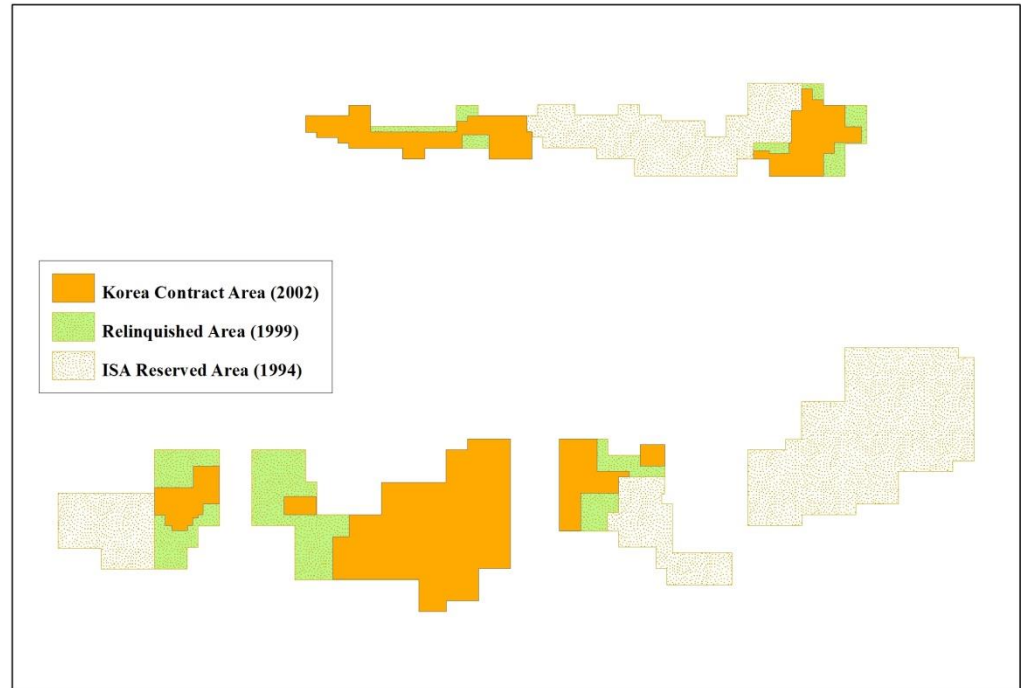
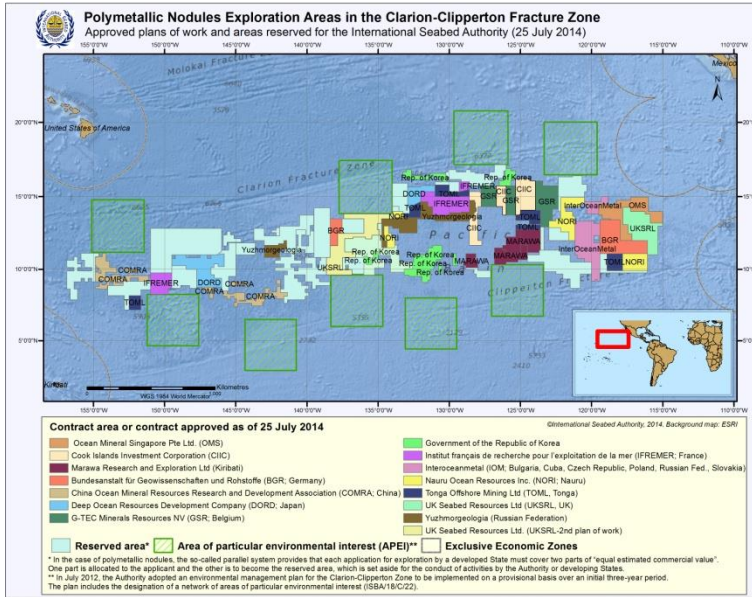




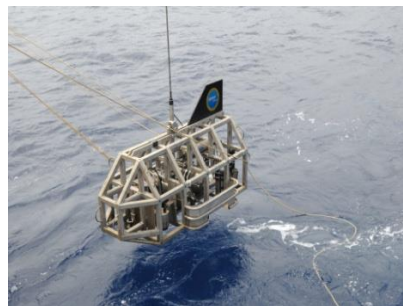
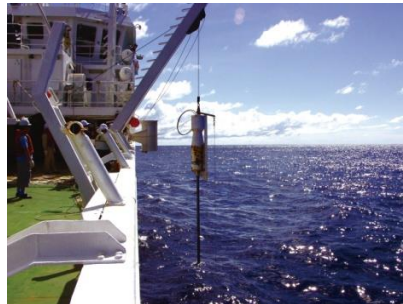
ACTIVITIES ON IRZ & PRZ IN KOREAN CONTRACT AREA

Berlin, Germany
September 2017

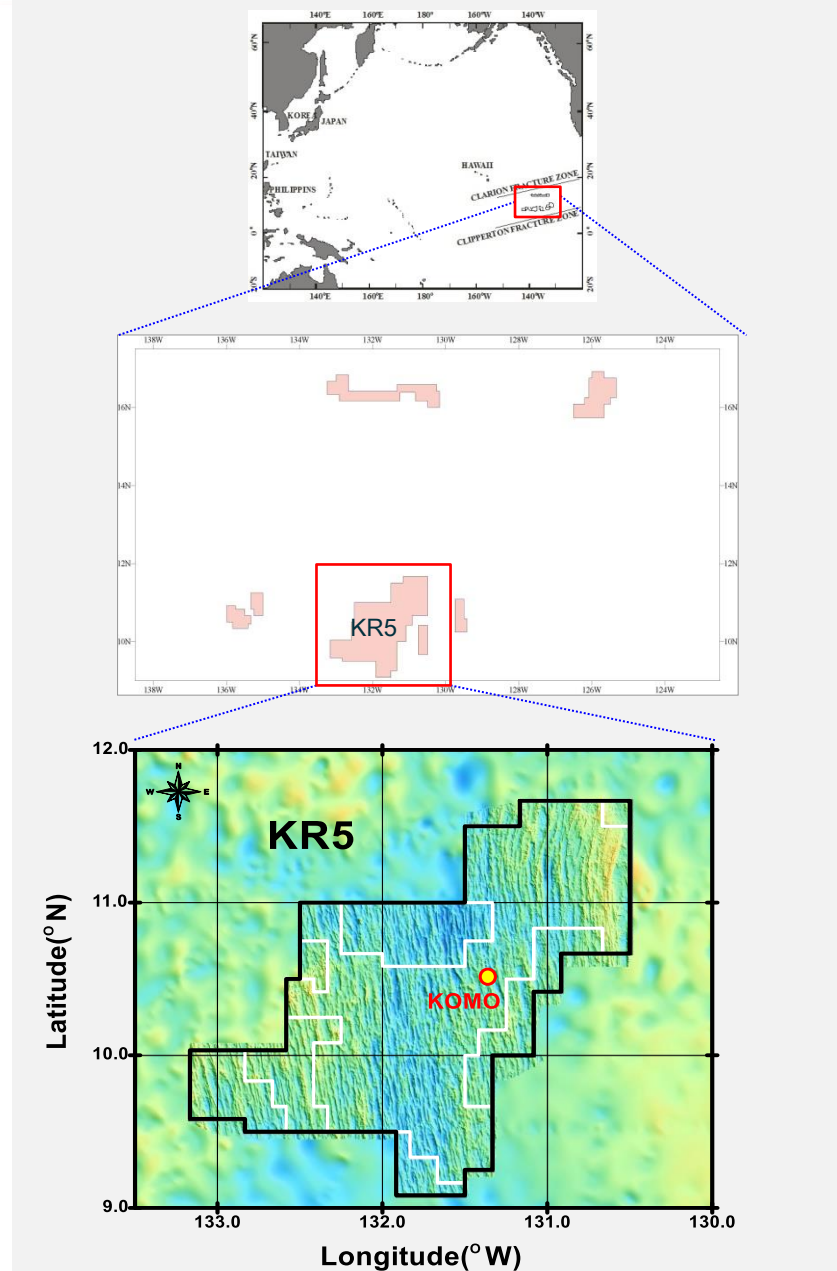


- 1994 : Registration as a pioneer investor (150,000 km²)
- 1997 : 1st relinquishment (30,000km²)
- 1999 : 2nd relinquishment (15,000km²)
- 2002 : Selection of final contract area (75,000km²)

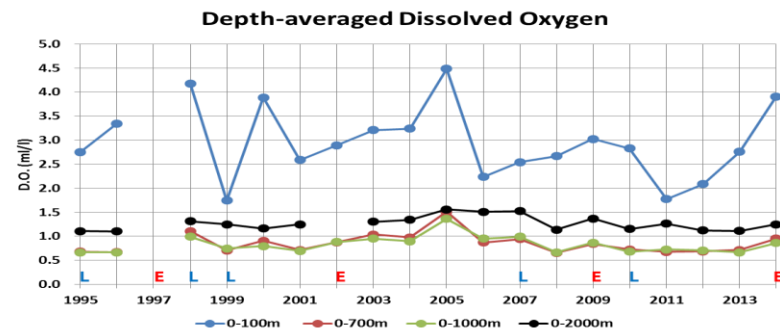
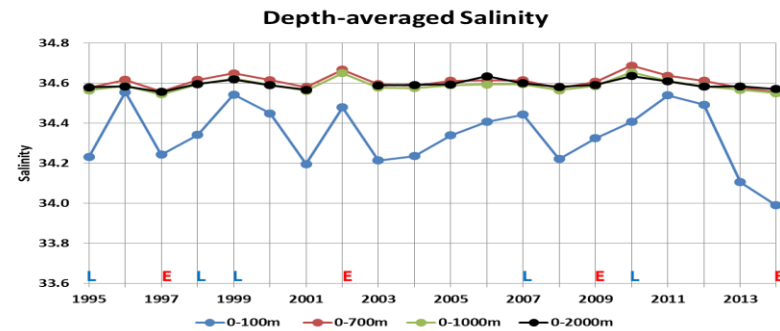
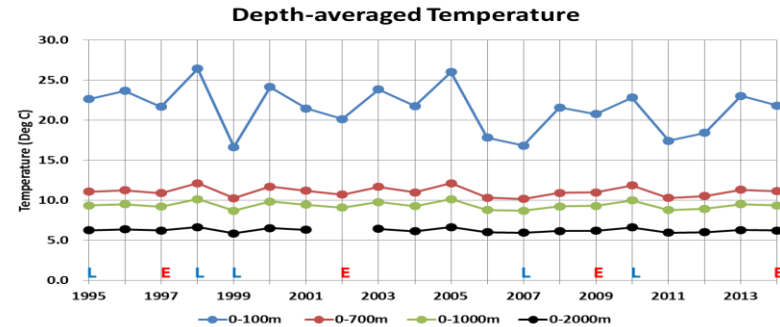
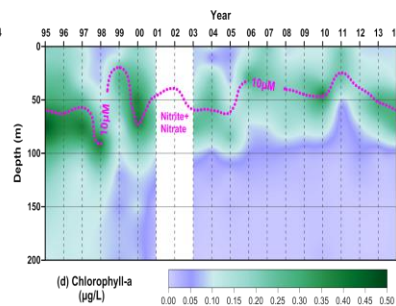
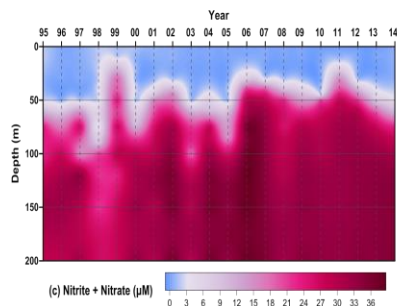
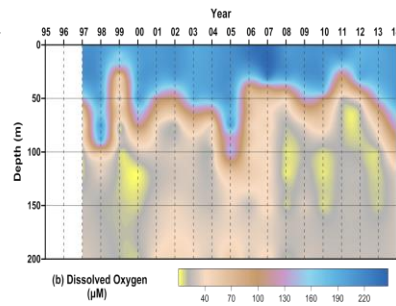
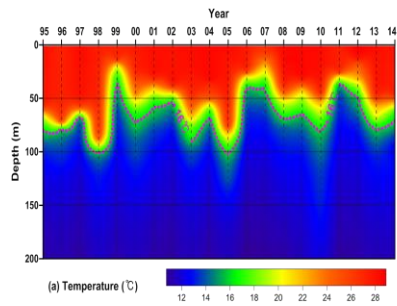
- Stage I (1994-2010) : Resource assessment and environmental baseline study
 - - 925 days (ave. 62 days/year)
- Stage II (2011-2015) : High resolution topographic and acoustic seafloor mapping in a prospective area and environment data collection for BIE (195 days)



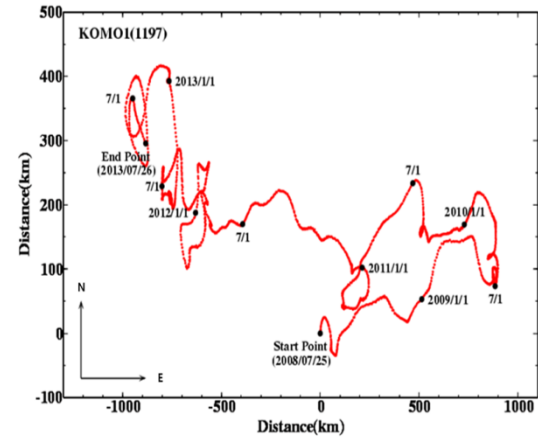
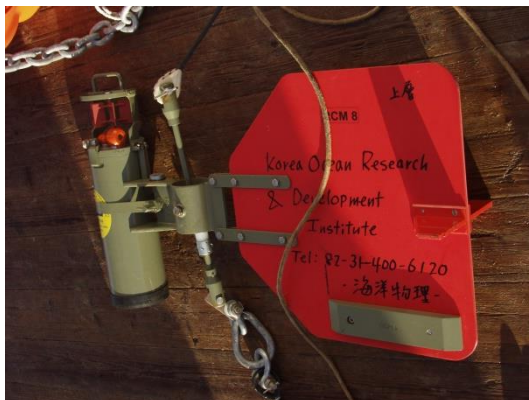
- Selection of a Long-term Monitoring Site in 1995
- Representative of the environmental characteristics of the southern Korea Contract Blocks
- KOMO (KODES Long-term Monitoring Station)
 - 10.5°N, 131.3°W
 - Chemical oceanographic observation since 1995
 - Operation of mooring system from 2003
- Can be served as the PRZ for 'Benthic Impact Experiment'
- Can be impacted by mining activities



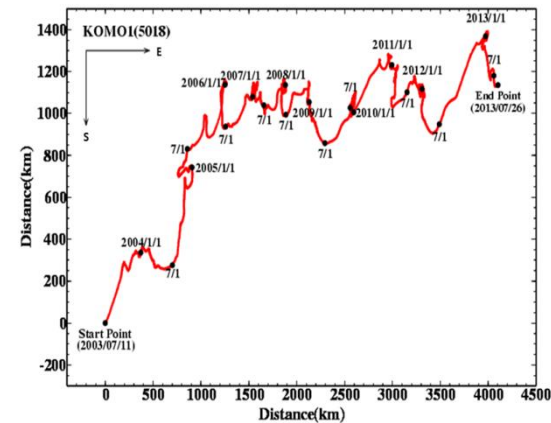
- Conductivity-temperature-depth (CTD) system
- Temperature, Salinity, Dissolved oxygen, etc.



- Long-term mooring system
- Current profiles at three different depths (1250m, 4550m, 5000m)

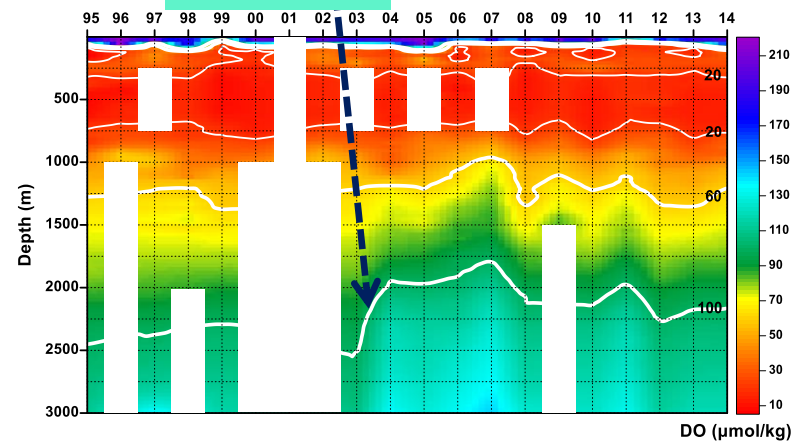
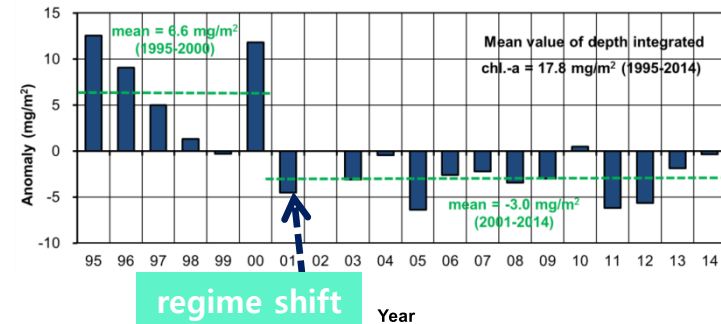
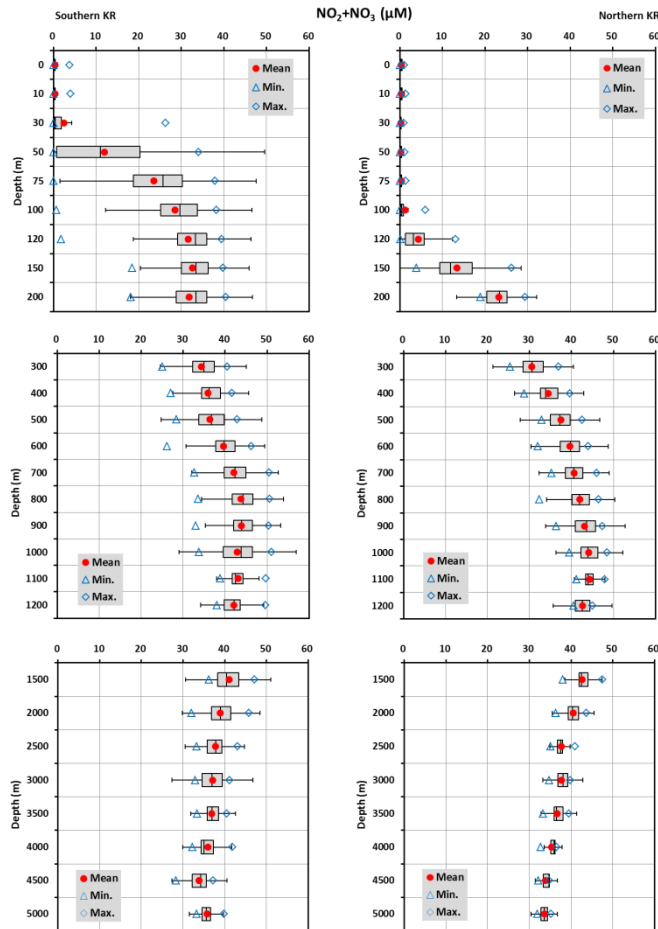


Progressive Vector Diagram

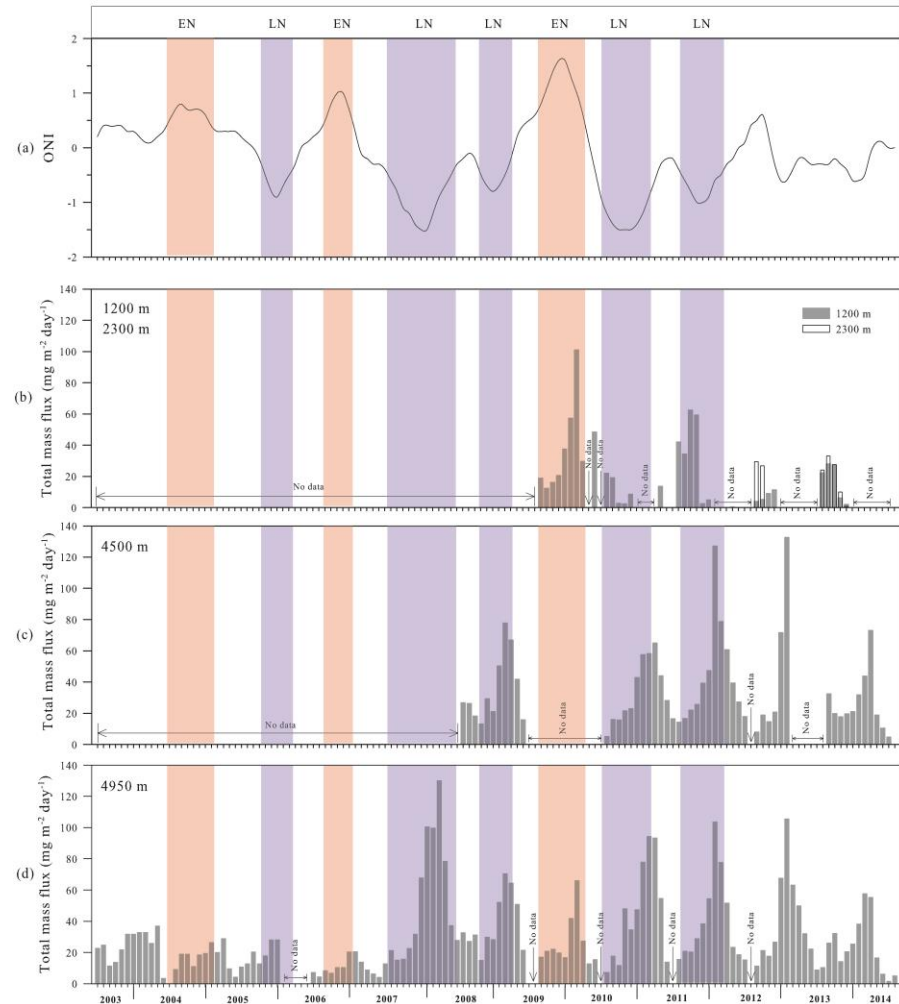
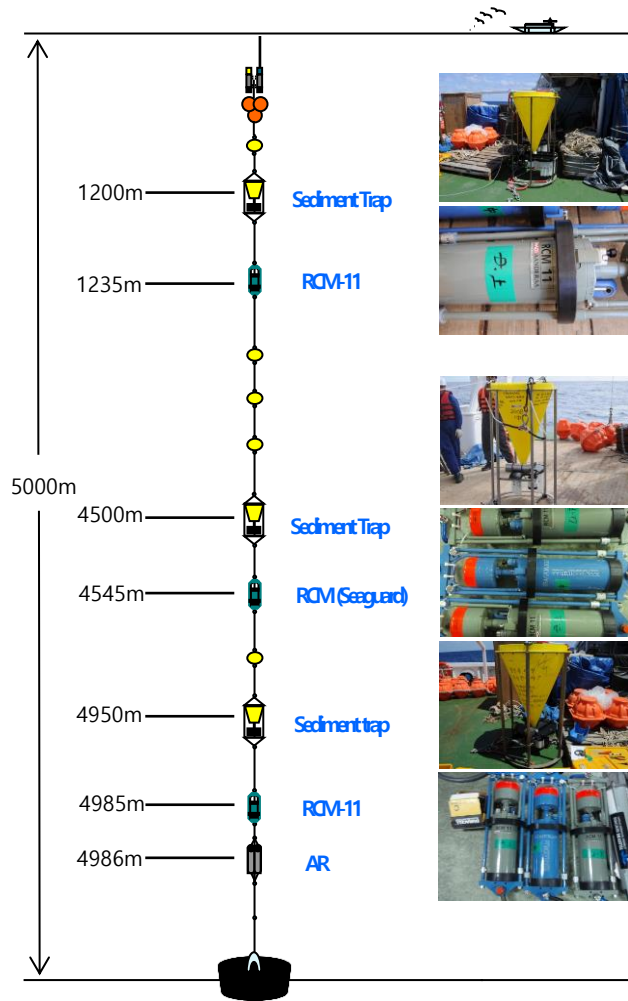


Depth (m)	Observation period	Mean Scalar Speed (cm/s)	Mean Vector Velocity (KOMO1)			
			u(cm/s)	v(cm/s)	speed (cm/s)	Direction (degree)
1,250	2008-2013	4.68	-0.65	0.22	0.39	288.6
4,550	2003-2013	3.64	1.07	0.37	1.13	75.4
5,000	2003-2013	3.63	1.27	0.32	1.31	75.37

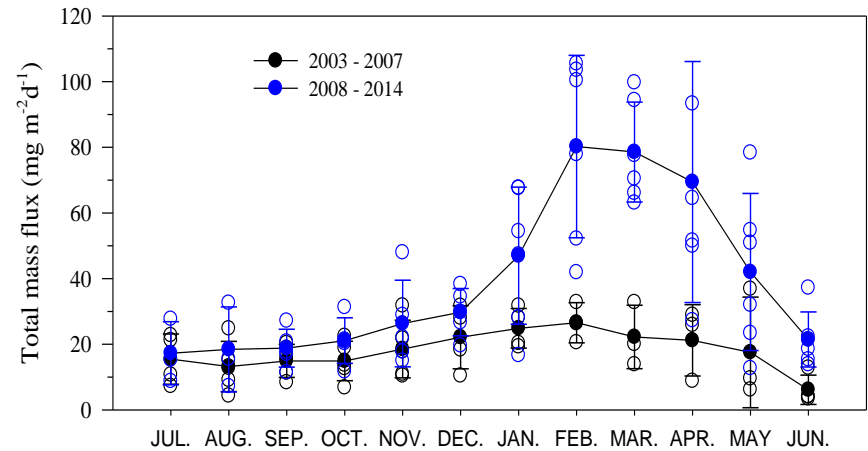
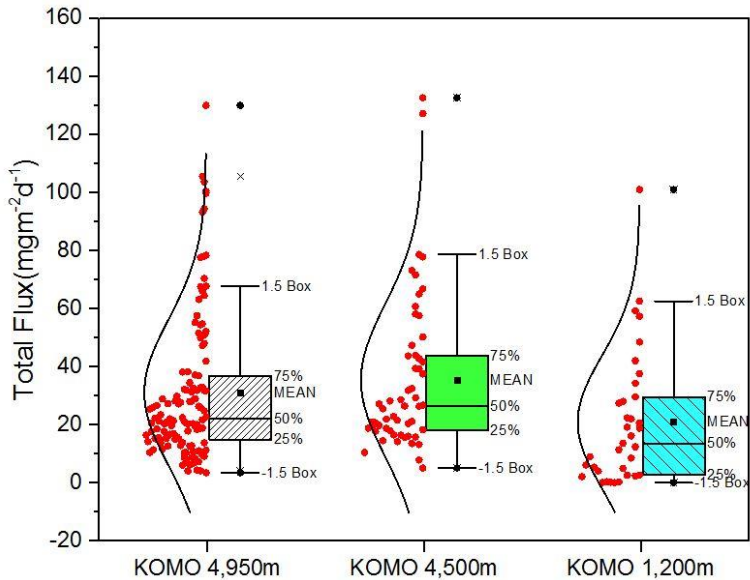
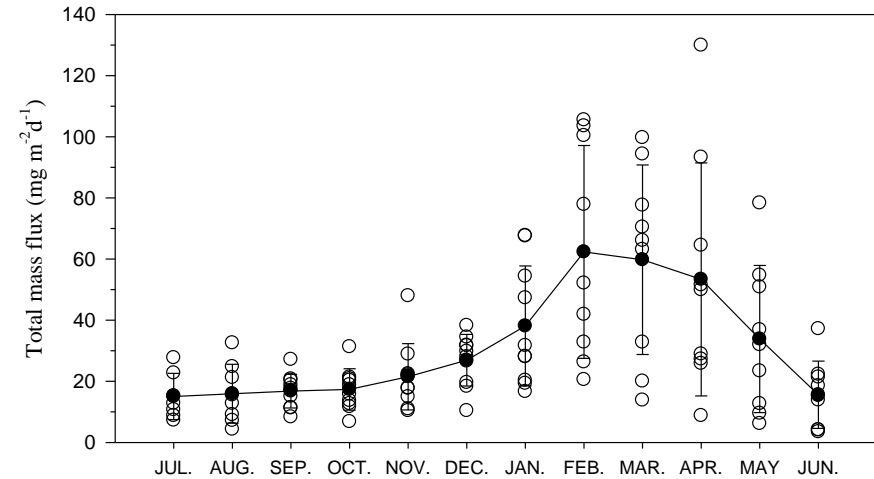
- Conductivity-temperature-depth (CTD) system
- Annual and depth variation of the major nutrients



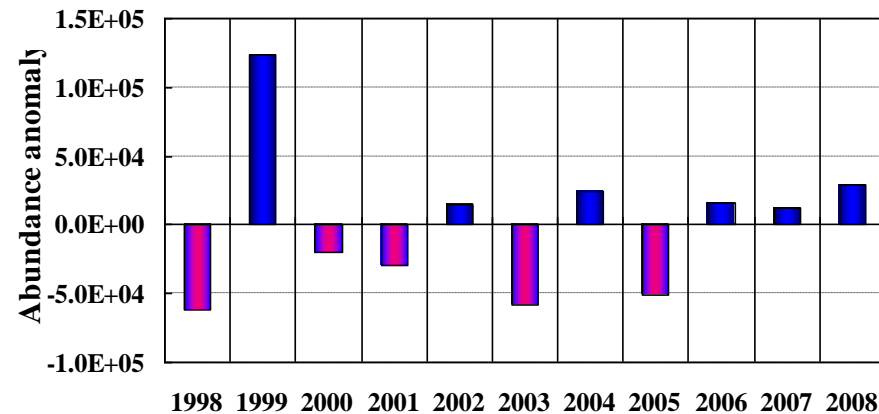
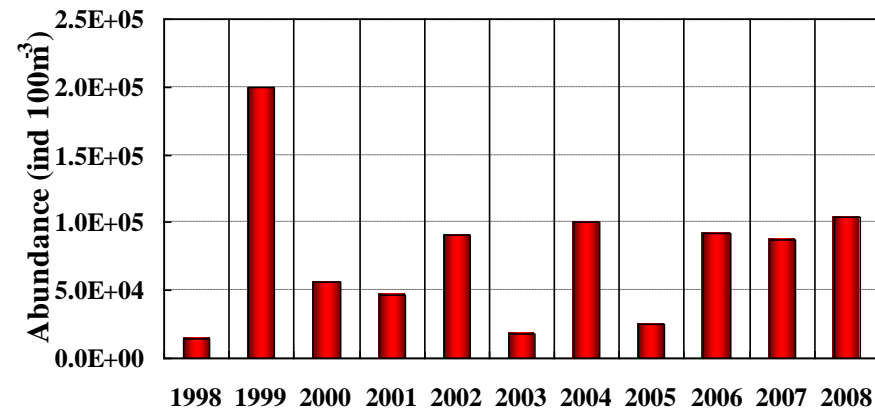
- Long-term Mooring System (Sediment trap)
- Annual variation of particle flux at three depth (1200m, 4500m, 4950m)



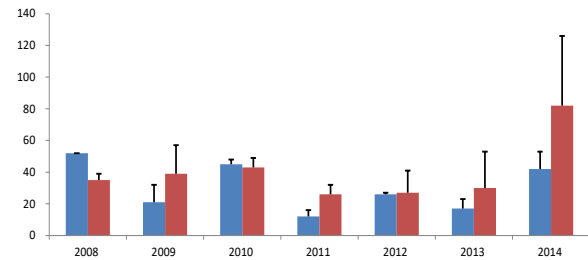
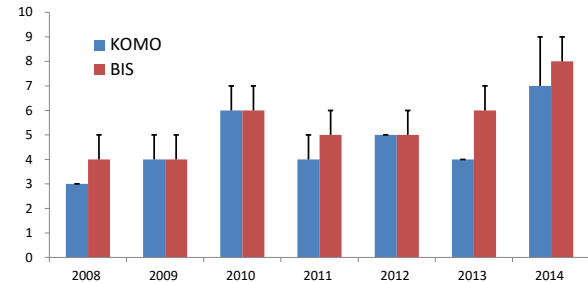
- Natural variation of total particle flux at three different depth
- Monthly variation
 - 2003-2007 vs. 2008-2014
 - 2008: PDO regime shift (warm to cold)



- Bongo Net
- Abundance, biomass and species structure
 - Zooplankton



- Multiple Corer
- Abundance, biomass and species structure
 - Meiofauna, Microfauna



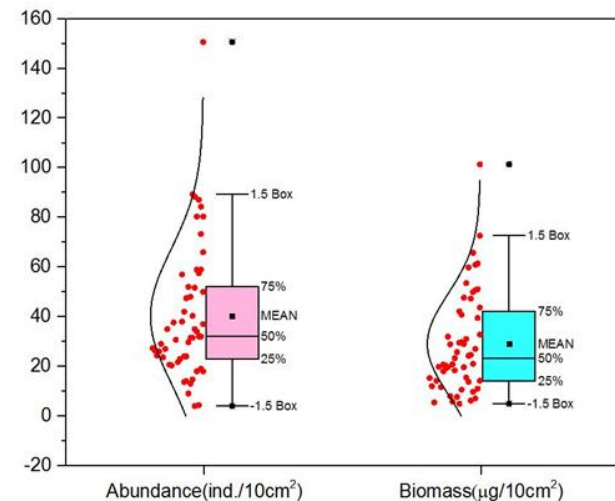
Download - GenBank Graphics

Oxystomina sp. TCR202 16S ribosomal RNA gene, partial sequence
Sequence ID: gb|HM564628.1| Length: 1605 Number of Matches: 1

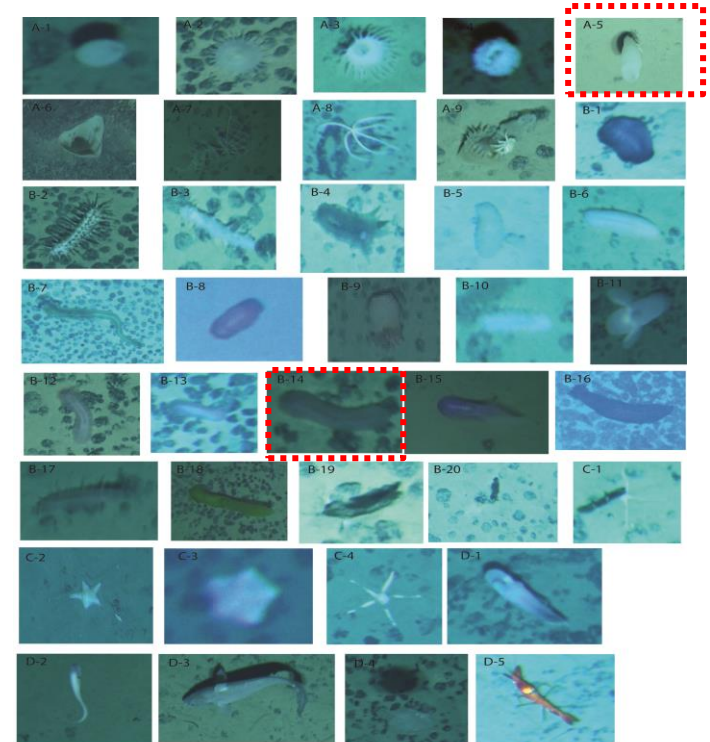
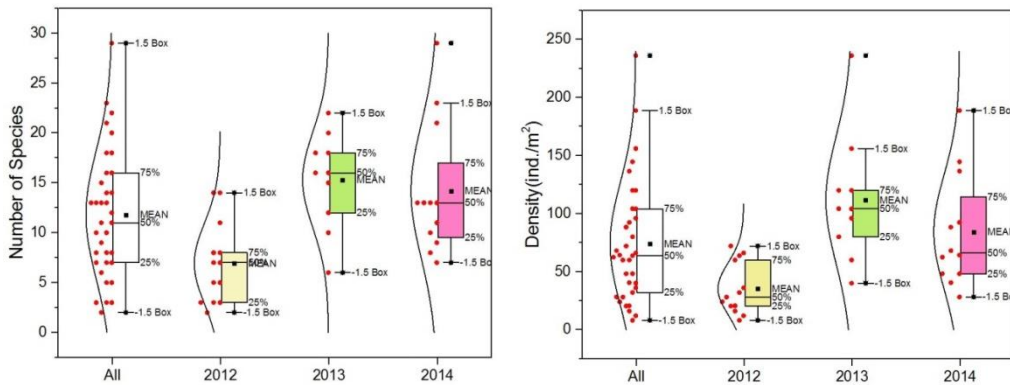
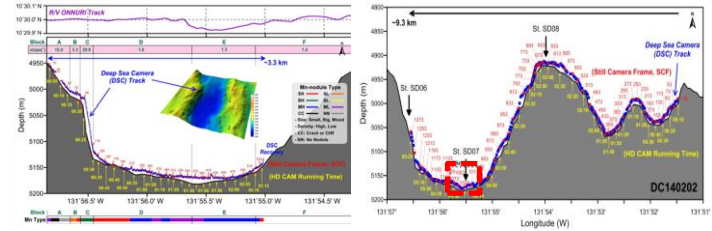
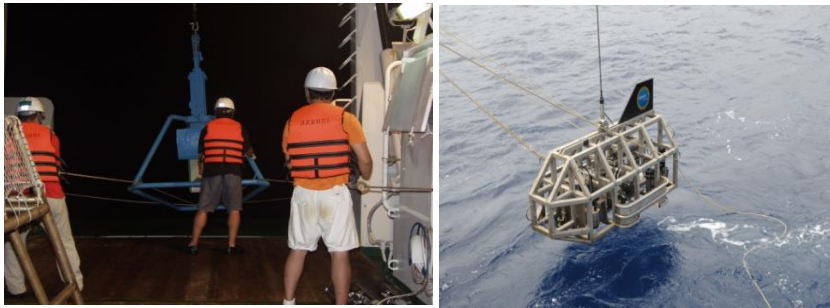
Score	Expect	Identities	Gaps	Strand
529 bits (286)	1e-146	293/296 (99%)	1/296 (0%)	Plus/Minus

Range 1: 1 to 296 GenBank Graphics

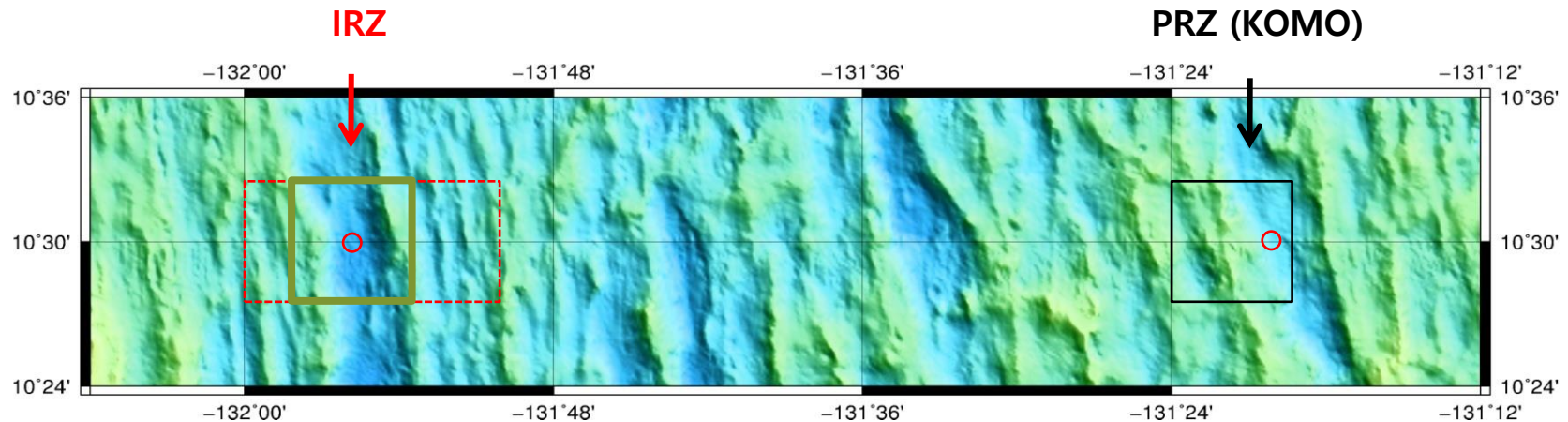
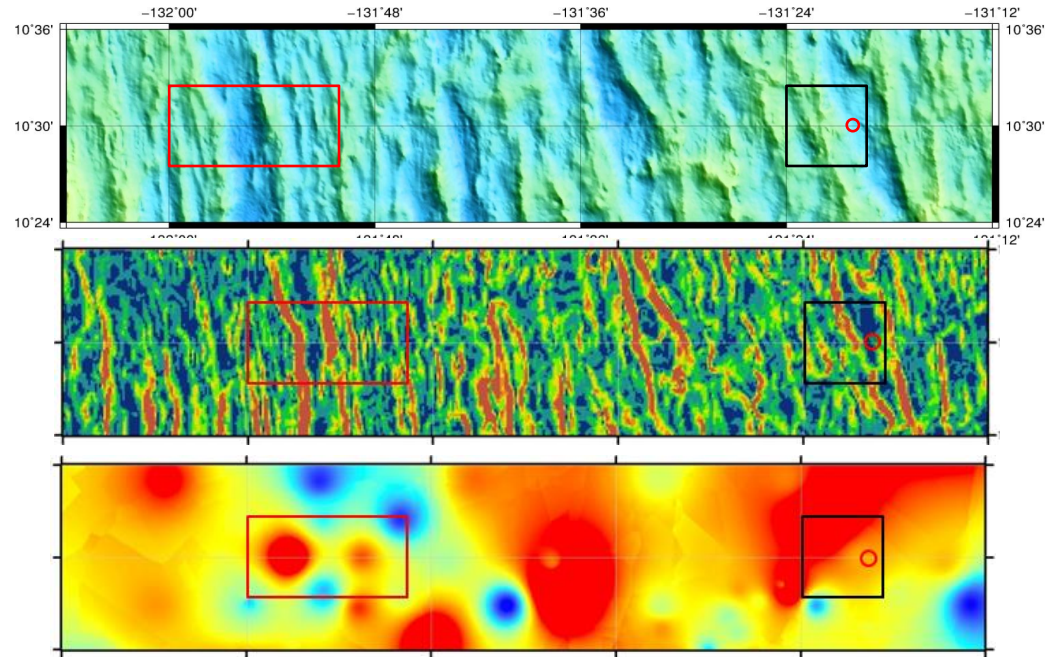
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Query 61	CCATCGAAGTTCATAGGCGACACTTGAAGTTCCTCCCGGTACCA-GACATGCC	119
Sbjct 236	CCATCGAAGTTCATAGGCGACACTTGAAGTTCCTCCCGGTACCA-GACATGCC	177
Query 120	ATGACTAAGTATTCAGATTCACAGGTACGATCGAAGTACGATGGTTGTCTCA	179
Sbjct 176	ATGACTAAGTATTCAGATTCACAGGTACGATCGAAGTACGATGGTTGTCTCA	117
Query 180	ATAACGCGCTTCTCCGTAAGTTCAGCTTCTCTCCCTGATTAAGCTTCAGATACC	239
Sbjct 116	ATAACGCGCTTCTCCGTAAGTTCAGCTTCTCTCCCTGATTAAGCTTCAGATACC	57
Query 240	ACAGTTCACACGTAAGTTCAGCTTCTCTCCCTGATTAAGCTTCAGATACC	295
Sbjct 56	ACAGTTCACACGTAAGTTCAGCTTCTCTCCCTGATTAAGCTTCAGATACC	1



- Box Corer, Deep-towed Camera System
- Abundance, biomass and species structure
 - Macrofauna, Megafauna

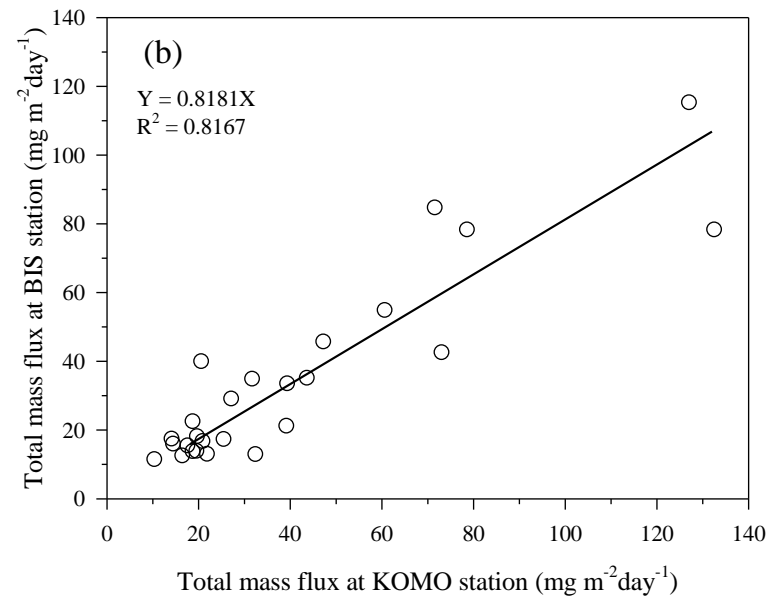
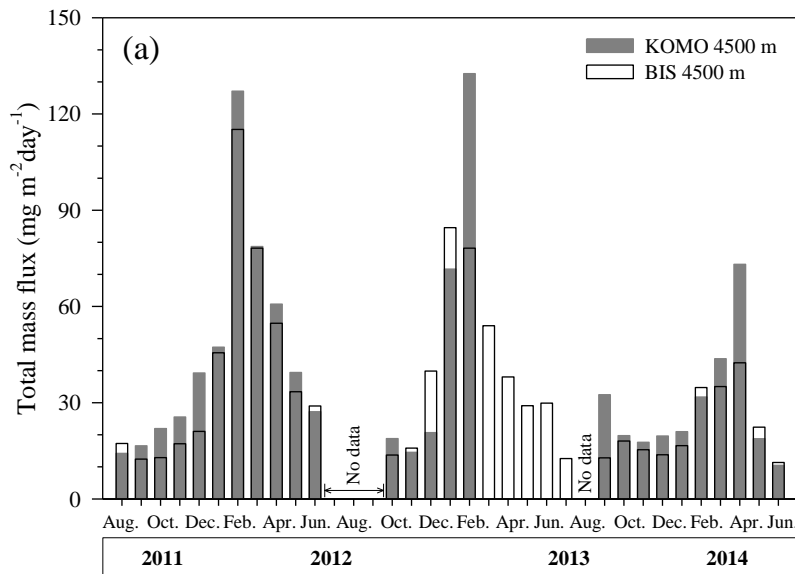


- Selection for 'Benthic Impact Experiment' Site in 2010 (not as an Impact Reference Zone)
- Similar conditions with PRZ in environmental characteristics
- Dimension (100km², 10x10km)
 - 10°27' ~ 10°33'N, 131°53' ~ 131°58'W
 - Distance between IRZ & PRZ: ~70km
- Baseline studies from 2011 to 2014 for comparison between IRZ & PRZ

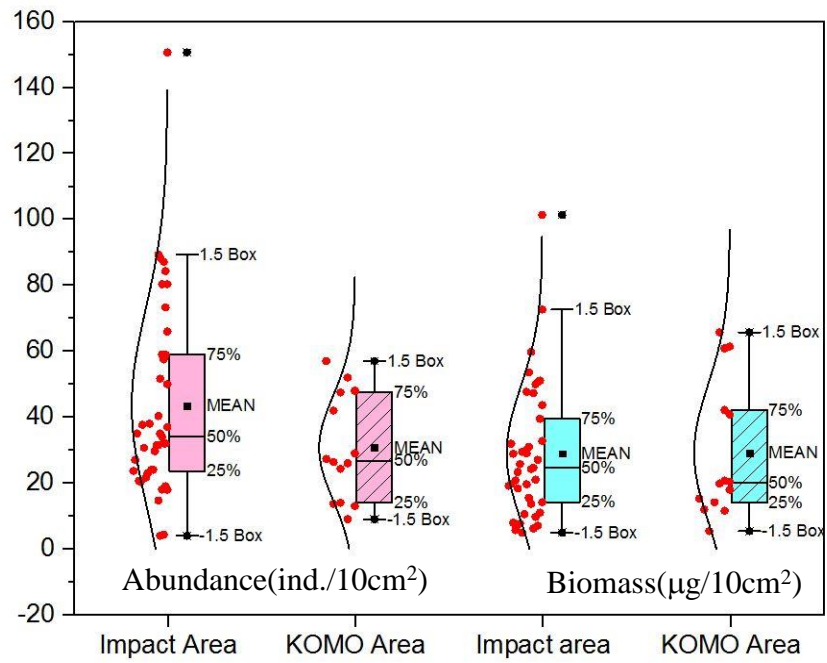
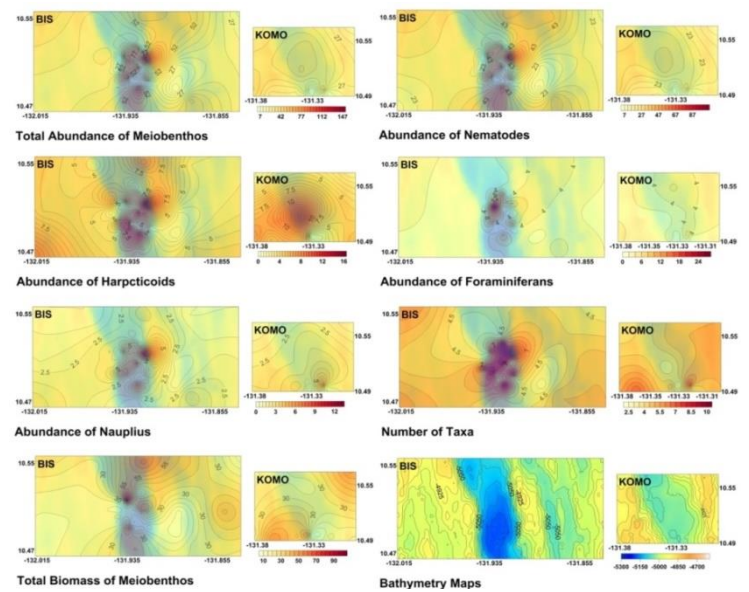
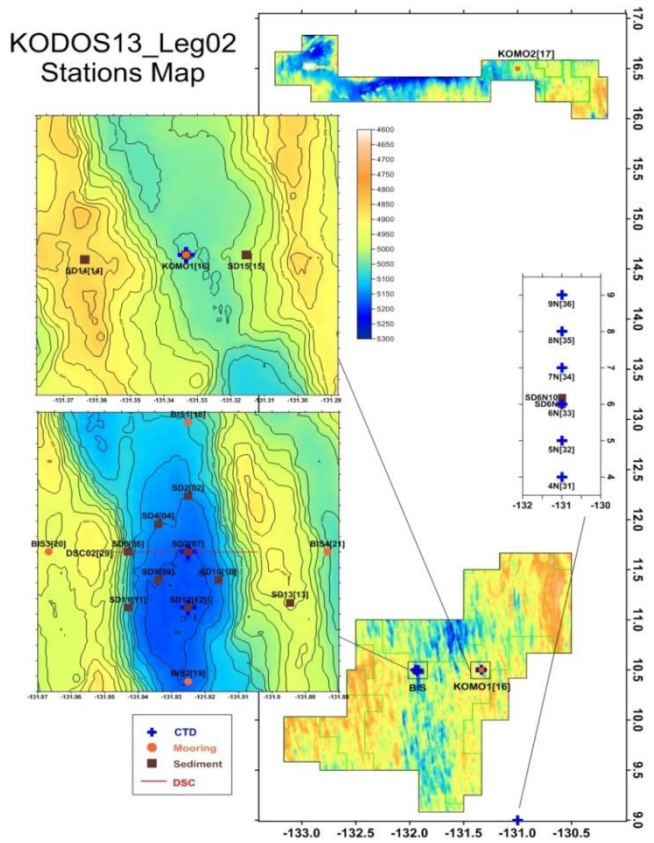


	Range	Average	Winter-Spring (Dec. – May)	Summer-Fall (June – Nov.)
KOMO	10.5 - 132.6	40.2	55.0	19.9
BIS	11.4 - 115.2	34.3	47.7	16.0

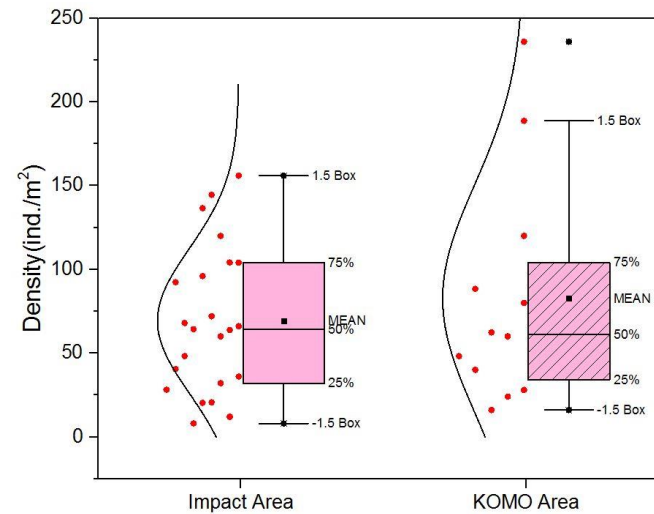
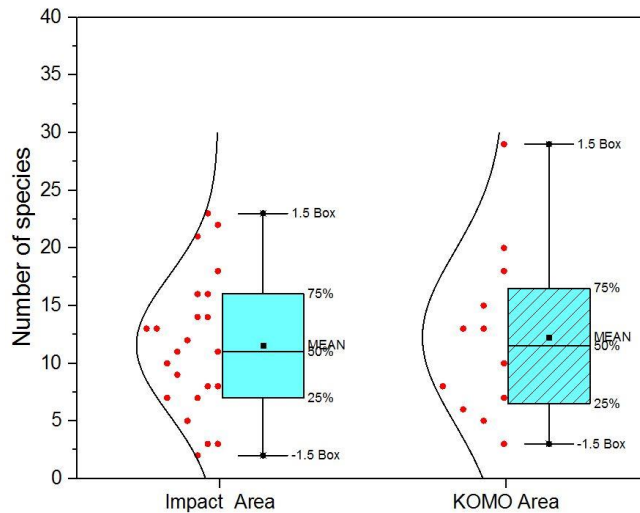
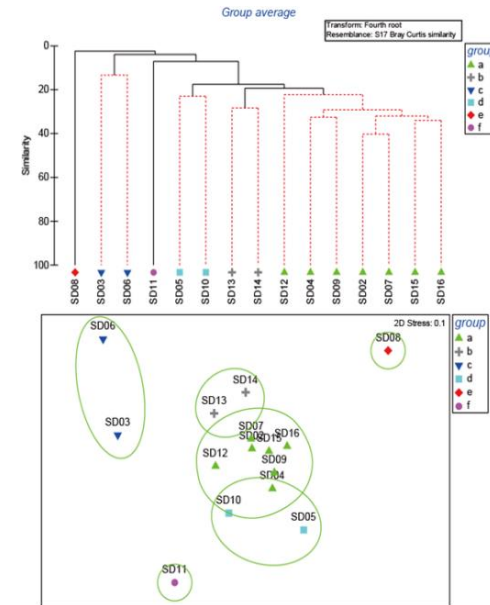
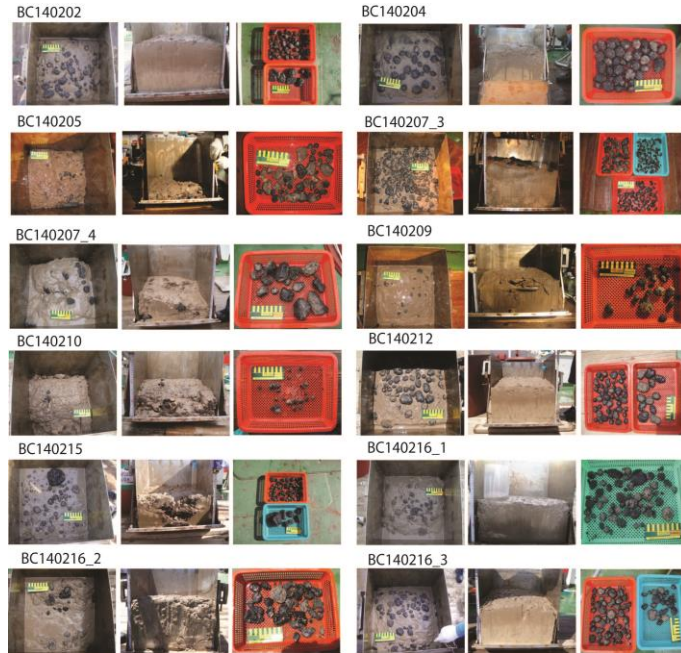
(mg m⁻² day⁻¹)



IRZ vs. PRZ _ Meiofauna

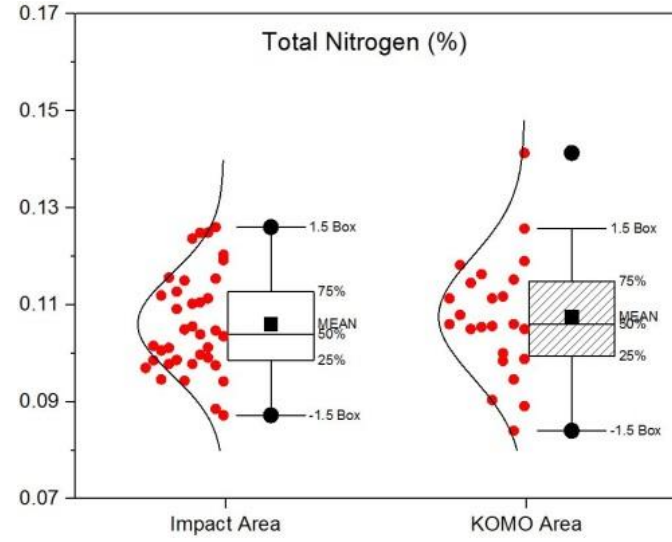
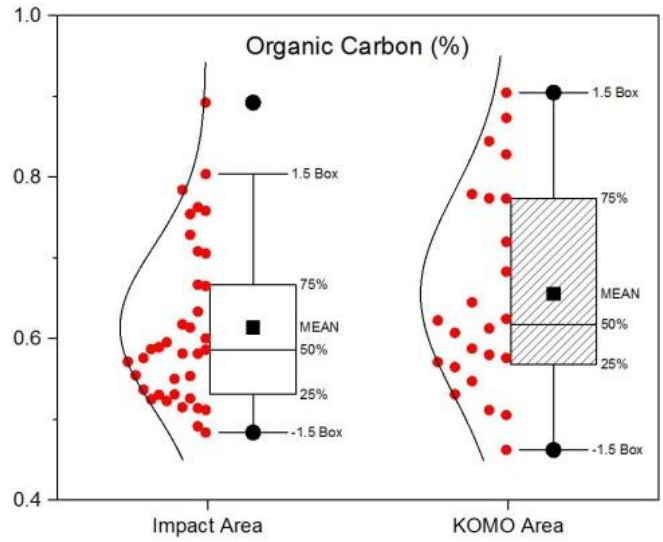
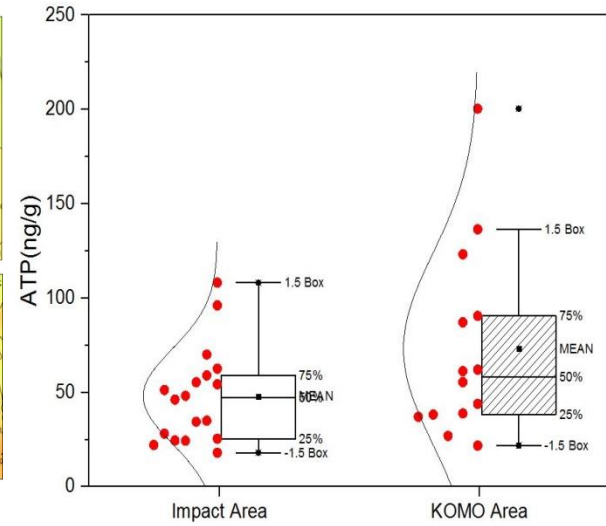
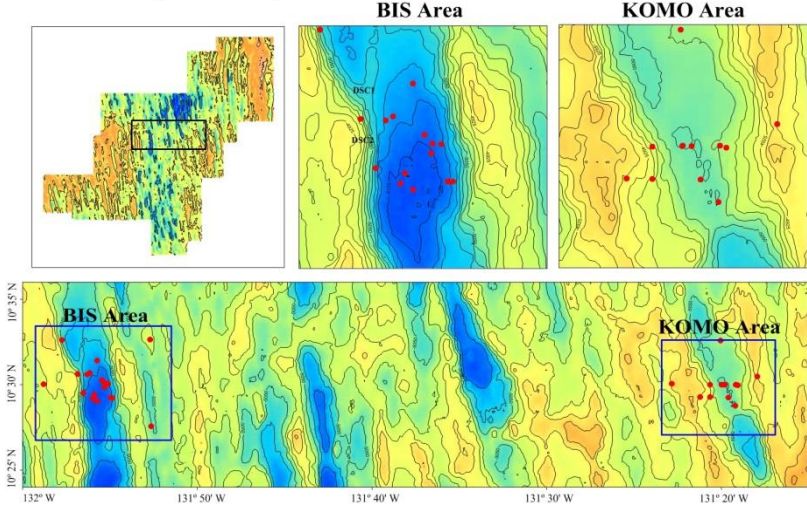


IRZ vs. PRZ _ Macrofauna



IRZ vs. PRZ _ Sediment Property

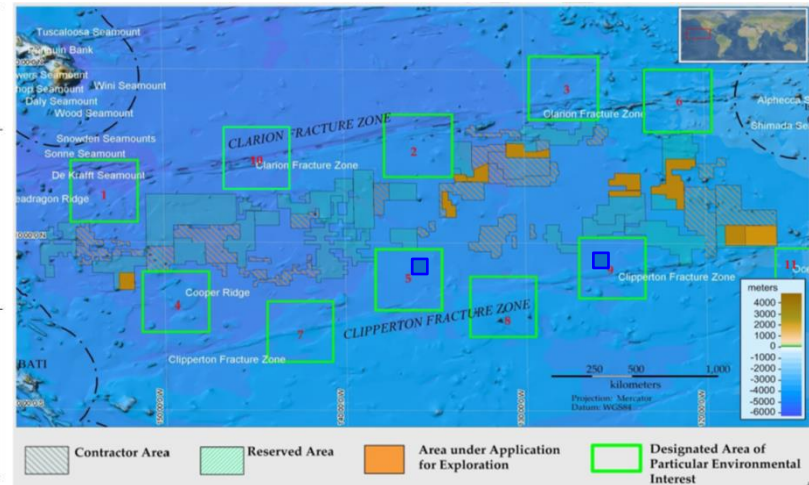
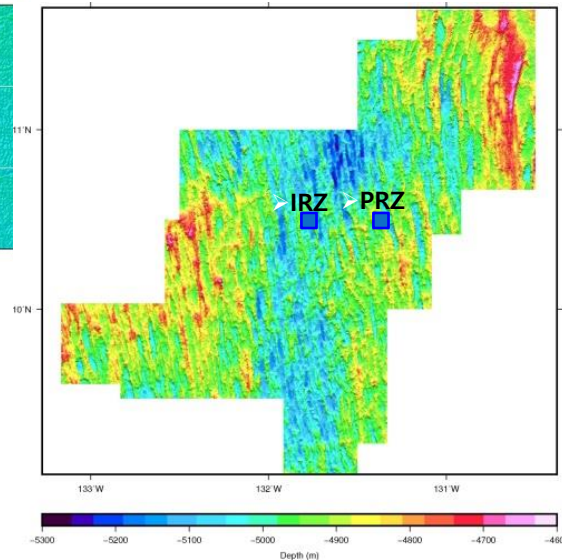
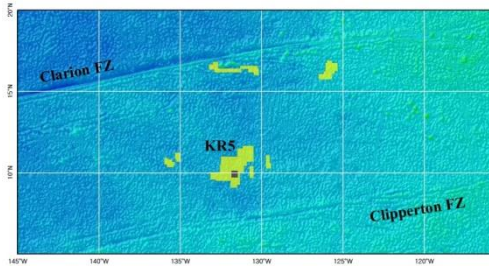
ATP Sampling Station Map



Future Exploration Plan of Korea

Korea Institute of Ocean Science & Technology

- Five year extension contract: 2016.4 – 2020. 4
- Objectives of activity programme (Two exploration cruises: 2018, 2019)
 - Estimation of polymetallic nodule abundance
 - Gathering additional environmental and biological data
- Exploration Plan for 2018 cruise (provisional)
 - RV Kilo Moana (Univ. of Hawaii)
 - Duration: 30days (20 May to 19 June)
 - Biological baseline data from IRZ, PRZ, and APEI
 - DCS data for mega-fauna distribution in KR5 area





Thank you !!!