Wave measurement using GPS

Dong-Kyu Lee[1], Kwan-Chang Lim[2], Luca Centurioni[1]

[1]Scripps Institution of Oceanpgraphy, La Jolla, CA, USA

[2]Korea Hydrographic and Oceanographic Administration, Inchon, Korea

☼ First applied by Poulain et al. (2001) on CODE drifter

☼ Wave measurement using low cost (~$60), >1 Hz sampling GPS

☼ Surface Wave < 20 seconds

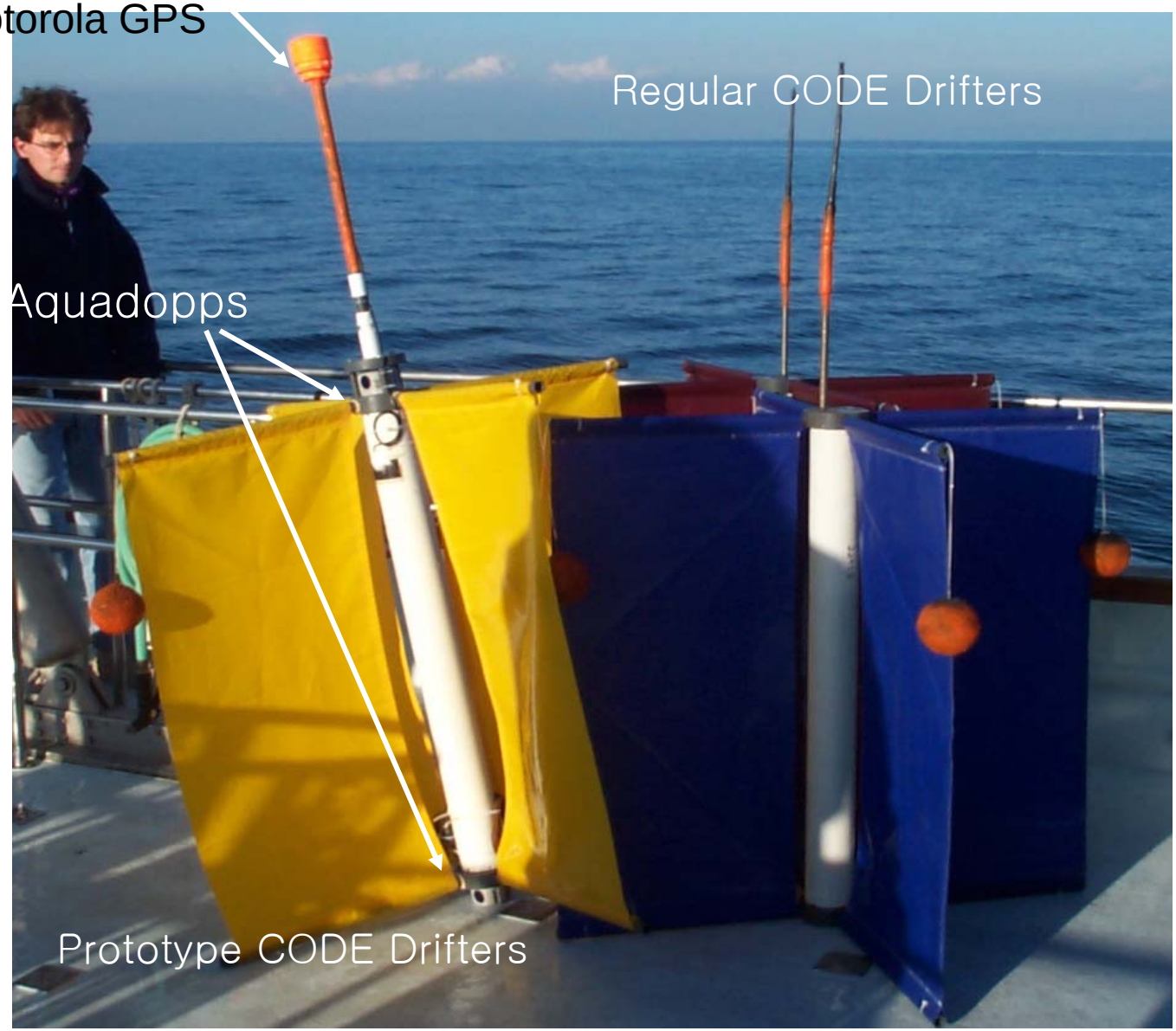
☼ GPS positioning error > 50 seconds

☼ High pass filter and FFT

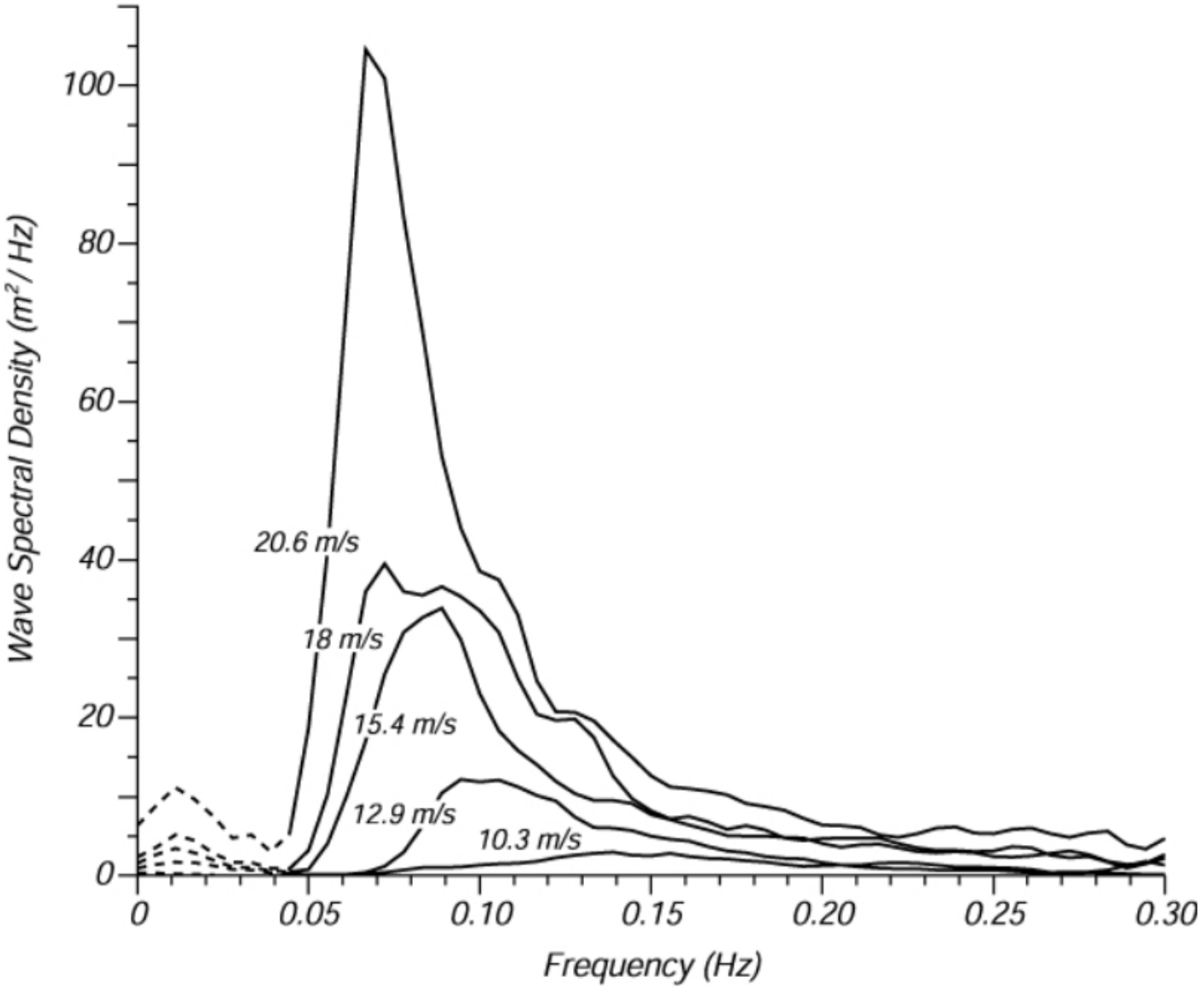
☼ Field comparison in the East China Sea (out of DGPS range)

☼ Develop drifter application

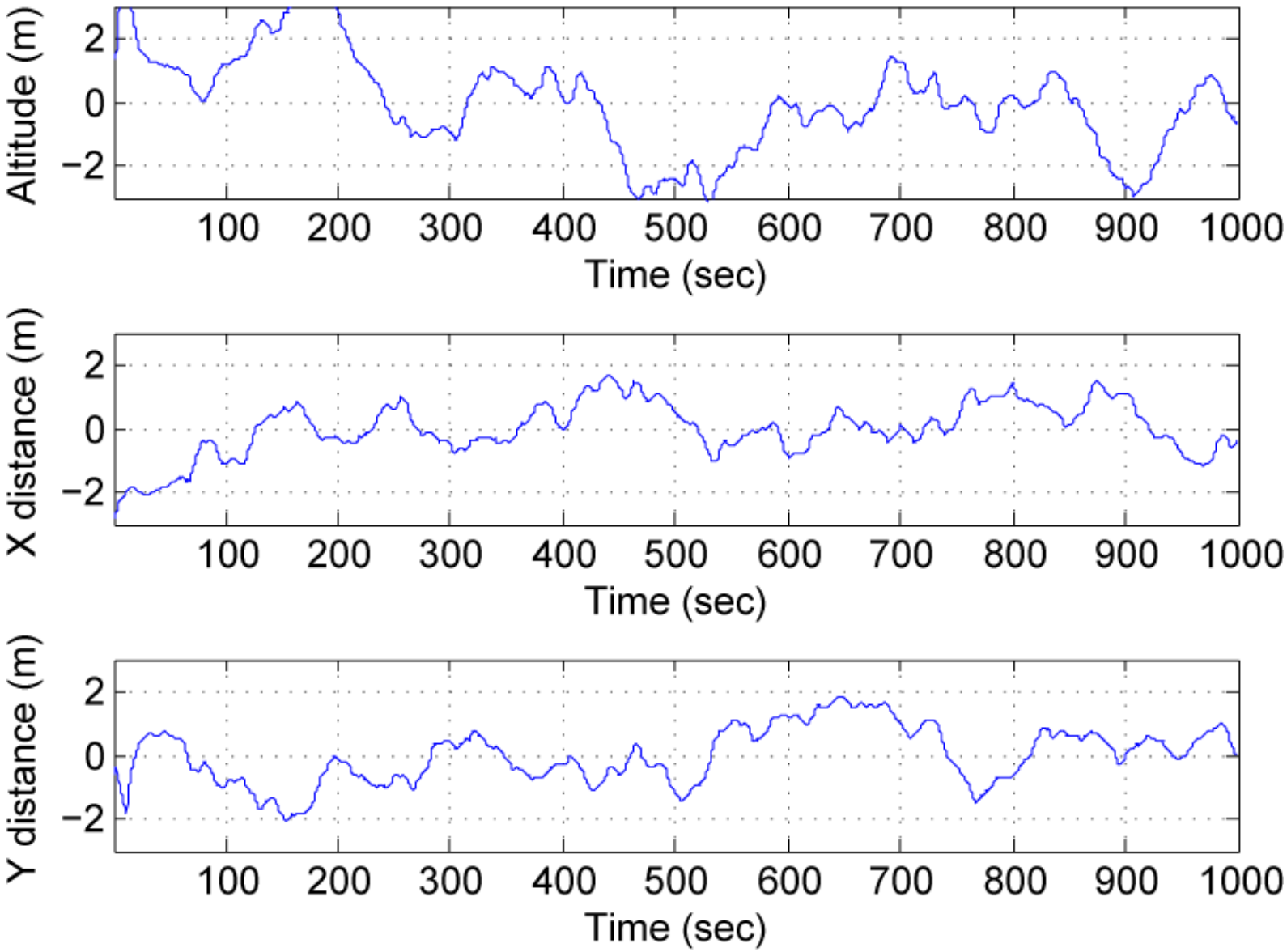
Instruments: Prototype CODE surface drifters by Poulain (2001)



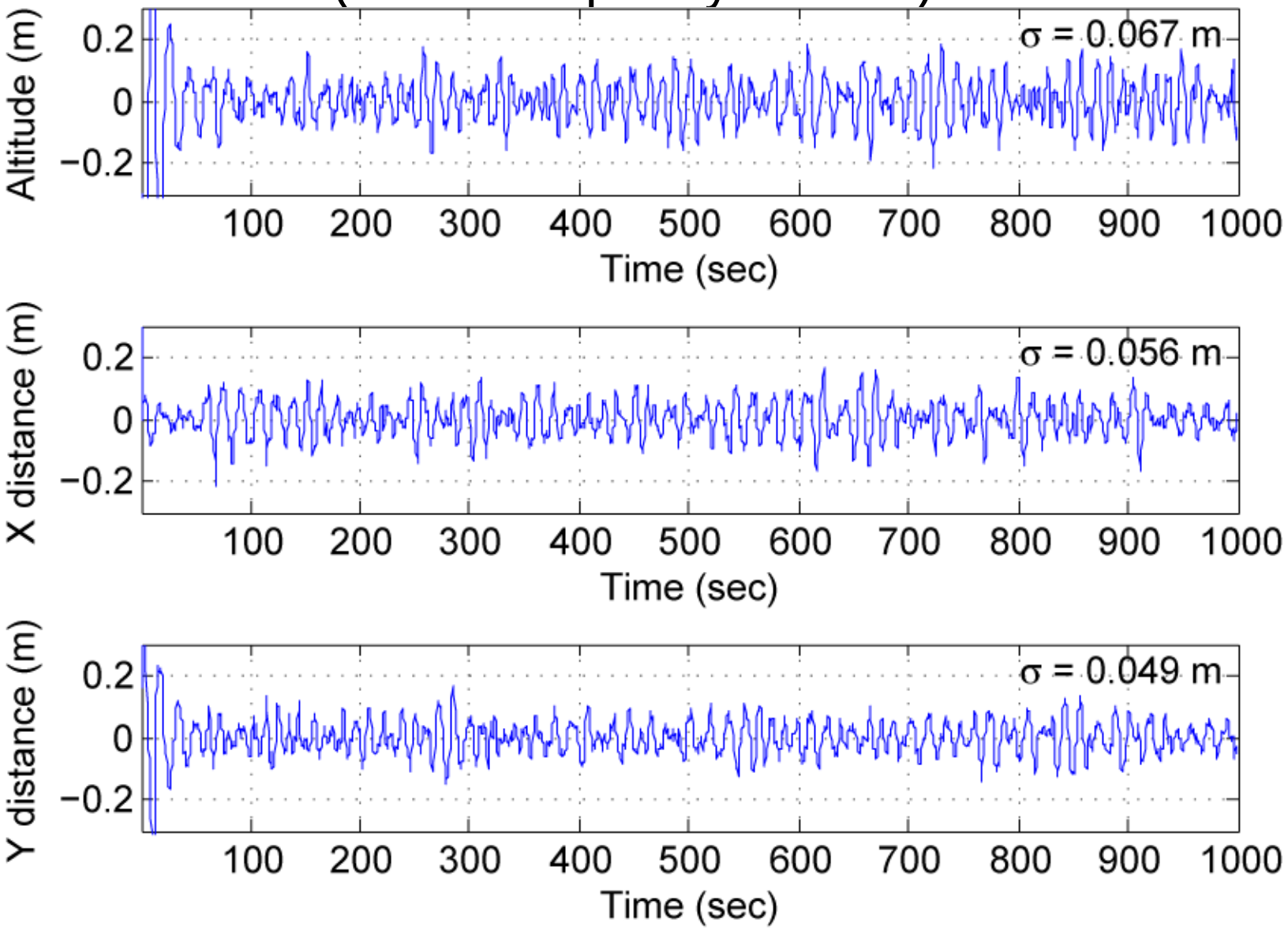
Surface Wave Spectra



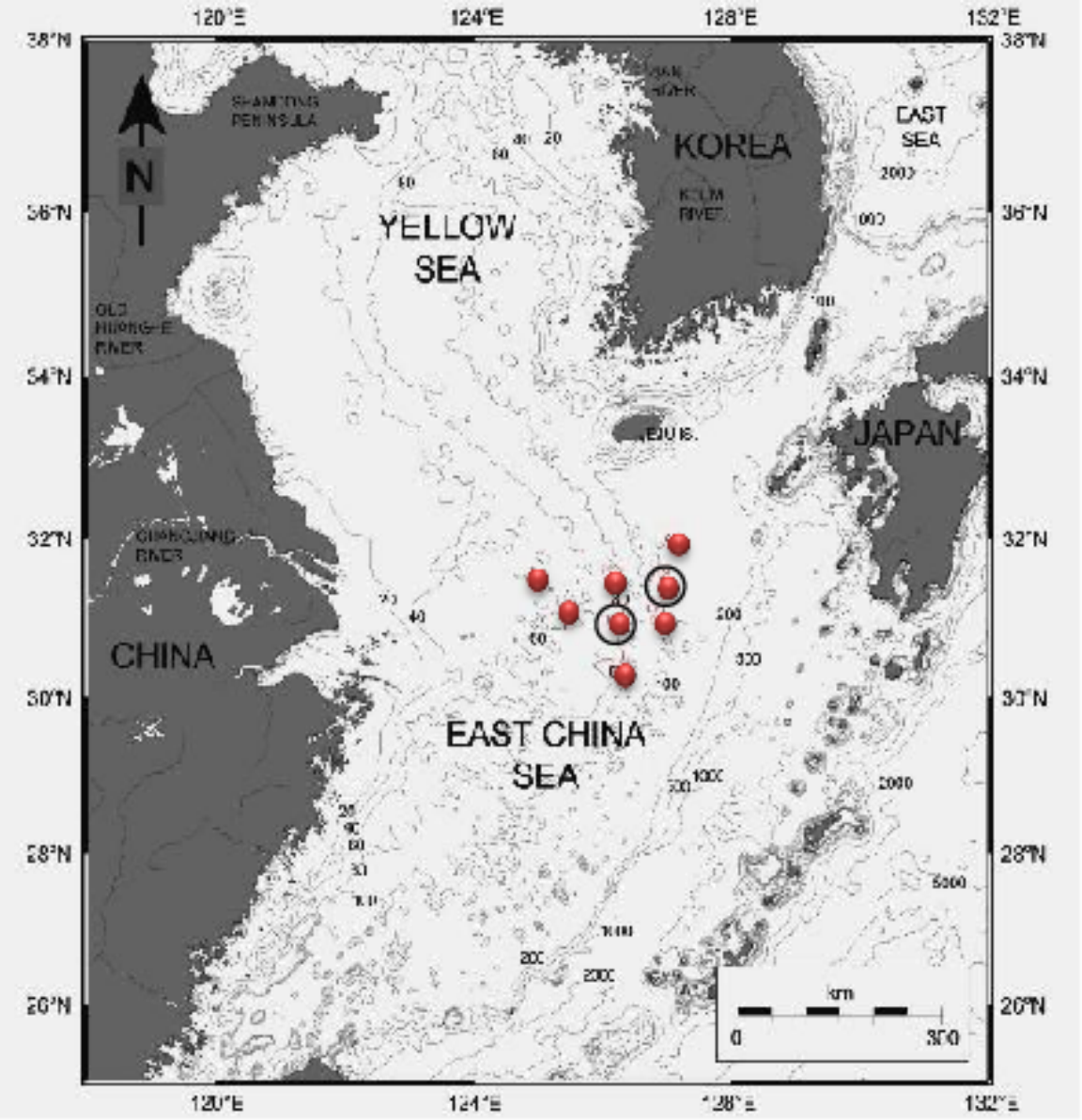
Fixed position GPS output (2 Hz sampling)



Fixed position GPS after high pass filter (cutoff frequency 0.03 Hz)

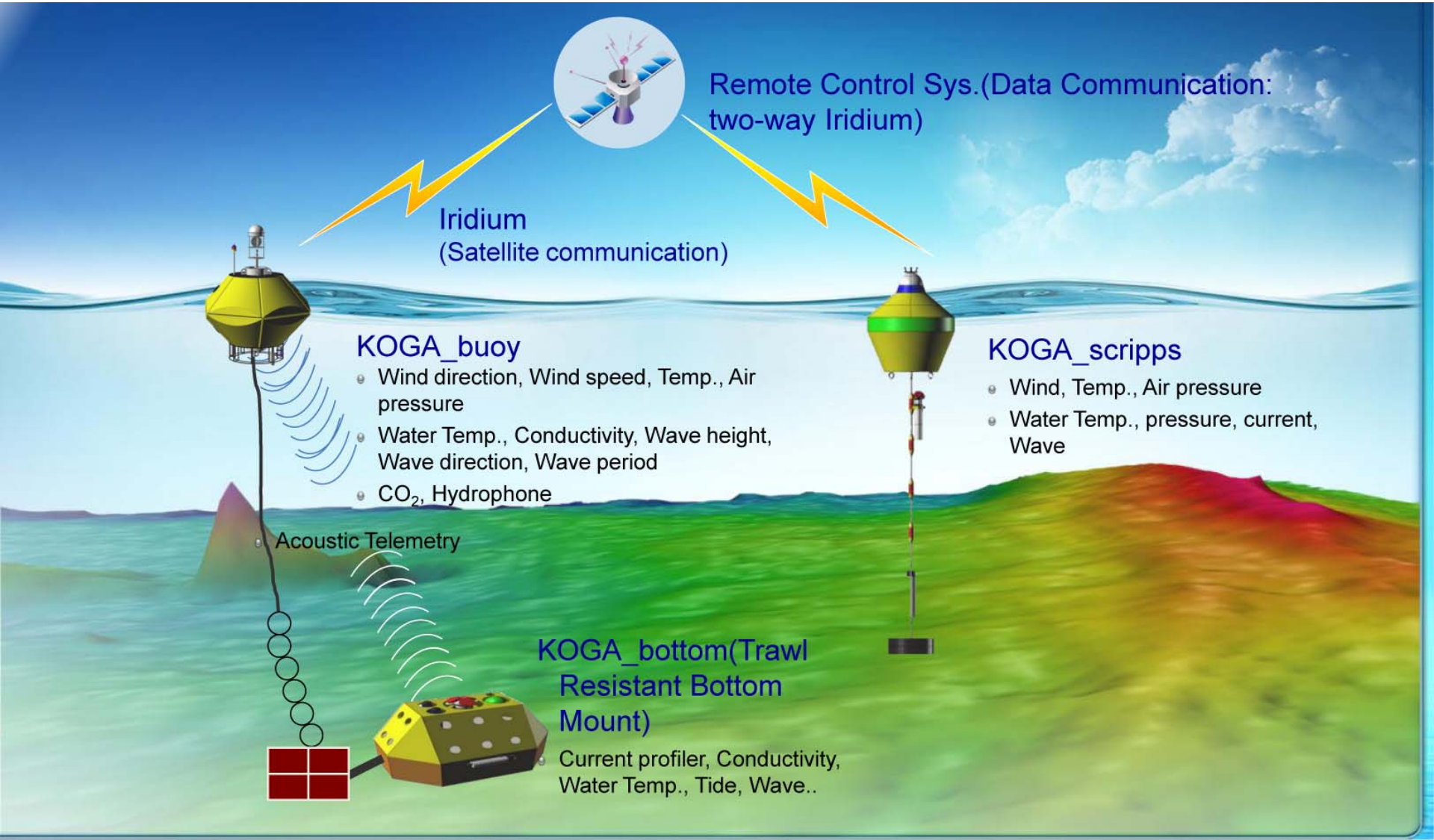


Korea Ocean Gate Array in the East China

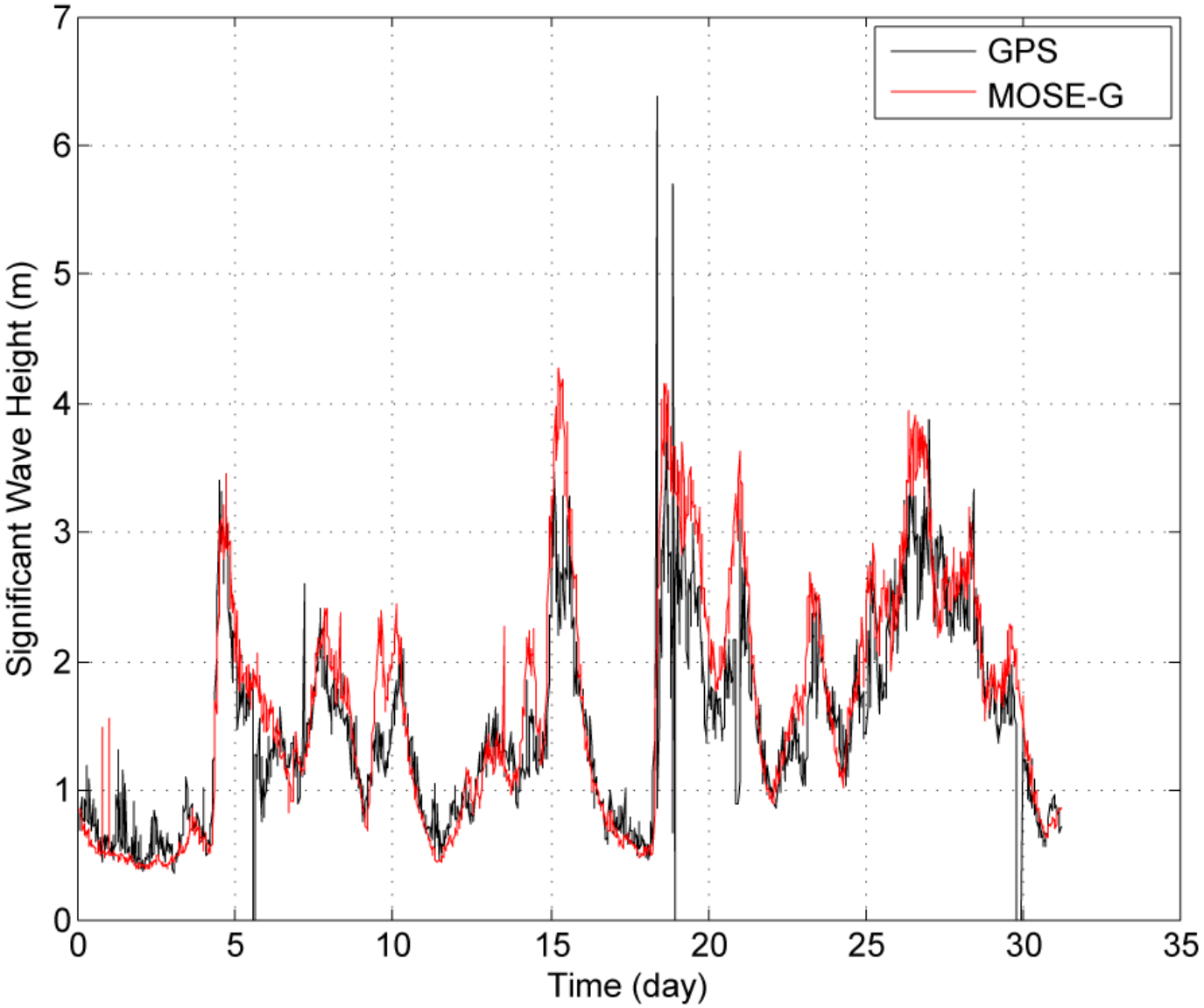


KOGA buoy (5 m) – Datawell MOSE-G

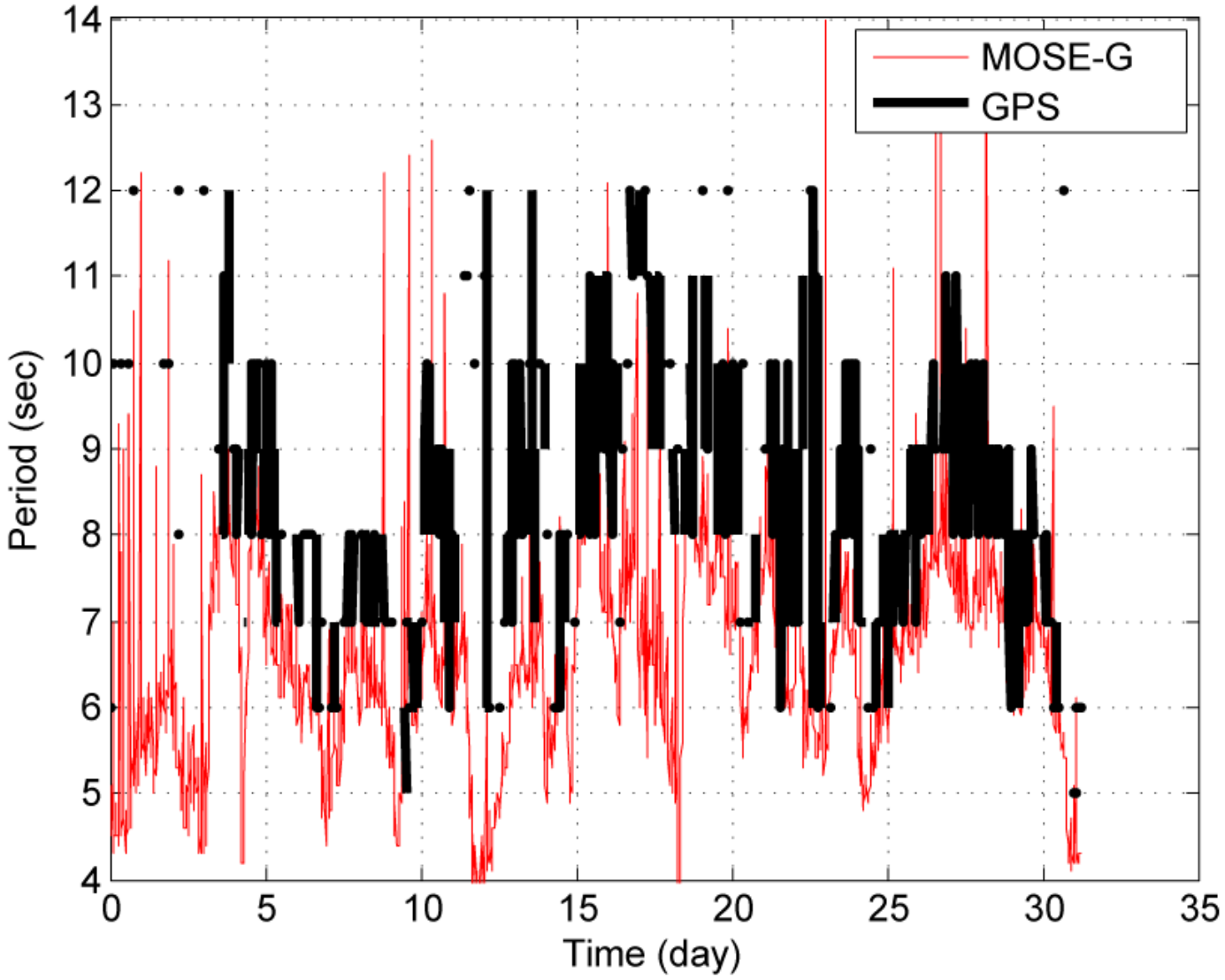
KOGA Scripps (0.75 m) - GPS



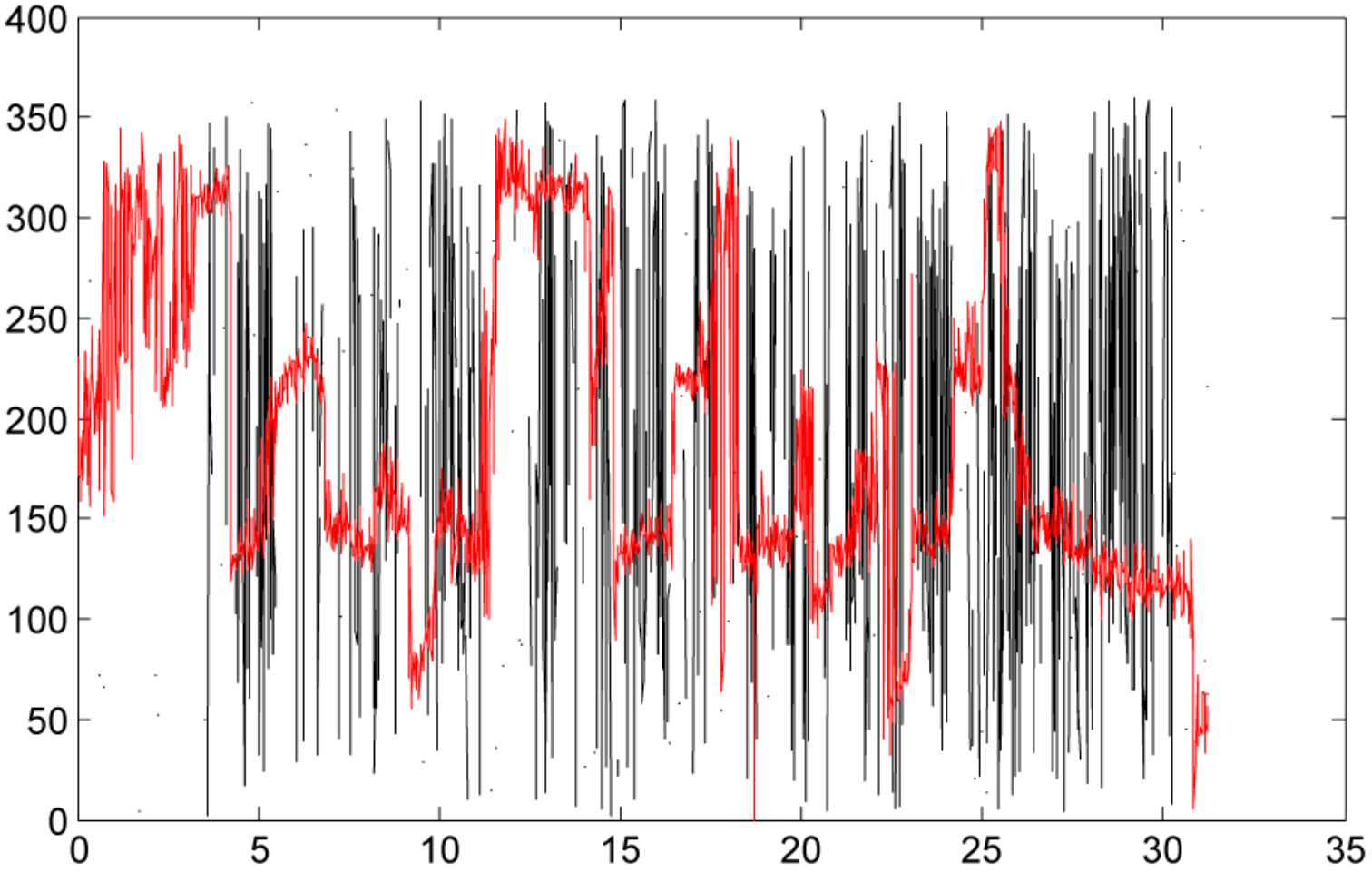
Significant wave height (4×σ)



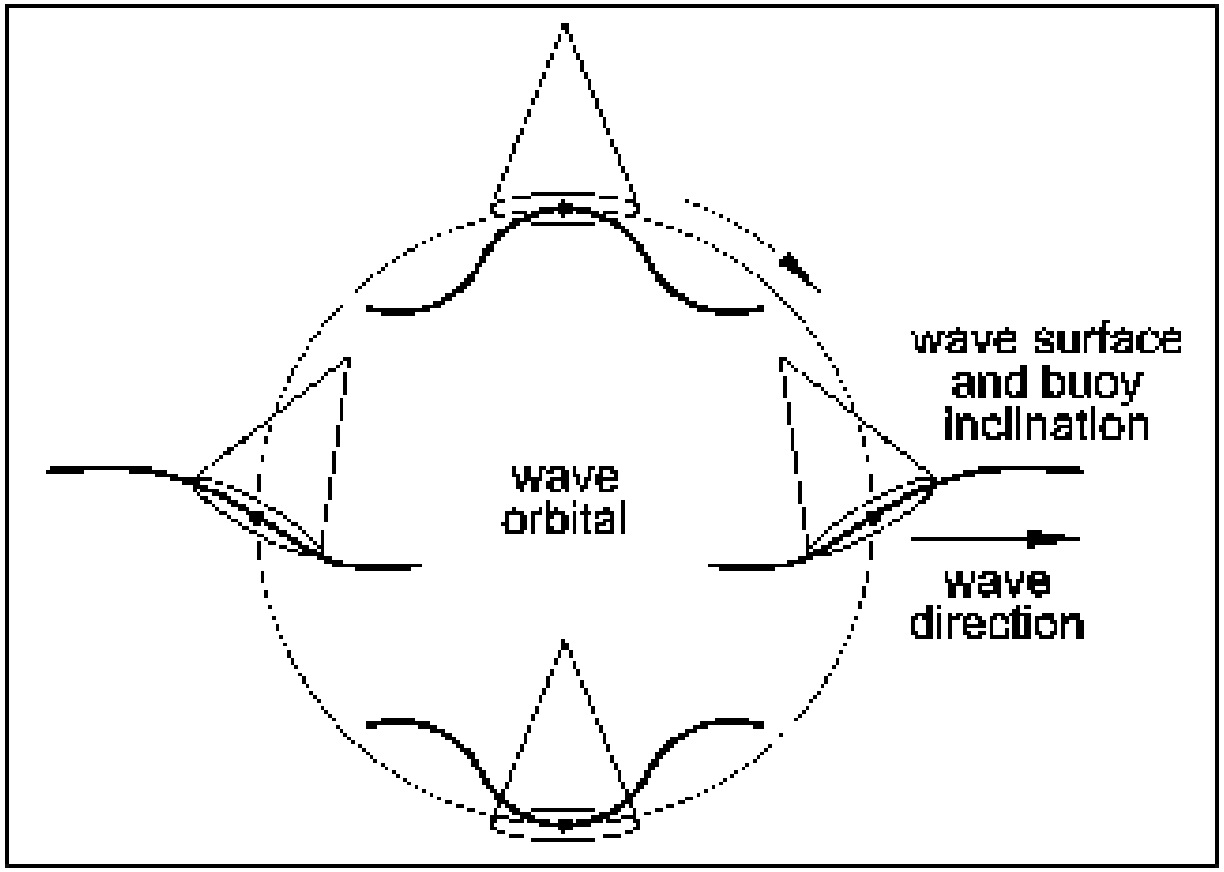
Dominant Wave Period (GPS)
Average Wave Period (MOSE-G)



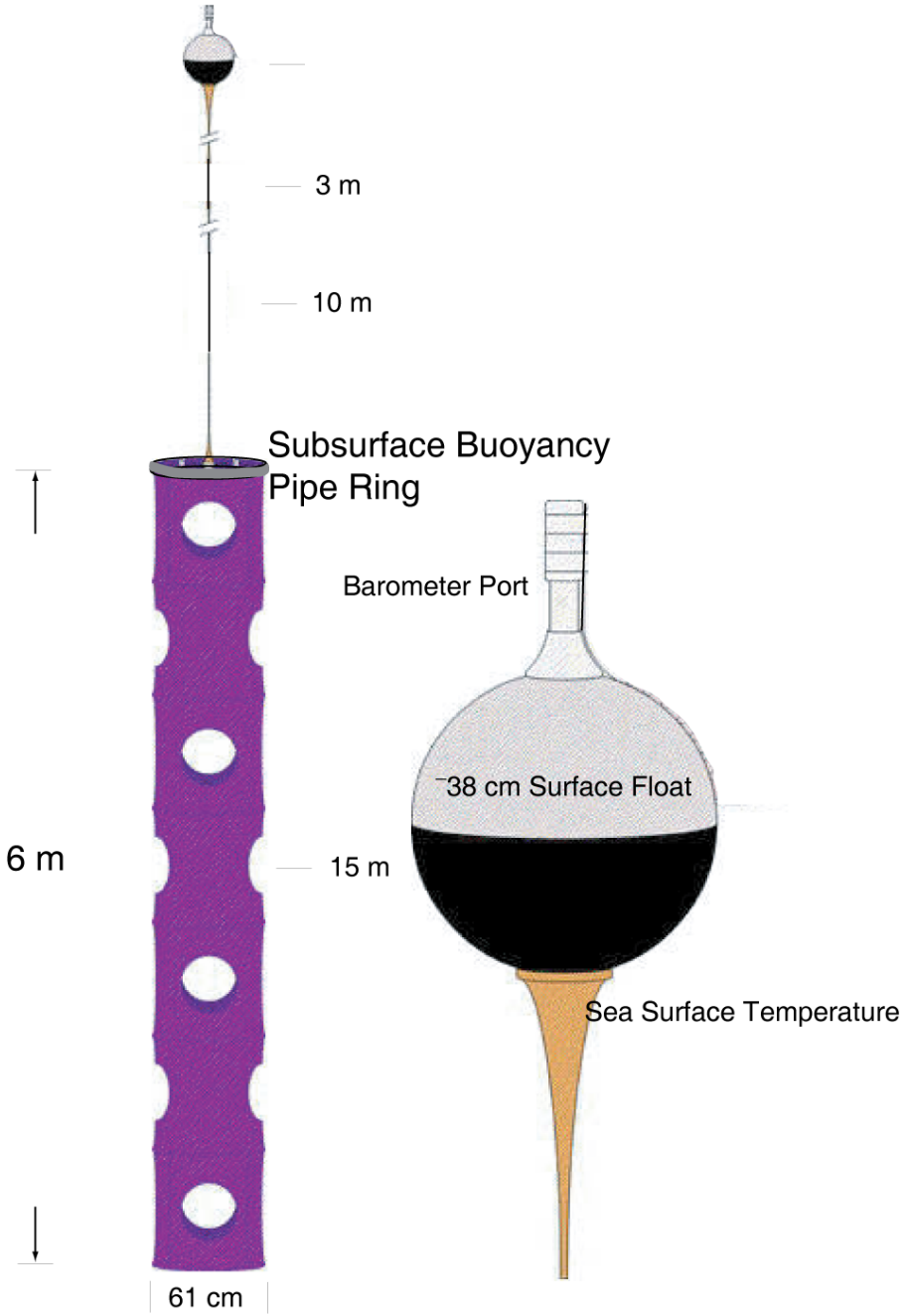
Dominant Wave Direction (GPS)
Significant Wave Direction (MOSE-G)

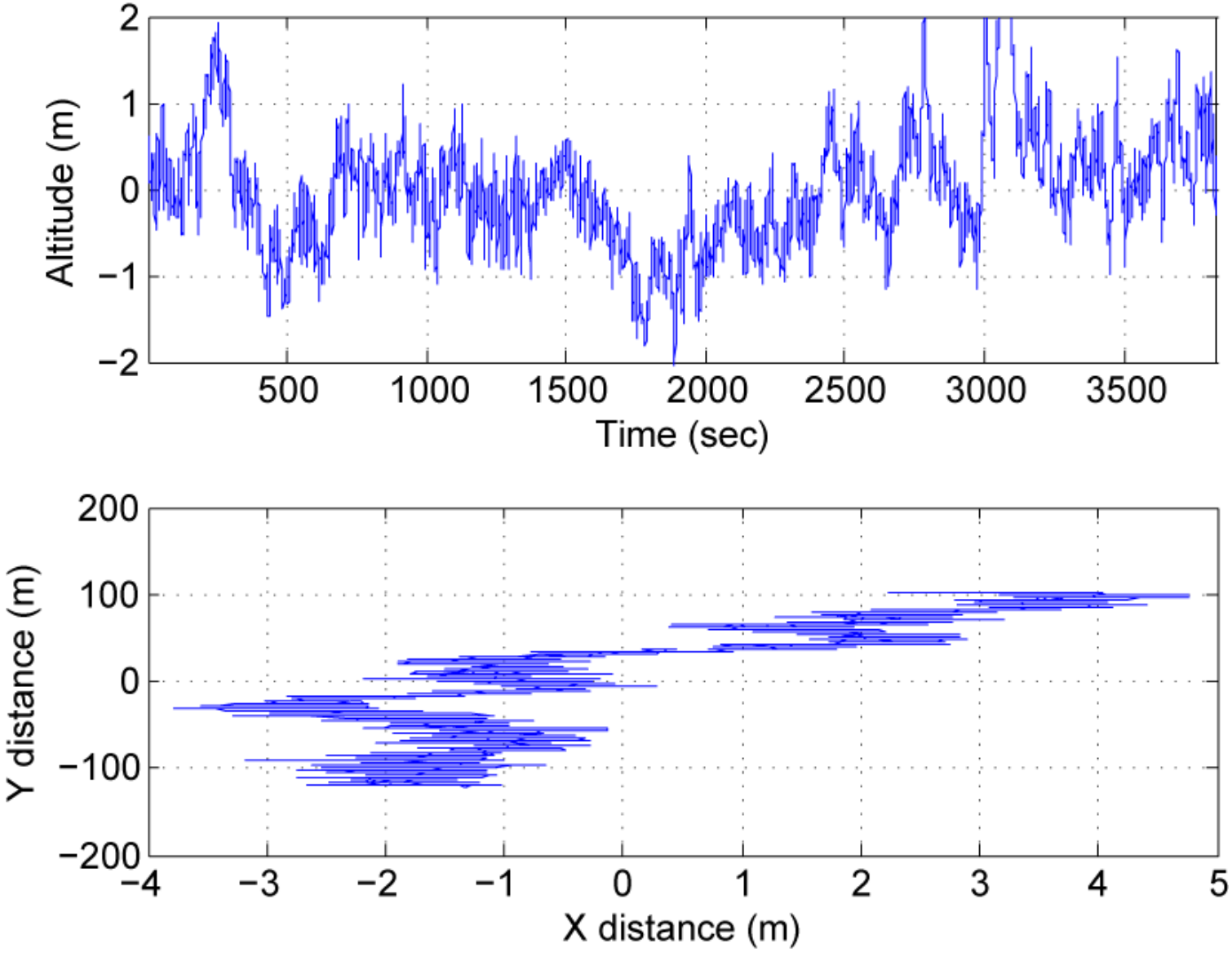


Installation on small buoy is better

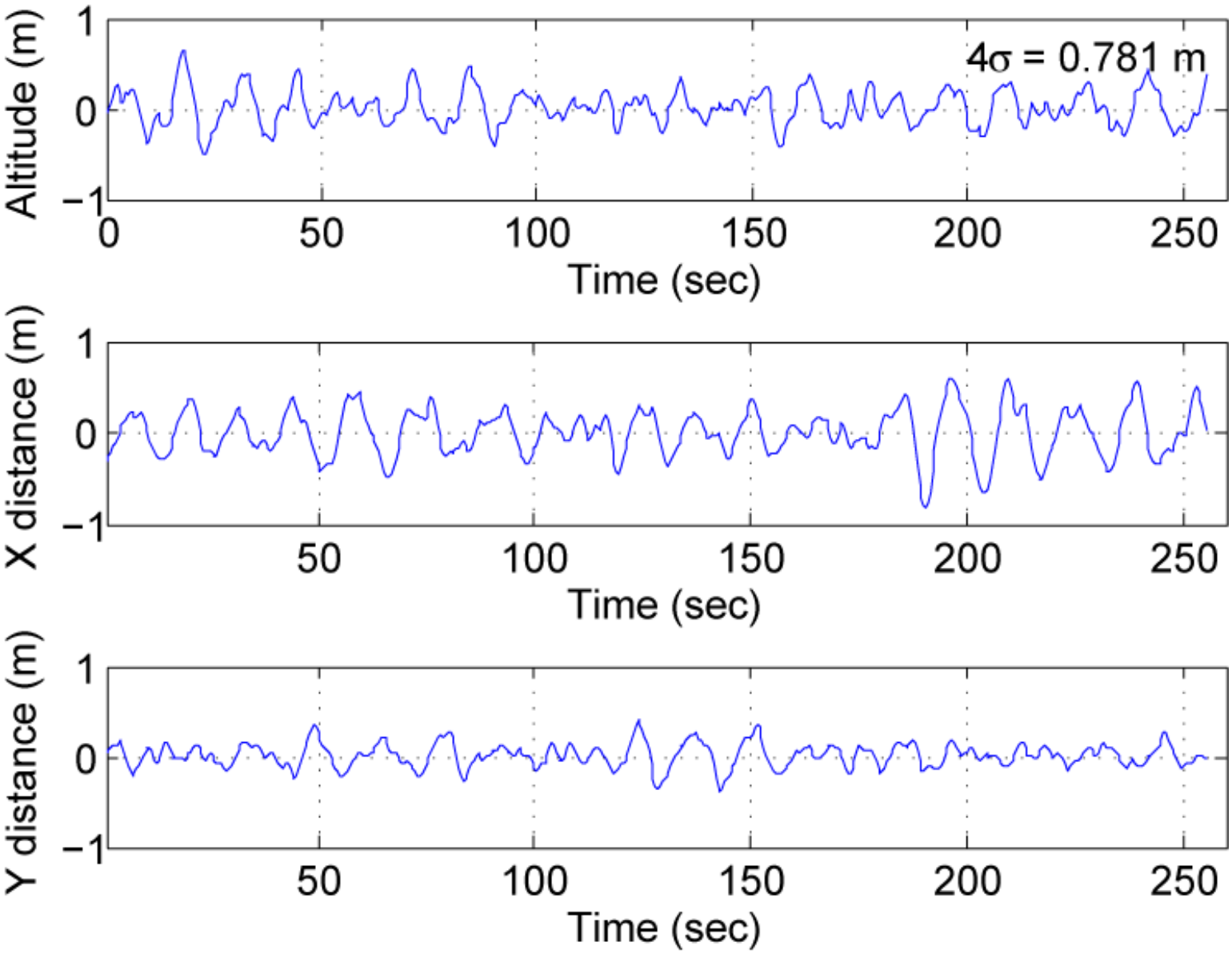


SVPB-Wave


3 m
10 m
Subsurface Buoyancy
Pipe Ring
Barometer Port
38 cm Surface Float
6 m
15 m
Sea Surface Temperature
61 cm


Altitude (m)
2
1
0
−1
−2
500
1000
1500
2000
2500
3000
3500
Time (sec)
Y distance (m)
200
100
0
−100
−200
−4
−3
−2
−1
0
1
2
3
4
5
X distance (m)

Drifter near Scripps Pier



	Significant wave height	Average Period	Dominant Period	Dominant Direction
Drifter	0.78 m	7.7 s	13.5 s	283 °
Scripps Pier	0.61 m	7.3 s	13.5 s	
Offshore (4 km)	0.84 m	9.4 s	15.4 s	275 °

Summary

- Low-cost GPS solution for wave measurement works
- High pass filtering and FFT of 512 samples (256 seconds) installed on small buoy
- It will be installed on mooring buoy and drifter
- Drifter (SVPB-Wave) with Iridium SBD modem is developed