Normal Oceanic Mantle (NOMan) Project

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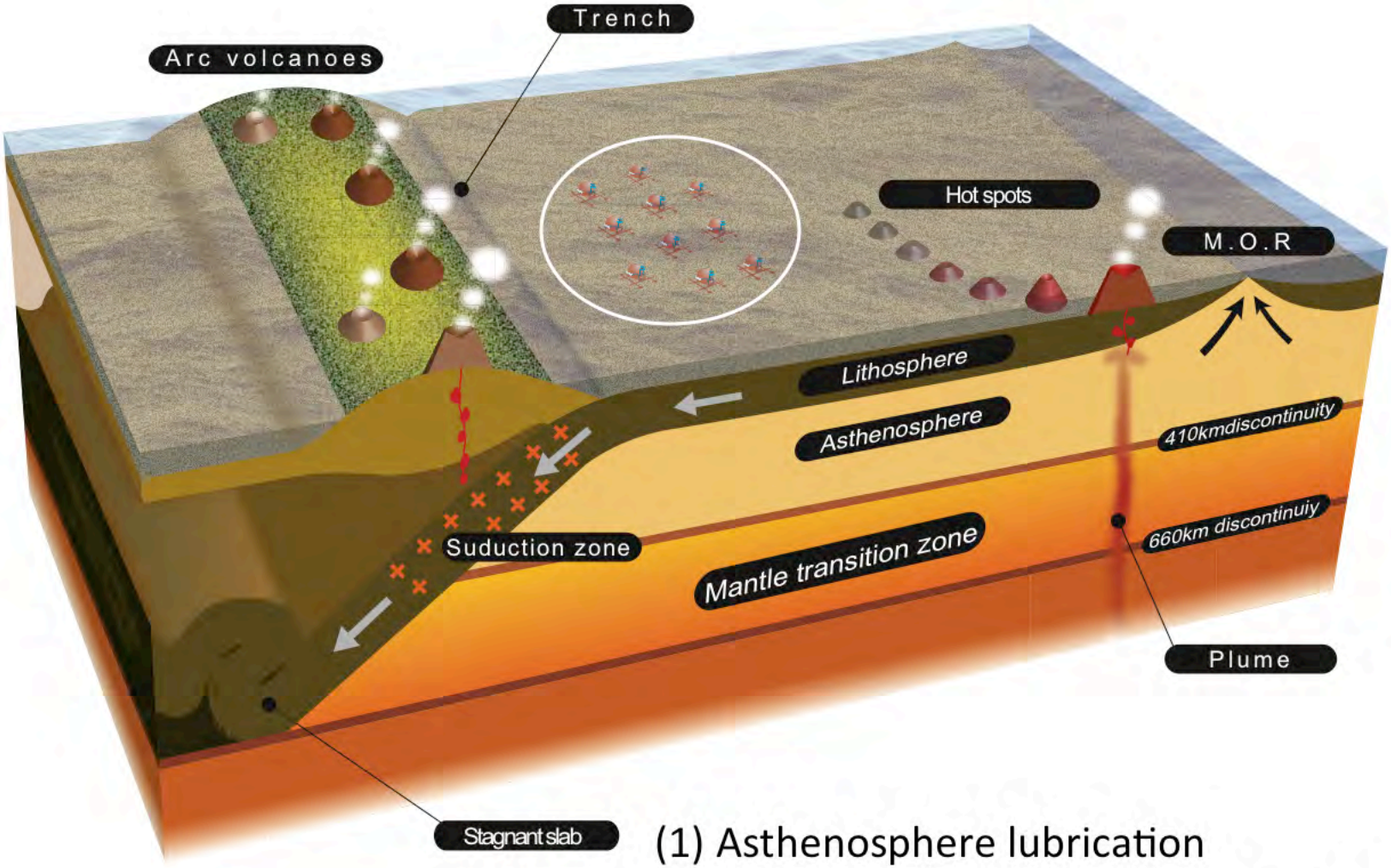
Takehi Isse, Daisuke Suetsugu, and the NOMan Project team

NOMan workshop, March 4, 2013

The NOMan Project (FY2010-2014): Scientific target



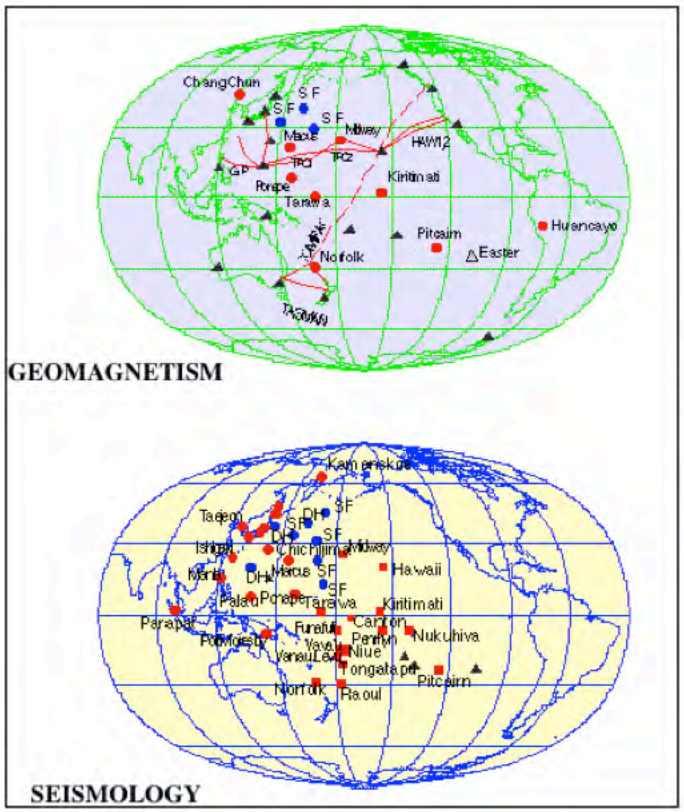
(1) Asthenosphere lubrication
(2) Water (volatiles) in the transition zone

By advanced seafloor geophysical observations

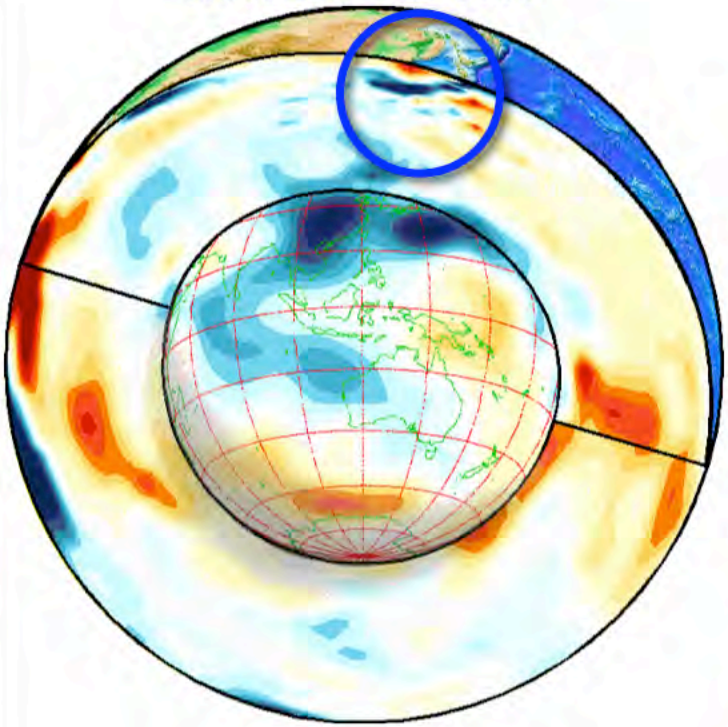
Research history of our group

OHP（1996-2001）
Ocean Hemisphere

SSP (2004-2008)
Stagnant Slab

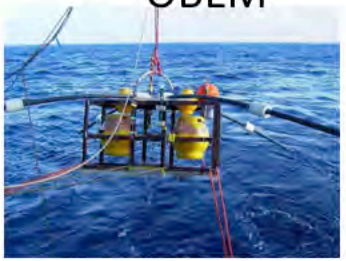


Subducted oceanic slab



BBOBS

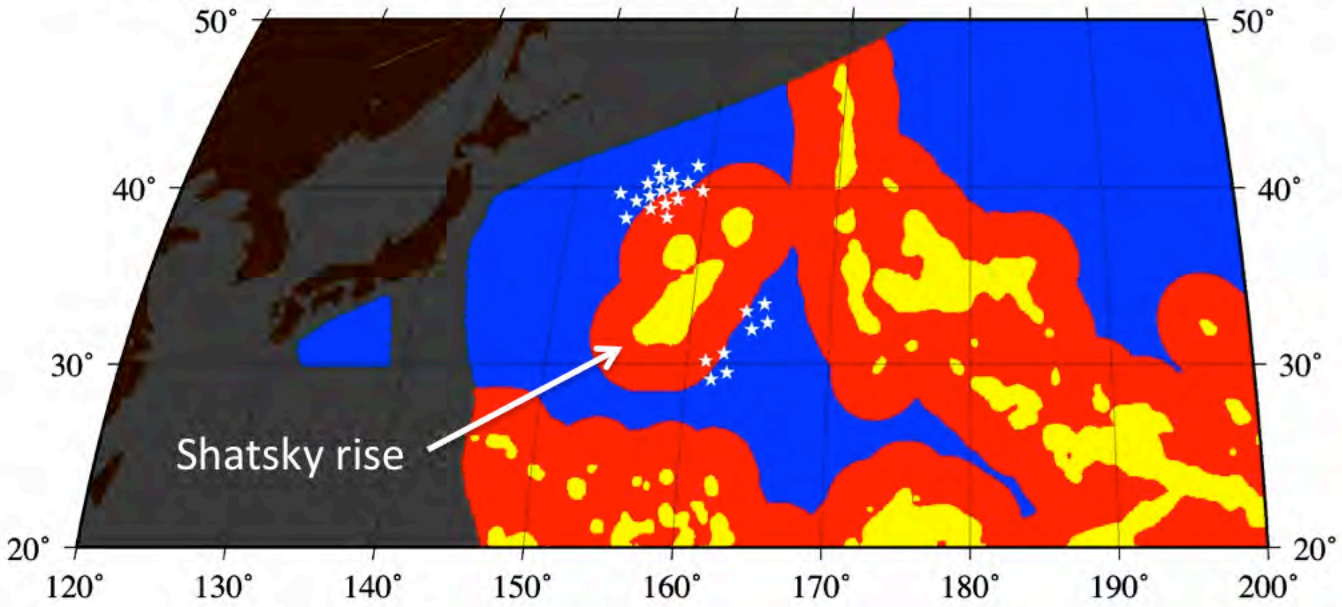
OBEM



Global Network

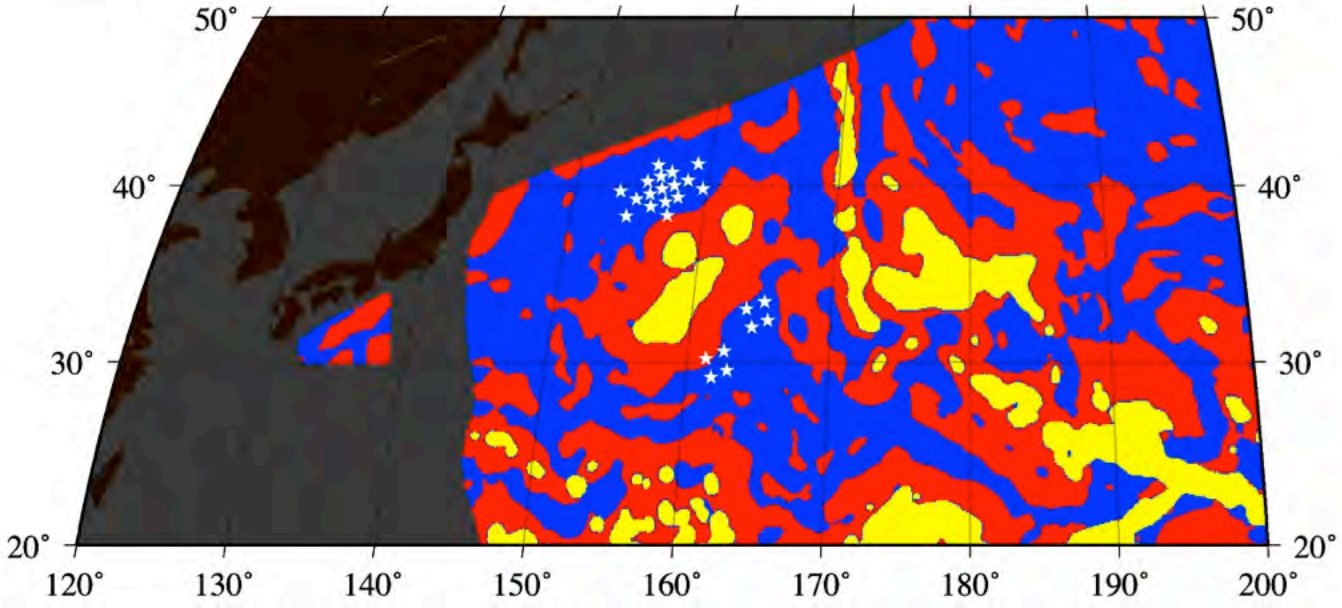
Zoom-in imaging

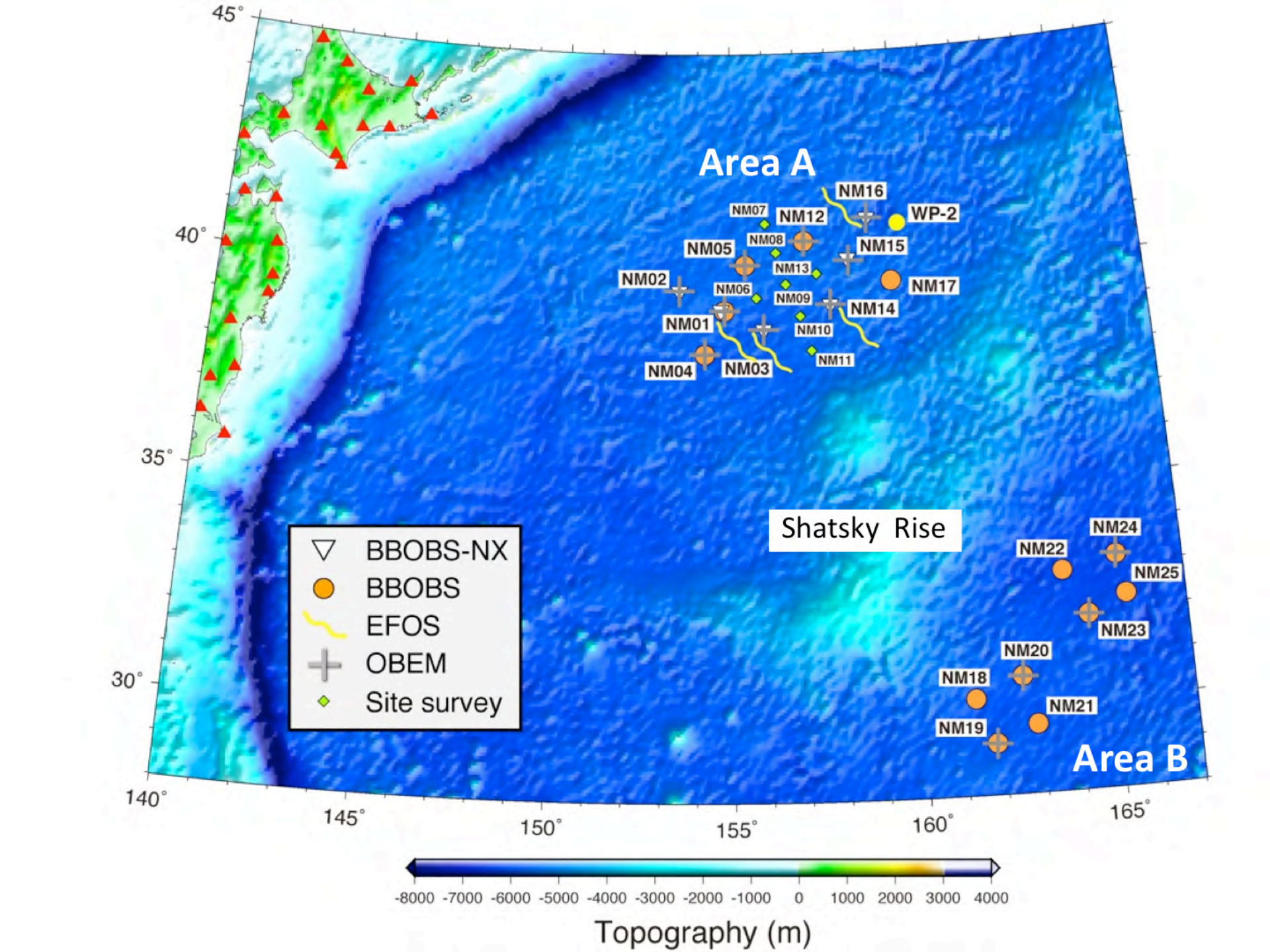
(a) Normal crust (blue) by distance criterion



(b) Normal crust (blue) by correlation criterion

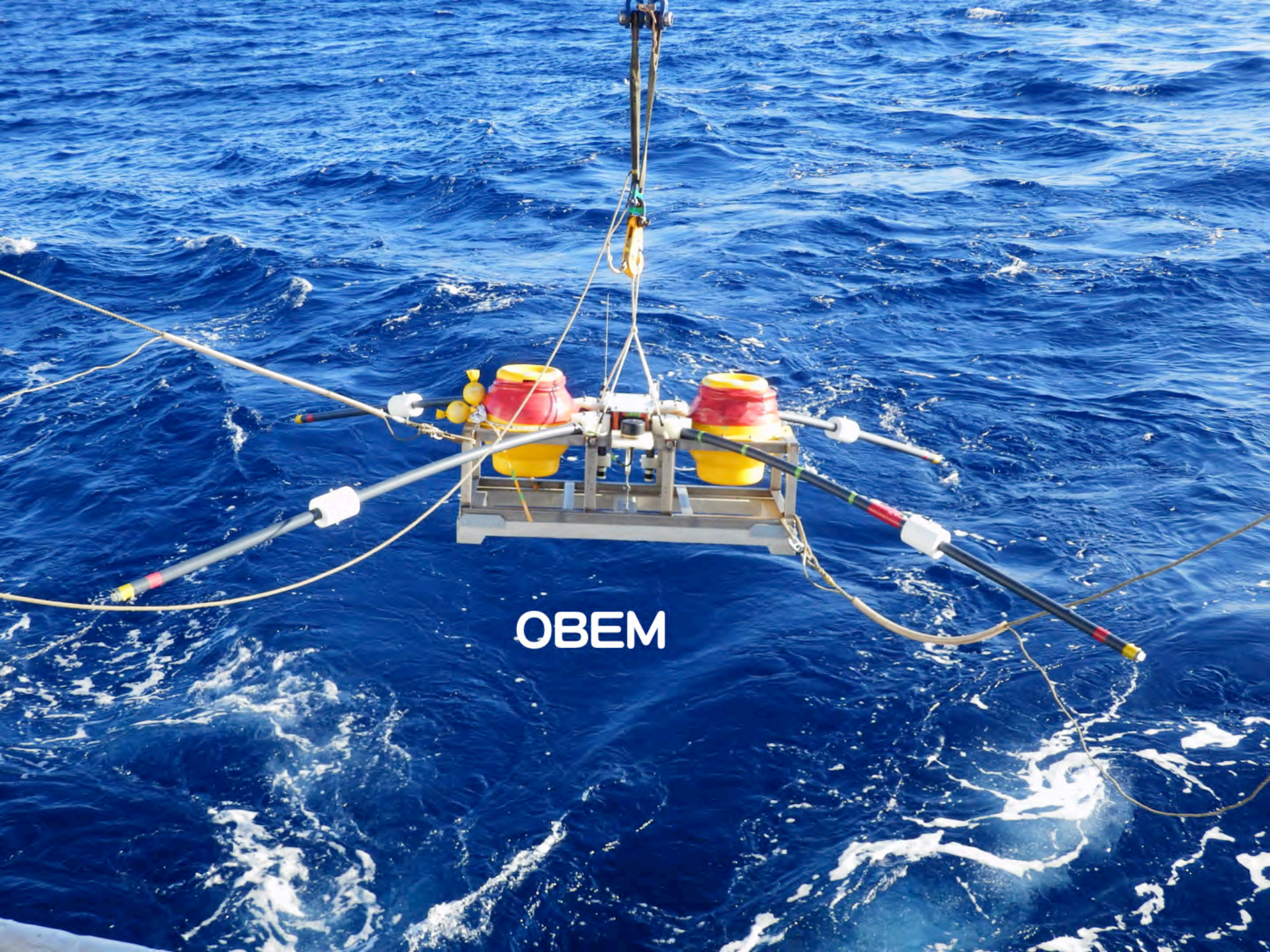
Korenaga&Korenaga (2008)




Area A
NM16
NM07
NM12
WP-2
NM08
NM15
NM05
NM13
NM02
NM17
NM06
NM09
NM14
NM01
NM10
NM04
NM03
NM11
Shatsky Rise
NM24
NM22
NM25
NM23
NM20
NM18
NM21
NM19
Area B
BBOBS-NX
BBOBS
EFOS
OBEM
Site survey
45°
40°
35°
30°
140°
145°
150°
155°
160°
165°
-8000 -7000 -6000 -5000 -4000 -3000 -2000 -1000 0 1000 2000 3000 4000
Topography (m)

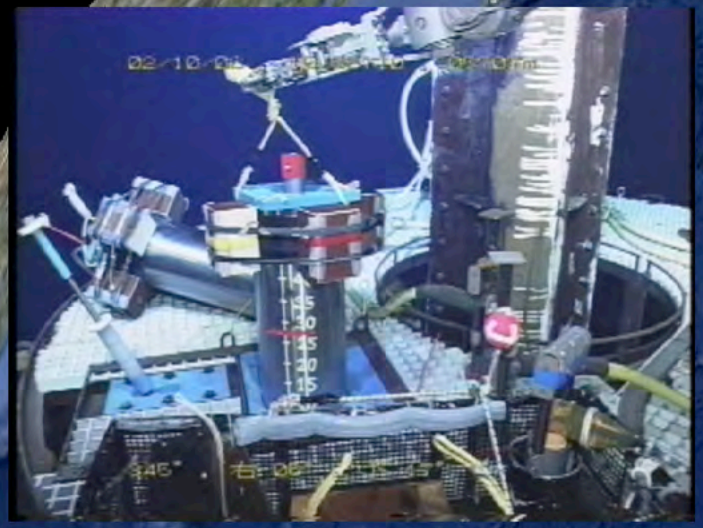
502
Ocean Bottom Seismograph
Earthquake Research Institute
University of Tokyo
JAPAN

BBOBS

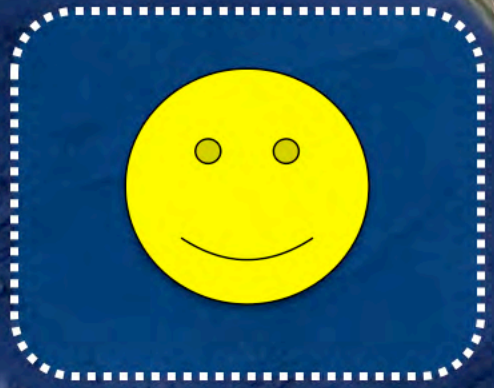

OBEM

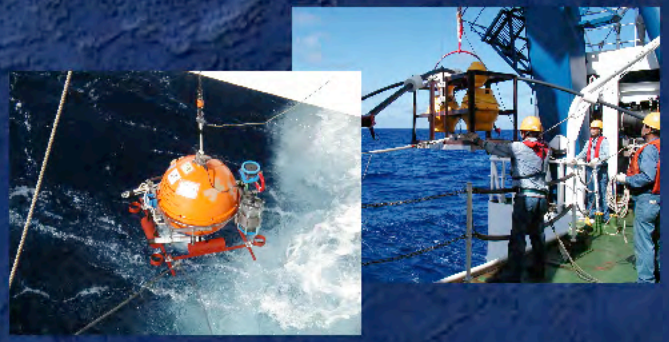
Difficult problem needs advanced instruments.

Data quality



Borehole seismometer



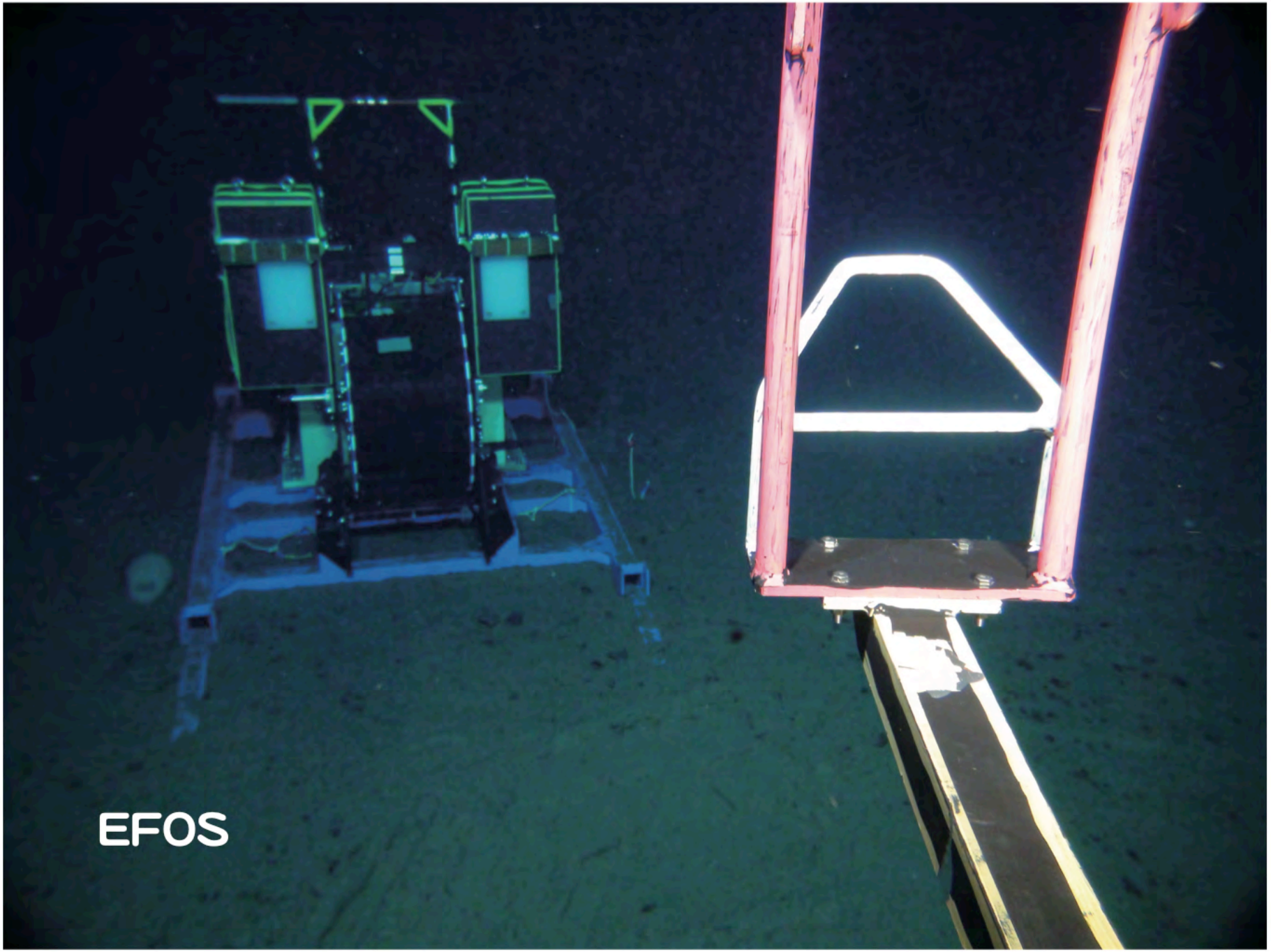


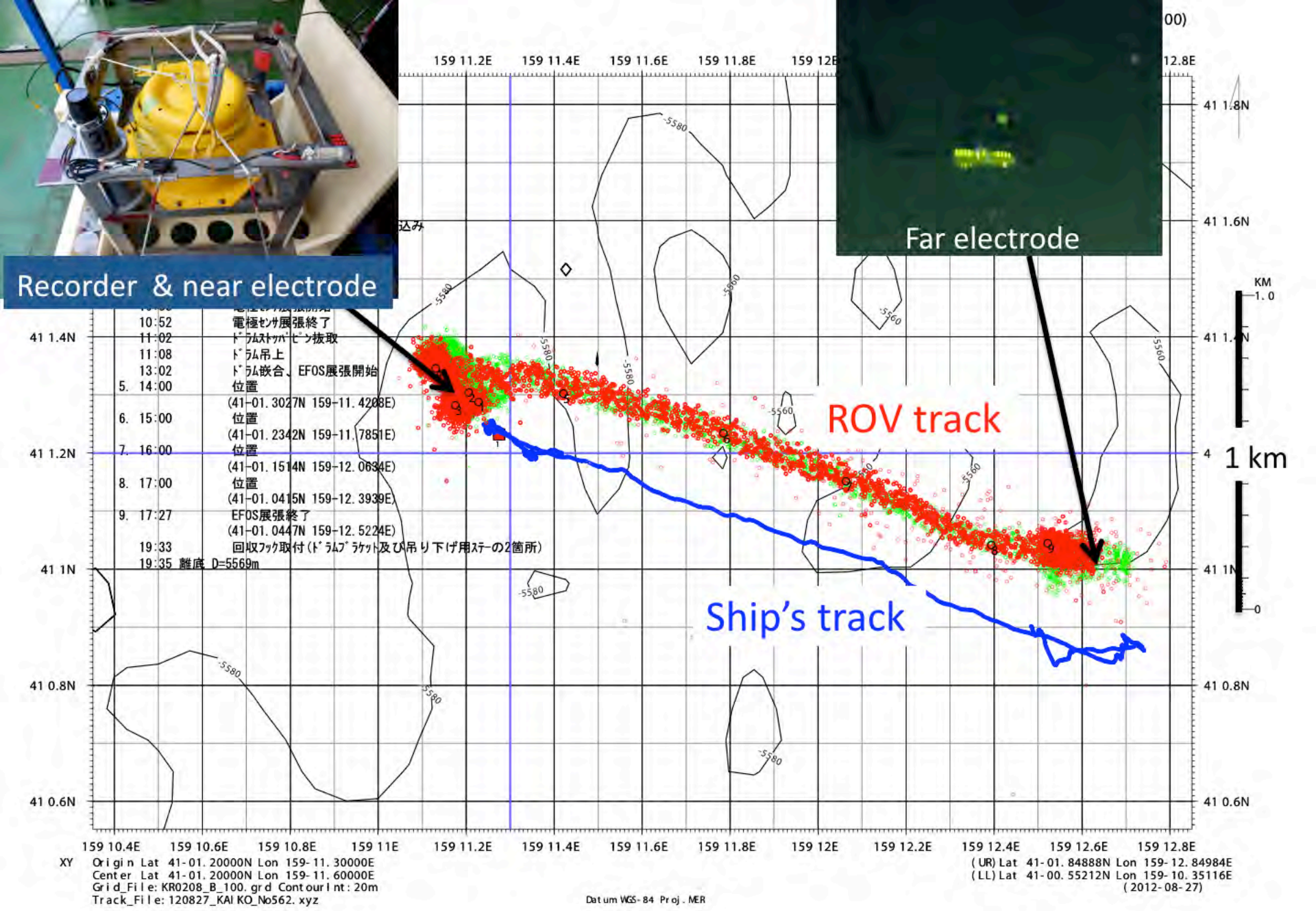
BBOBDS and OBEM

Mobility

BBOBS-NX
546

2/08/25 14:20:50
LHDG:273°
VHDG:324°
LD: 5451m LA: 125m
VD: 5580m VA: 194m
12/08/25 14:20:50
LHDG:273°
VHDG:324°
LD: 5450m LA: 125m
VD: 5580m VA: 194m

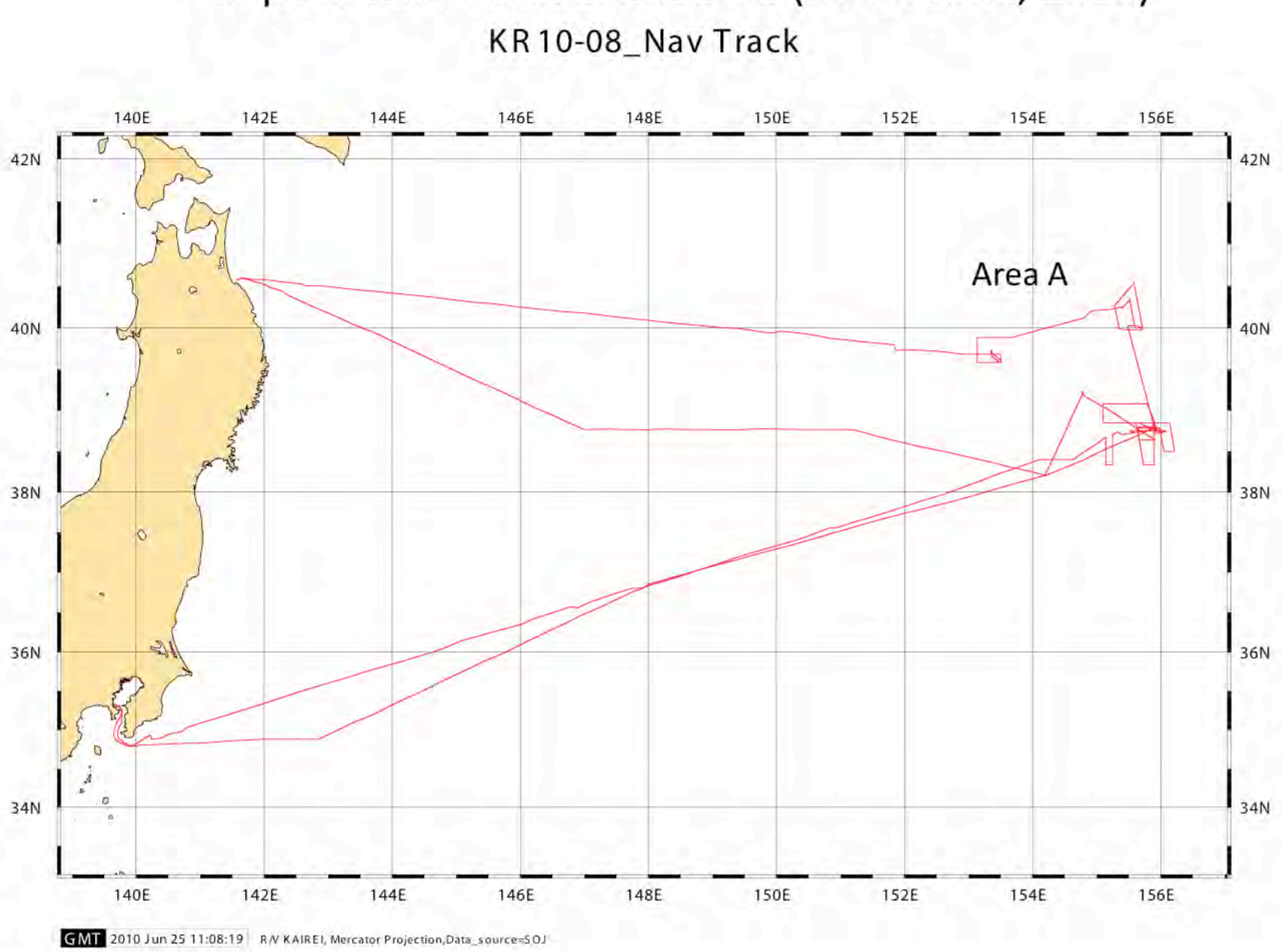

EFOS


Recorder & near electrode
Far electrode
ROV track
Ship's track
1 km
KM
1.0
0
10:52 電極ｾﾝｻ展張終了
11:02 ﾄﾞﾗﾑｽﾄｯﾊﾟﾋﾟﾝ抜取
11:08 ﾄﾞﾗﾑ吊上
13:02 ﾄﾞﾗﾑ嵌合、EFOS展張開始
5. 14:00 位置 (41-01.3027N 159-11.4208E)
6. 15:00 位置 (41-01.2342N 159-11.7851E)
7. 16:00 位置 (41-01.1514N 159-12.0634E)
8. 17:00 位置 (41-01.0415N 159-12.3939E)
9. 17:27 EFOS展張終了 (41-01.0447N 159-12.5224E)
19:33 回収ﾌｯｸ取付(ﾄﾞﾗﾑﾌﾞﾗｹｯﾄ及び吊り下げ用ｽﾃｰの2箇所)
19:35 離底 D=5569m
159 10.4E
159 10.6E
159 10.8E
159 11E
159 11.2E
159 11.4E
159 11.6E
159 11.8E
159 12E
159 12.2E
159 12.4E
159 12.6E
159 12.8E
41 1.8N
41 1.6N
41 1.4N
41 1.2N
41 1N
41 0.8N
41 0.6N
-5580
-5560
XY Origin Lat 41-01.20000N Lon 159-11.30000E
Center Lat 41-01.20000N Lon 159-11.60000E
Grid_File: KR0208_B_100.grd ContourInt: 20m
Track_File: 120827_KAIKO_No562.xyz
Datum WGS-84 Proj. MER
(UR) Lat 41-01.84888N Lon 159-12.84984E
(LL) Lat 41-00.55212N Lon 159-10.35116E
(2012-08-27)

R/V Kairei (JAMSTEC)

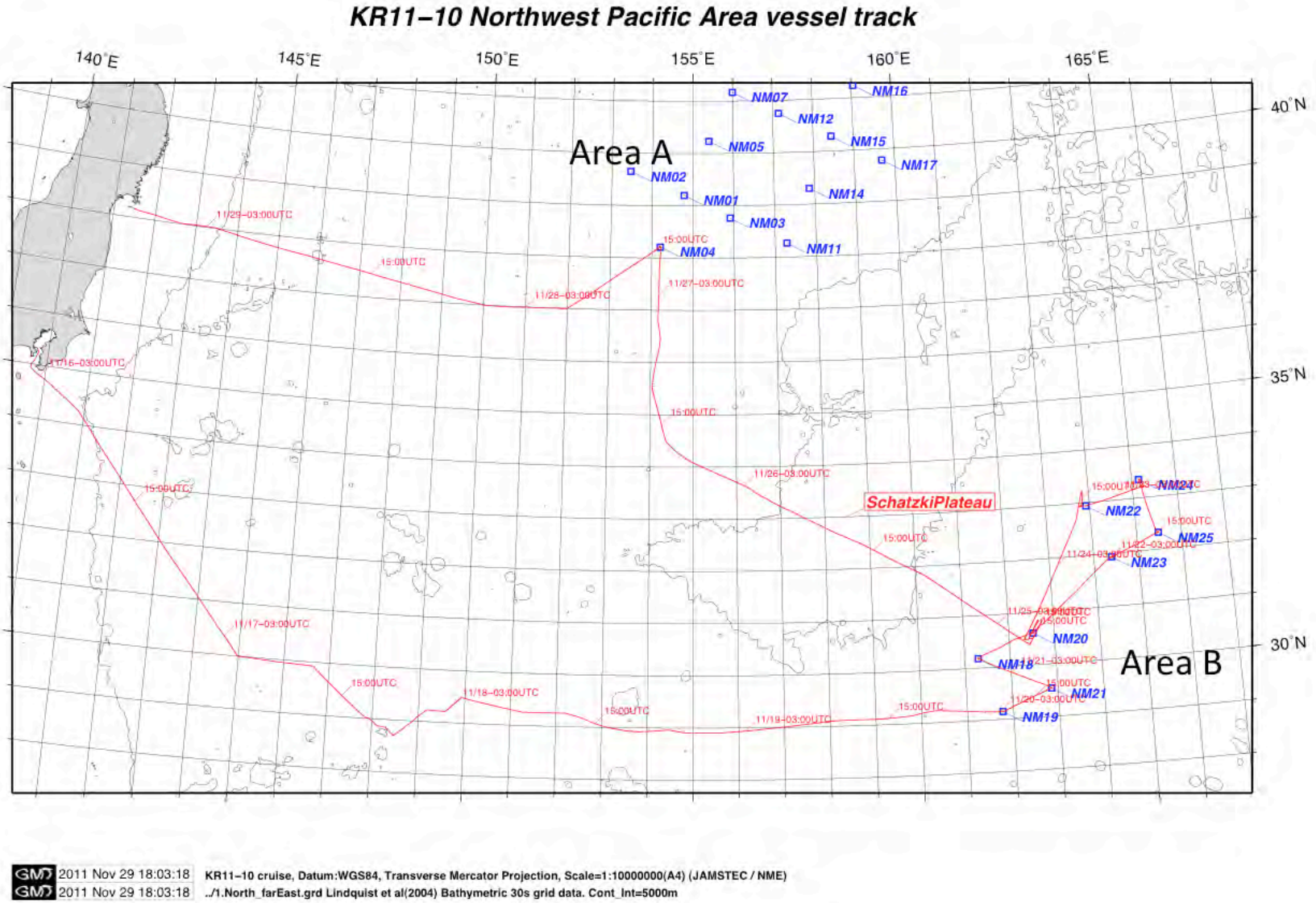
ROV Kaiko7000-II

Ship's track of Cruise KR10-08 (10-25 June, 2010)

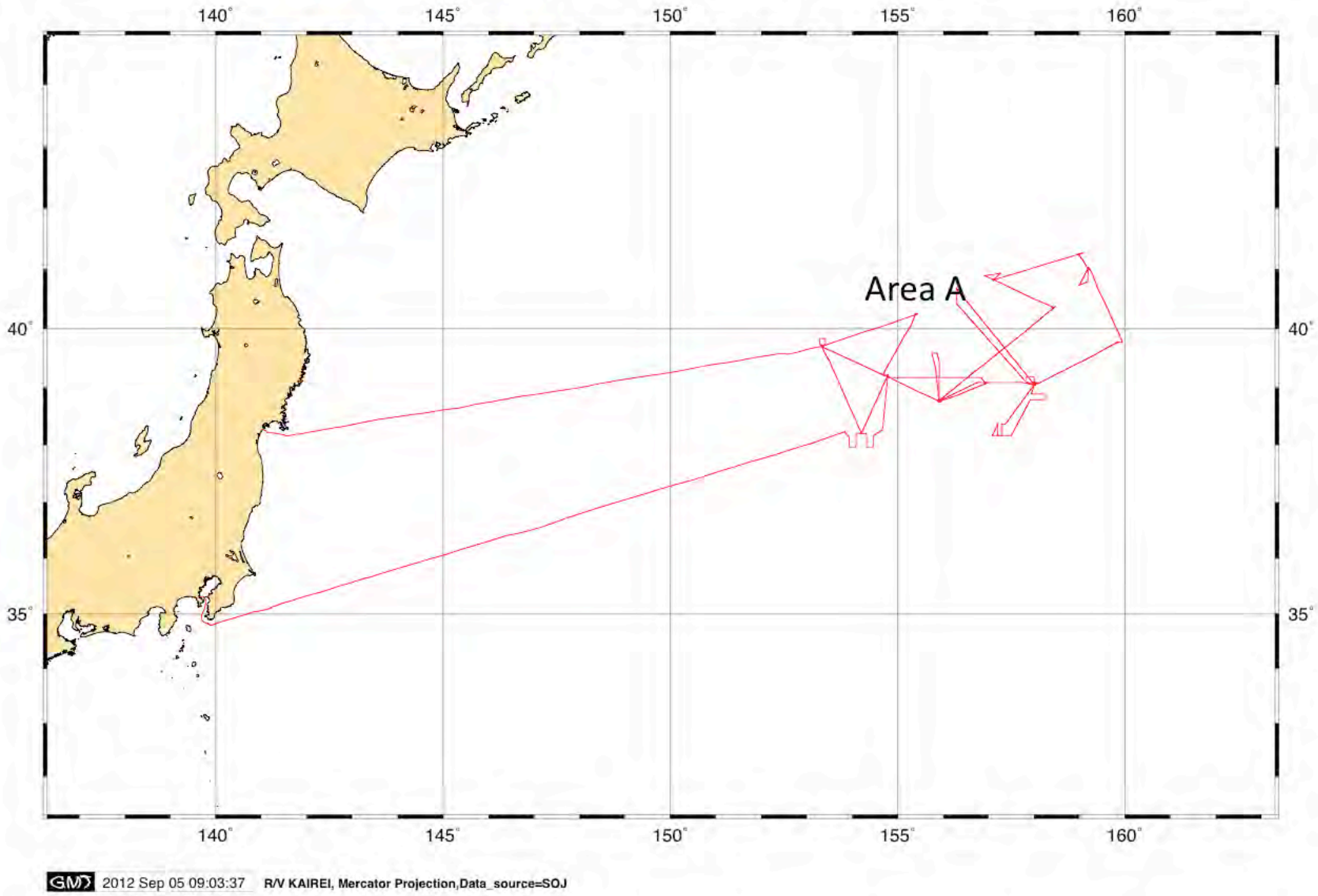


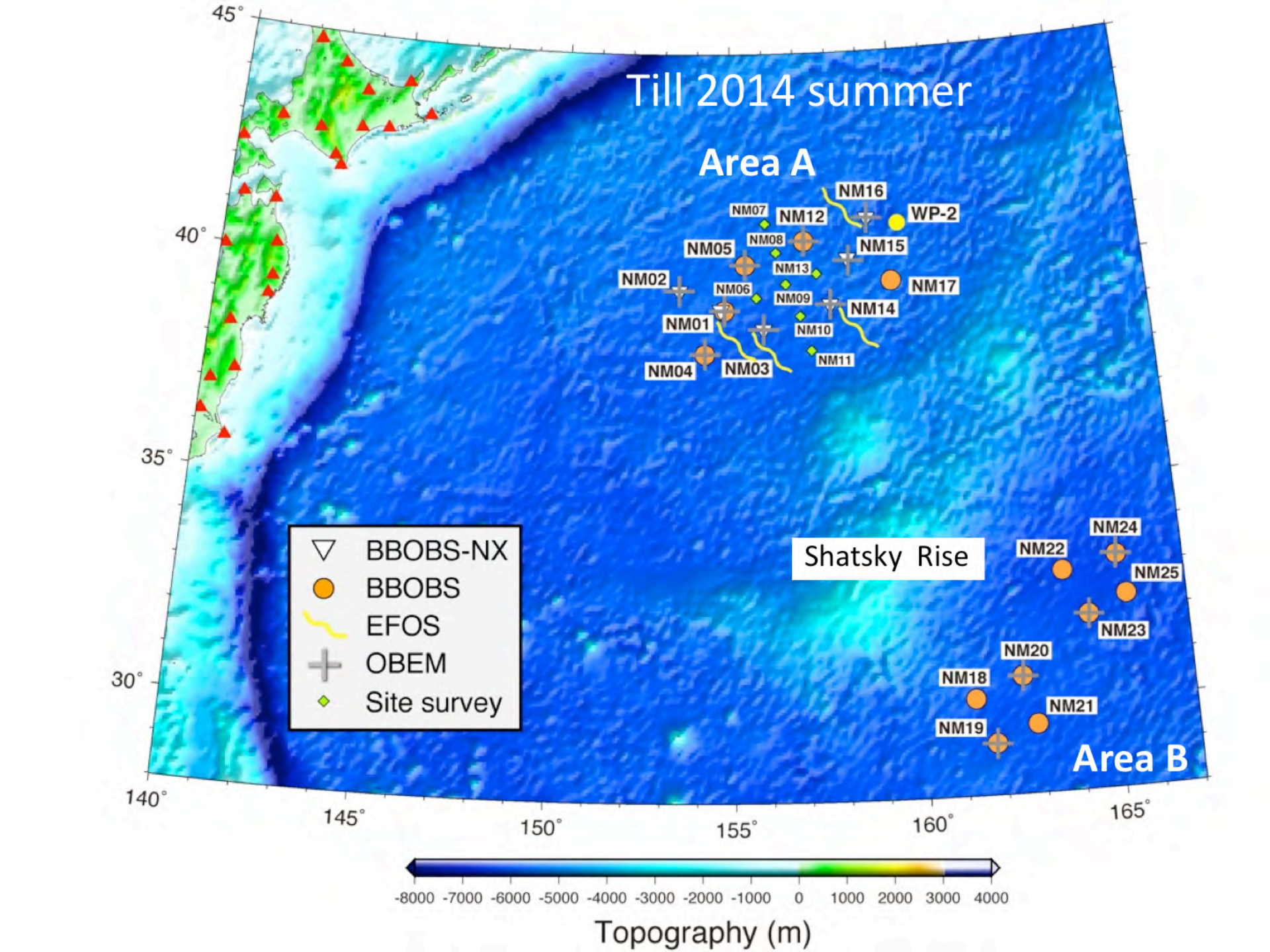
2011 Tohoku Earthquake and Tsunami

KR11-10 Ship's track (November 16-30, 2011)



Ship's track of Cruise KR12-14 (17 August-05 September, 2012)




Till 2014 summer
Area A
NM16
NM07
NM12
WP-2
NM08
NM15
NM05
NM13
NM02
NM17
NM06
NM09
NM14
NM01
NM10
NM04
NM03
NM11
Shatsky Rise
NM24
NM22
NM25
NM23
NM20
NM18
NM21
NM19
Area B
BBOBS-NX
BBOBS
EFOS
OBEM
Site survey
45°
40°
35°
30°
140°
145°
150°
155°
160°
165°
-8000 -7000 -6000 -5000 -4000 -3000 -2000 -1000 0 1000 2000 3000 4000
Topography (m)

The NOMan Project (FY2010-2014)

Progress:

- 3 scientific cruises in 2010, 2011 and 2012
- Observation currently at 10 sites in Area A and 8 sites in Area B
- Preliminary results
- Laboratory experiments on physical properties

Coming soon (in 2 years):

- Replacement (new installation) of BBOBS's and OBEM's in 2013
- Recovery of all instruments in 2014
- Solution to major questions & other results

Future:

- Further hypothesis tests
- Generalization
- Collaborations

Toward glorious tomorrow