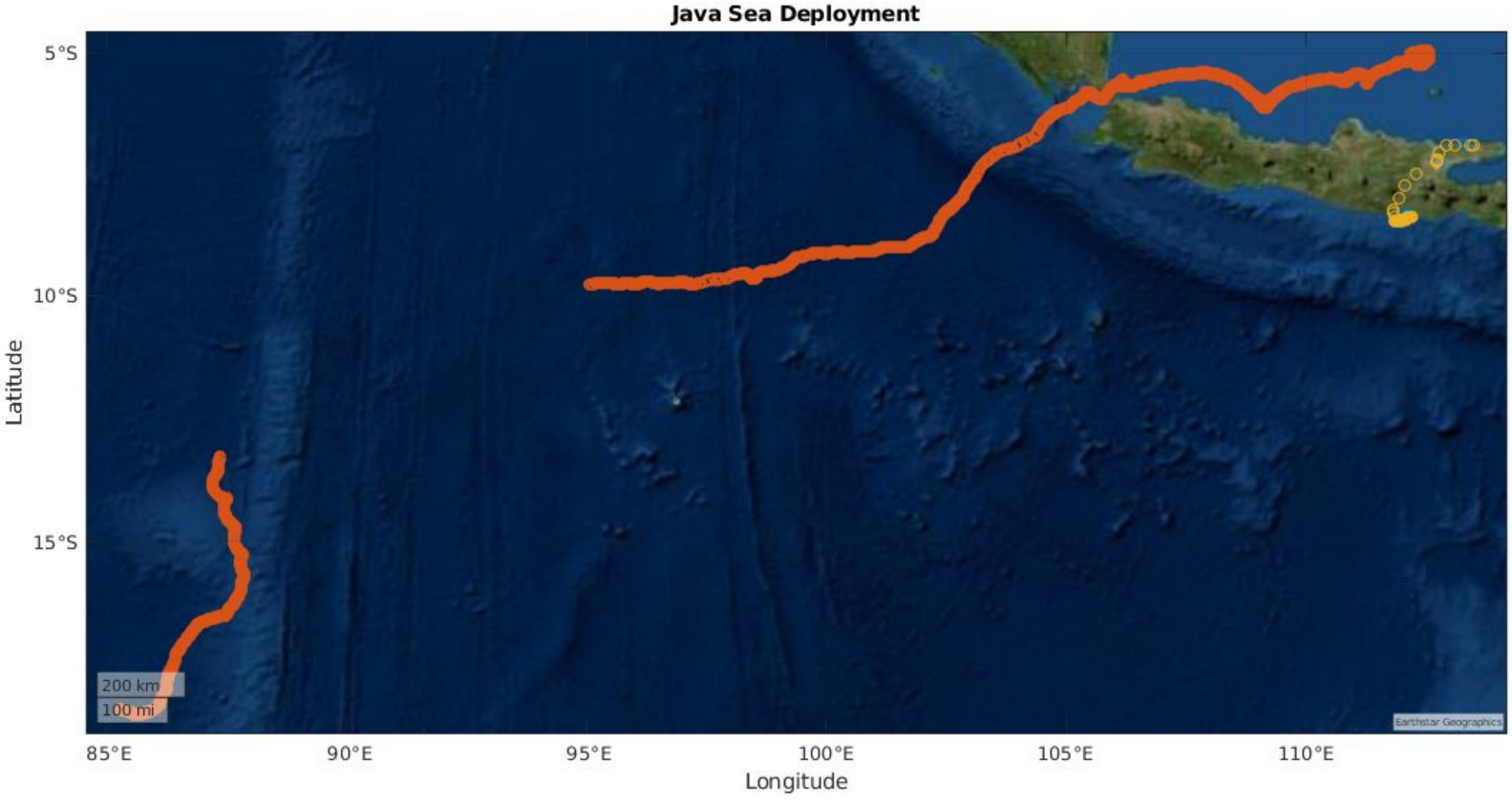


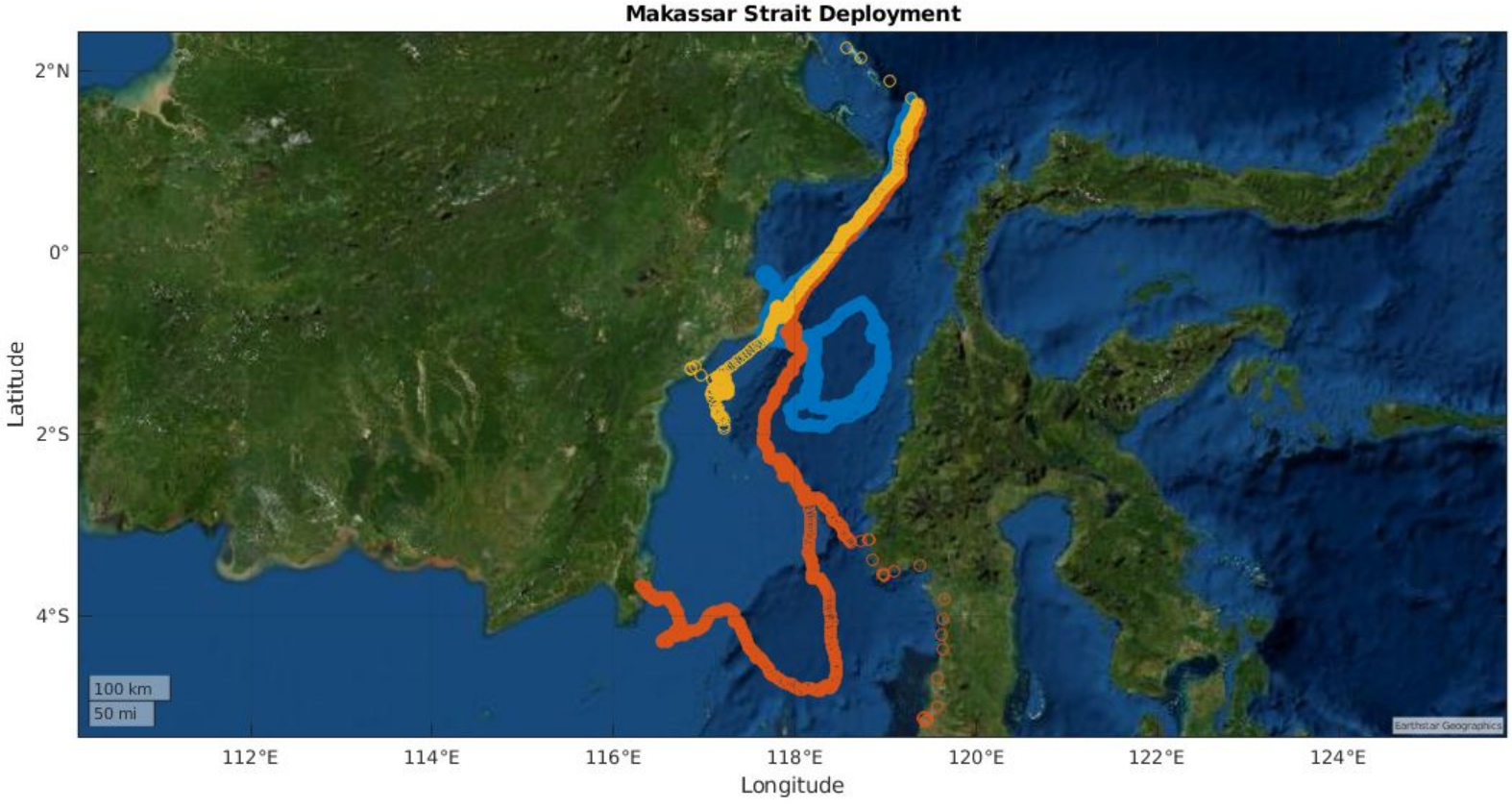


SVP-NKE

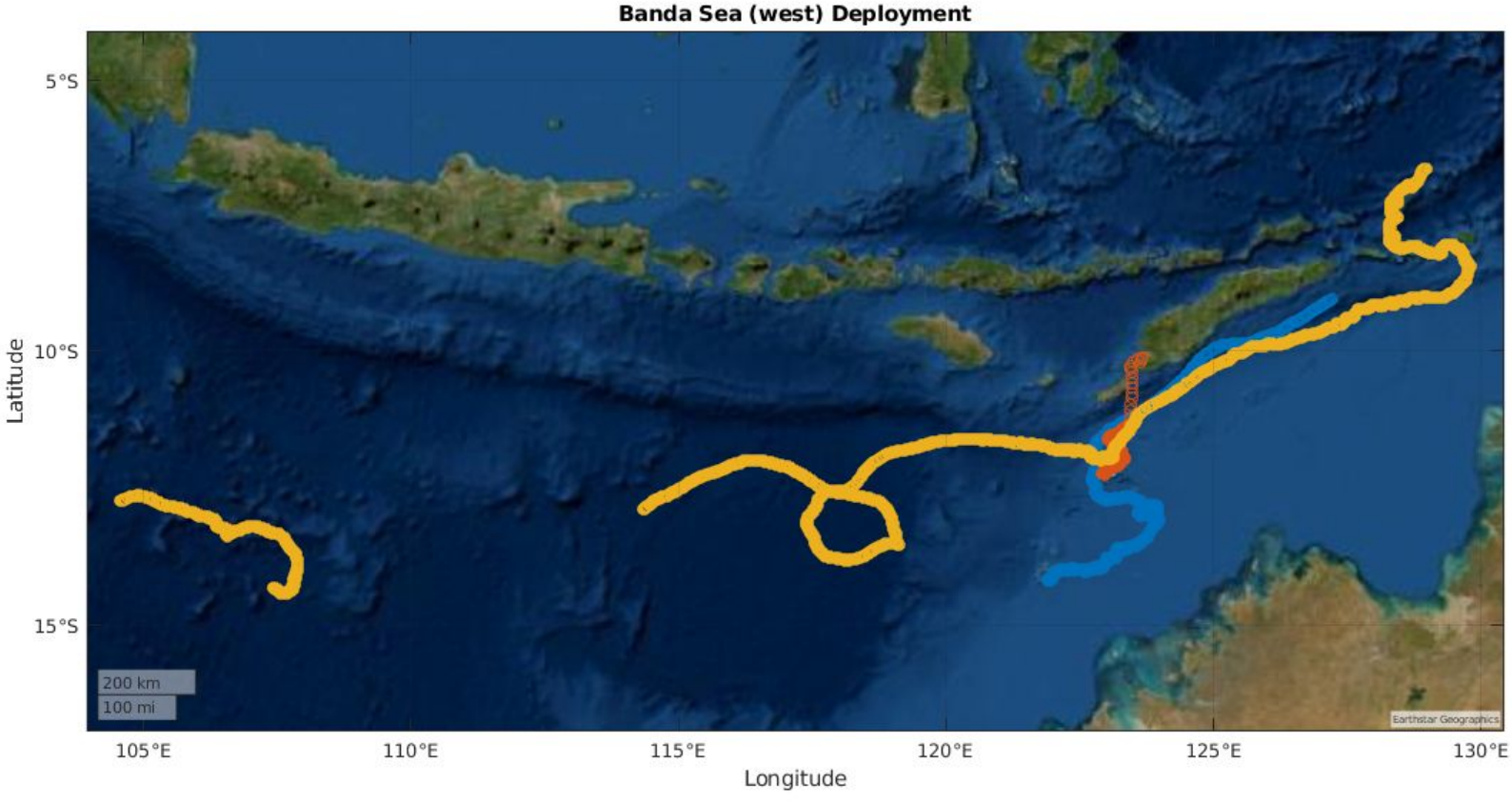
The changing-colour trajectory lines indicate the drift of drifting buoys (SVP-NKE) since deployed around Indonesia's seas which has already reach and adrift in Indian Ocean. The lines shows the last days of buoys movement due to the surface current.


Riau Deployment
2°N
0°
2°S
4°S
Latitude
100 km
50 mi
Earthstar Geographics
100°E
105°E
110°E
115°E
Longitude


Java Sea Deployment
5°S
10°S
15°S
Latitude
200 km
100 mi
Earthstar Geographics
85°E
90°E
95°E
100°E
105°E
110°E
Longitude


Makassar Strait Deployment
2°N
0°
2°S
4°S
Latitude
112°E
114°E
116°E
118°E
120°E
122°E
124°E
Longitude
100 km
50 mi
Earthstar Geographics


Banda Sea Deployment
5°S
10°S
15°S
Latitude
105°E
110°E
115°E
120°E
125°E
Longitude
200 km
100 mi
Earthstar Geographics


Banda Sea (west) Deployment
5°S
10°S
15°S
Latitude
105°E
110°E
115°E
120°E
125°E
130°E
Longitude
200 km
100 mi
Earthstar Geographics


Lombok Strait Deployment
7°30'S
8°S
8°30'S
Latitude
113°E
113°30'E
114°E
114°30'E
115°E
115°30'E
116°E
Longitude
20 km
10 mi
Earthstar Geographics

Challenges

- Two main things of deployment challenges which leads the buoy stranded, are vandalism and archipelagic deployment location (typical Indonesia's seas)
- Long-term deployment will provide longer and bigger picture of ocean dynamics
- Devices refurbishment is desired to reuse and redeploy with proven functionality after being in the first deployment.

Conclusions

- Further data processing and data acquisition quality are necessary on the longer pattern of Indonesia's ocean dynamics
- Upgraded and updated deployment plans are demanded to improve the deployment quality which stranded and was picked up by the local fishermen.
- Long-term deployment will provide longer and bigger picture of ocean dynamics
- Devices refurbishment is desired to reuse and redeploy with proven functionality after being in the first deployment.

Thank you

References

Roemmich, D., Riser, S., Davis, R., & Desaubies, Y. (2004). Autonomous profiling floats: Workhorse for broad-scale ocean observations. Mar. Technol. Soc. J, 38(2), 21-29.

Roemmich, D., Johnson, G. C., Riser, S., Davis, R., Gilson, J., Owens, W. B., ... & Ignaszewski, M. (2009). The Argo Program: Observing the global ocean with profiling floats. Oceanography, 22(2), 34-43.