



國立中央大學

National Central University

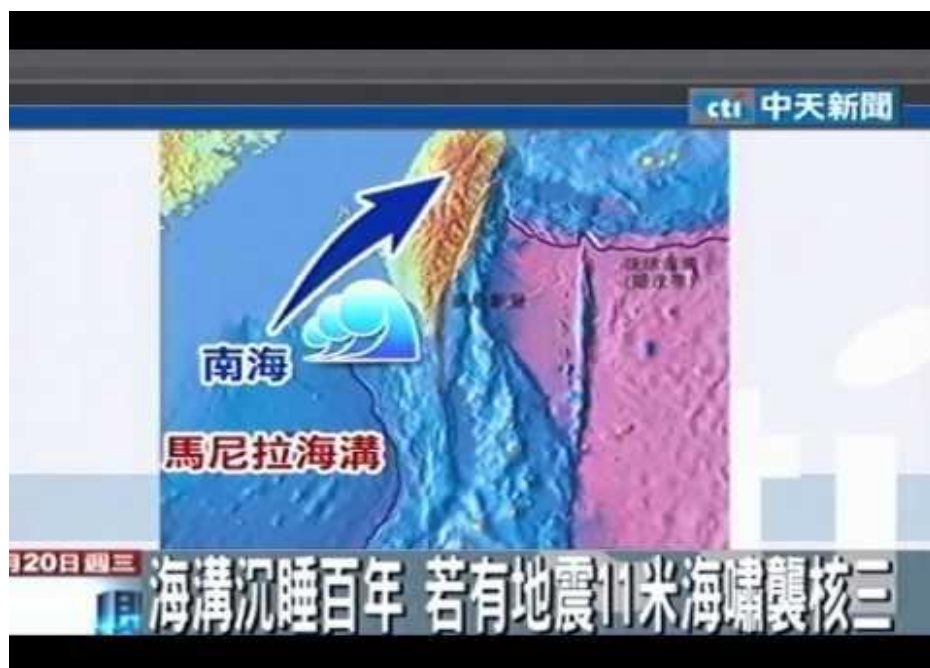
2018/8/29

@ 國家地震工程研究中心

海底地震儀於馬尼拉海溝北段 施測成果介紹

林靜怡、李安、陳彥甫、葉一慶、林義欽、
秦韶晉、梁進維

國立中央大學地球科學系



<https://www.google.com.tw/url?sa=i&source=images&cd=&ved=2ahUKEwjD9rfvvDcAhWDTwKHxwCD4QjRx6BAGBEAU&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D48929N-EQ18&psig=AOvVaw180vapDXybUISs8tsYcPax&ust=1534471708272526>

Wu and Huang (2009)

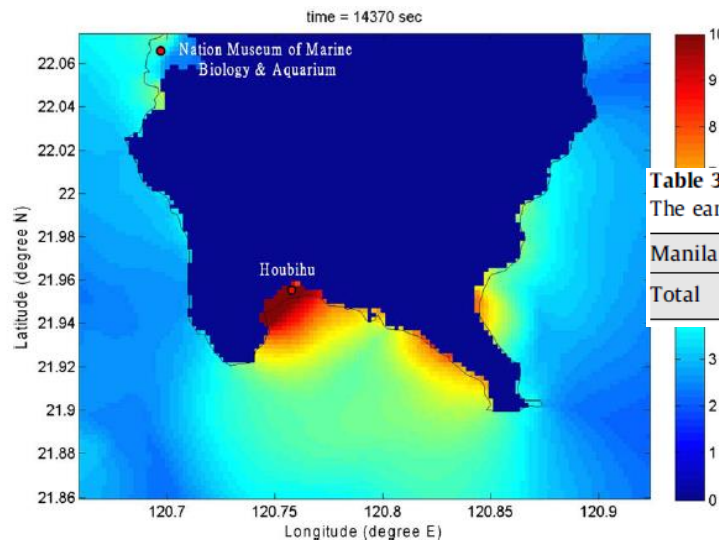


Fig. 6A. Maximum free-surface elevation and inundation area on Grid 3A.

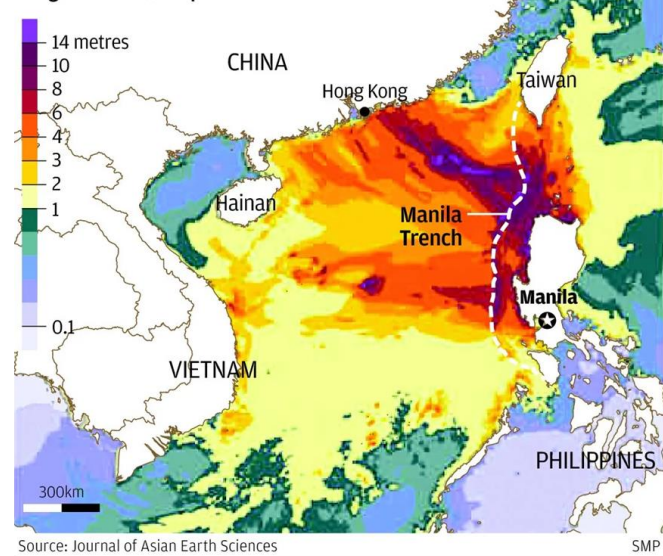
Table 1
Hypothetical fault planes along Manila trench issued by USGS.

Fault	Lon	Lat	Length (km)	Strike	Dip	Rake
E1	120.5	20.2	160	10	10	90
E2	119.8	18.7	180	35	20	90
E3	119.3	17	240	359	28	90
E4	119.2	15.1	170	3	20	90
E5	119.6	13.7	140	320	22	90
E6	120.5	12.9	100	293	26	90

Table 3
The earthquake parameters of Manila fault.

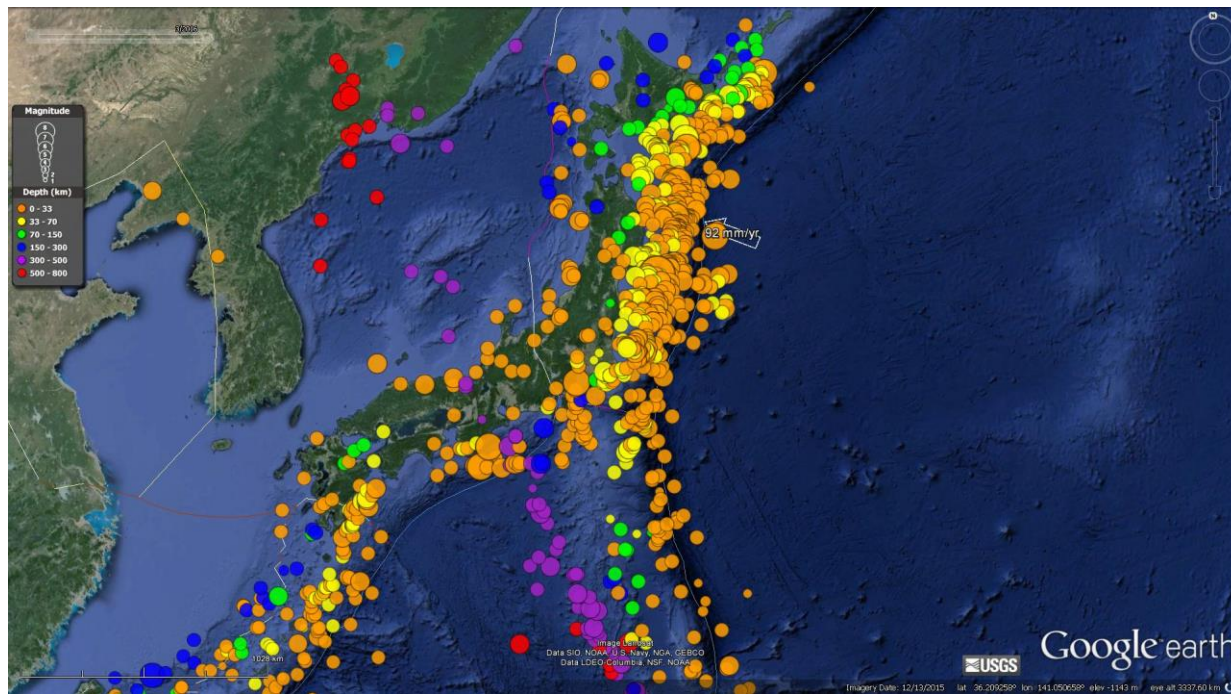
Manila Fault	M_w	Length (km)	Width (km)	Dislocation (m)	Depth (km)
Total	9.35	990	200	20	40

Projected wave heights within 16 hours of a magnitude-9 earthquake in the Manila Trench

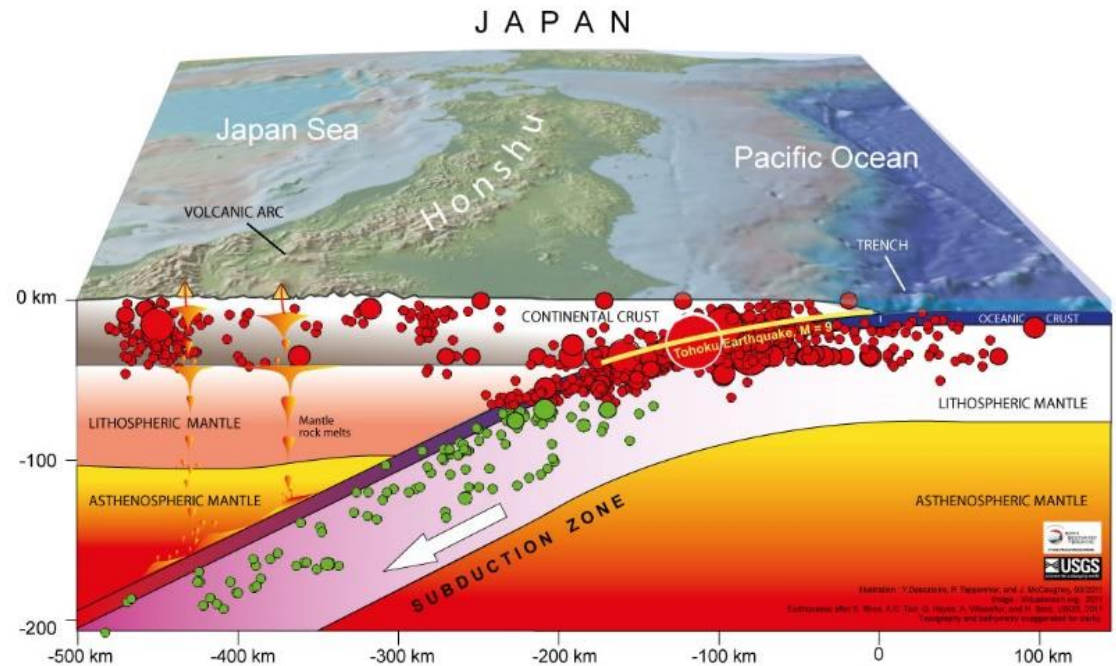


Tsunami propagation scenarios in the South China Sea, Dao et al. (JAES, 2009)

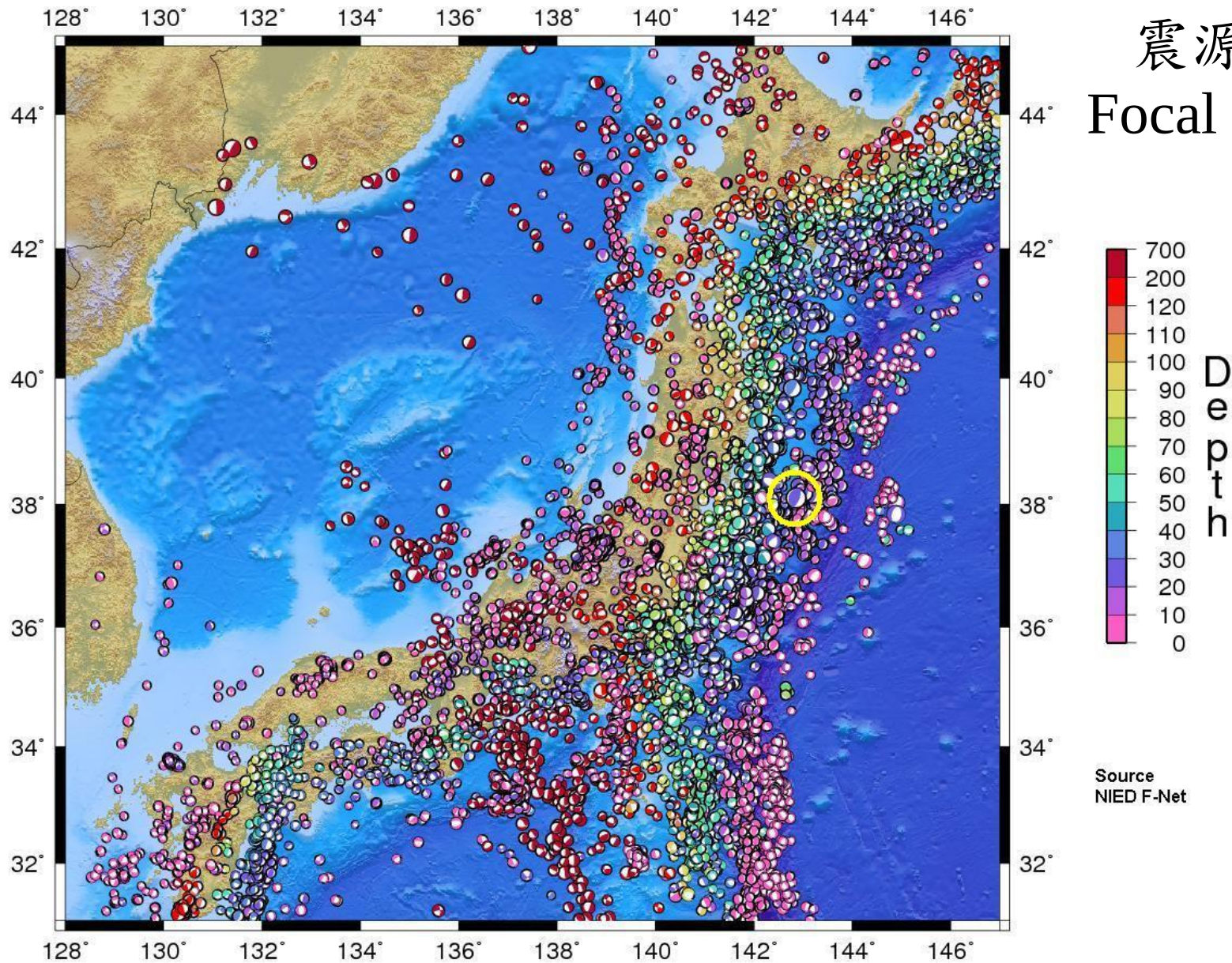
USGS has assessed Manila trench as a high risk zone to be a tsunami source. USGS Tsunami Sources Workshop 2006 (Kirby et al., 2006) further indentified six hypothetical fault planes based on the trench azimuth and the fault geometries



<https://www.earthobservatory.sg/news/great-east-japan-tohoku-2011-earthquake-important-lessons-old-dirt>



震源機制解 Focal mechanism



http://www.geophysics.geol.uoa.gr/imageseis/eqs/2011/Mw9_Tohoku_Honshu_Japan_Earthquake.htm

震源機制解 Focal mechanism

<https://earthquake.usgs.gov/learn/topics/beachball.php>

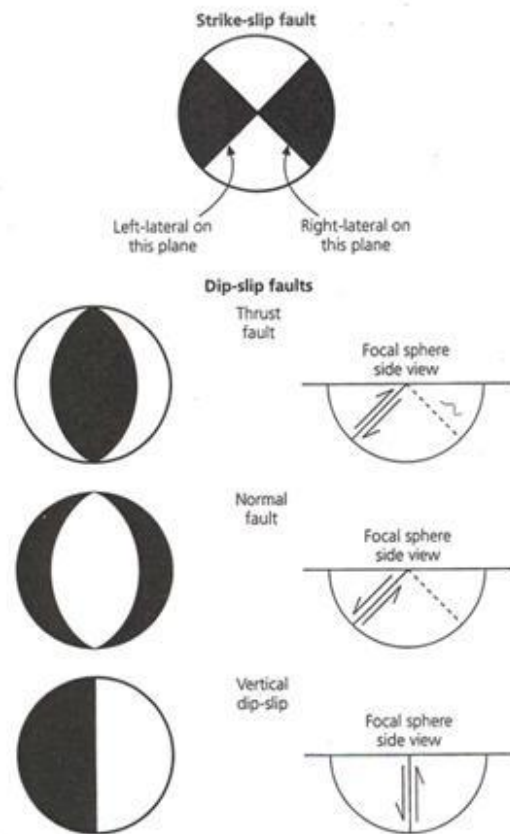
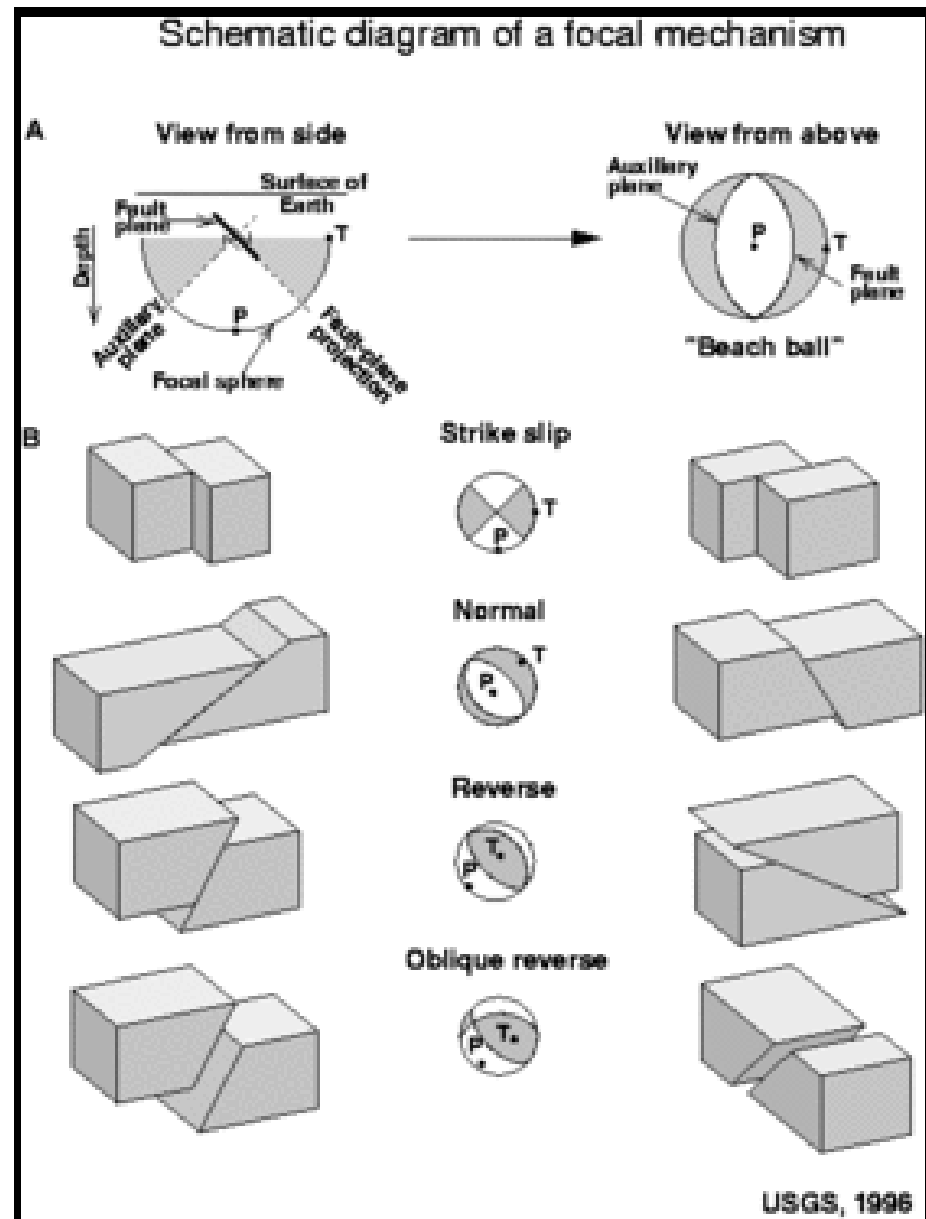
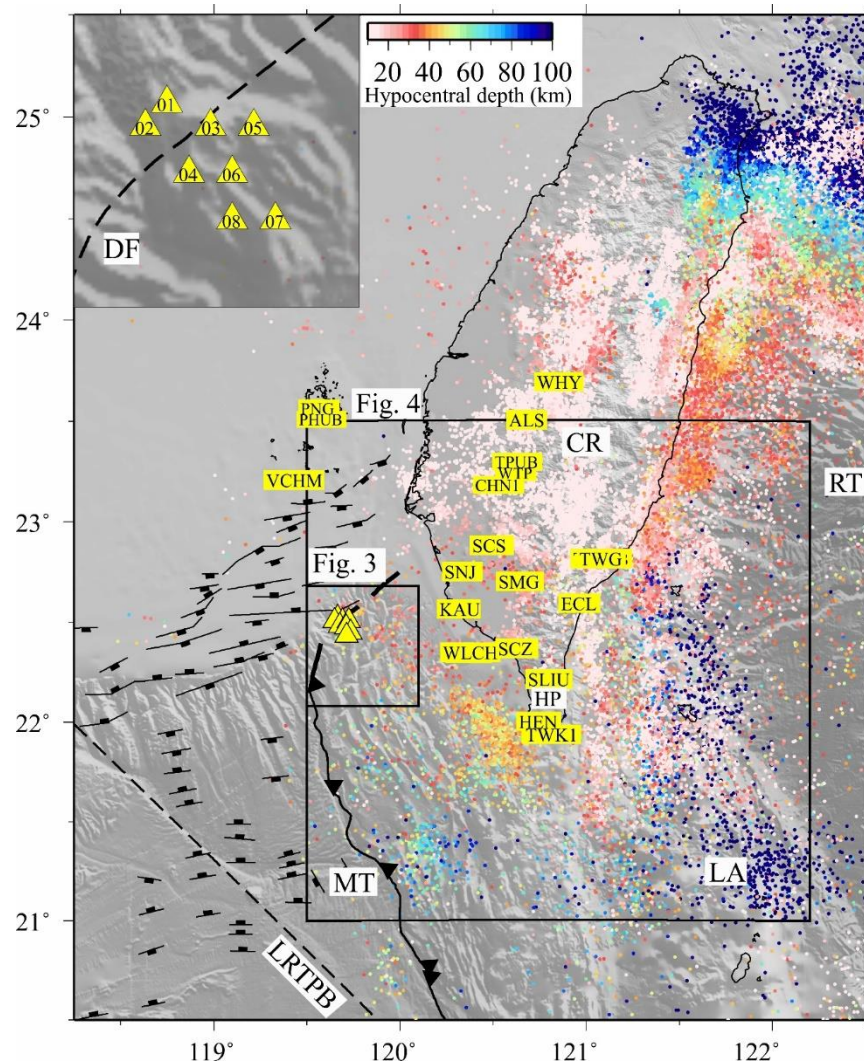


Fig. 4.2-14 Focal mechanisms for earthquakes with various fault geometries. Compressional quadrants are black. The strike-slip mechanism is for pure strike-slip motion on a vertical fault plane, which could be oriented either NE-SW or NW-SE. The pure dip-slip mechanisms are for faults striking N-S.

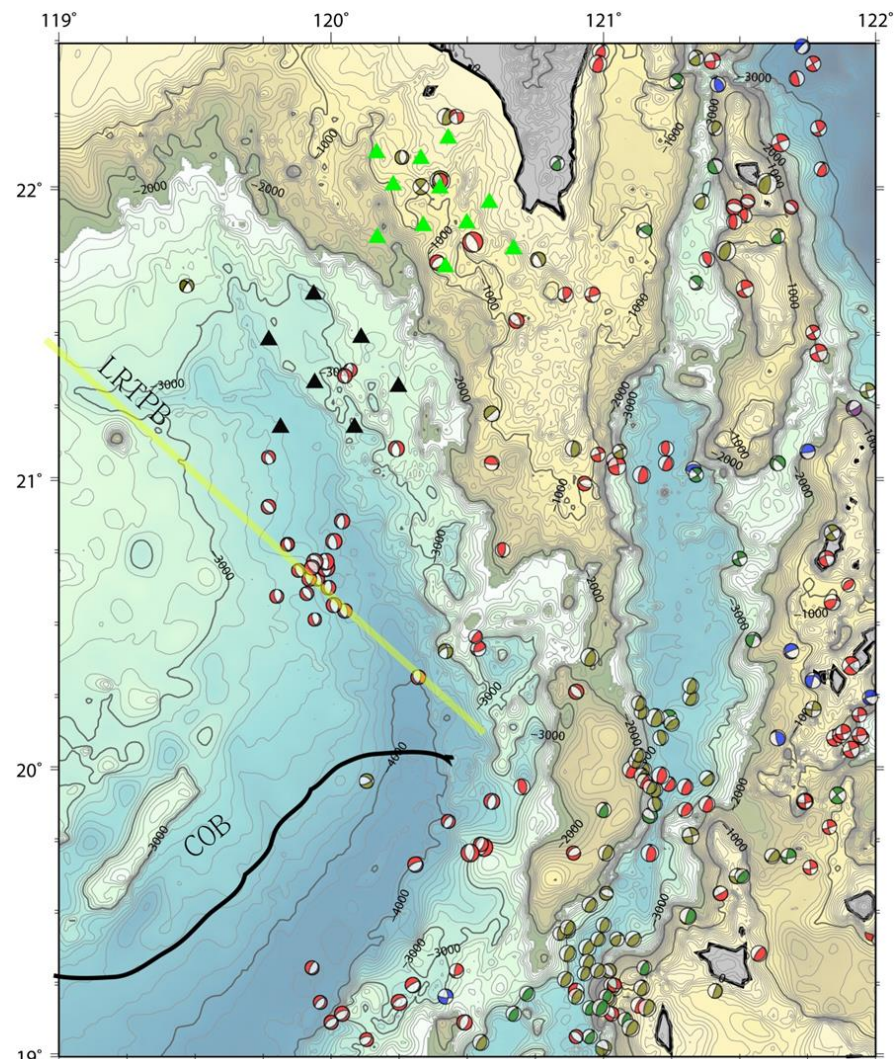


http://web.ics.purdue.edu/~nowack/geos557/lecture17-dir/lecture17_files/image059.jpg

1990~2014



Wu et al. (2009)



GCMT



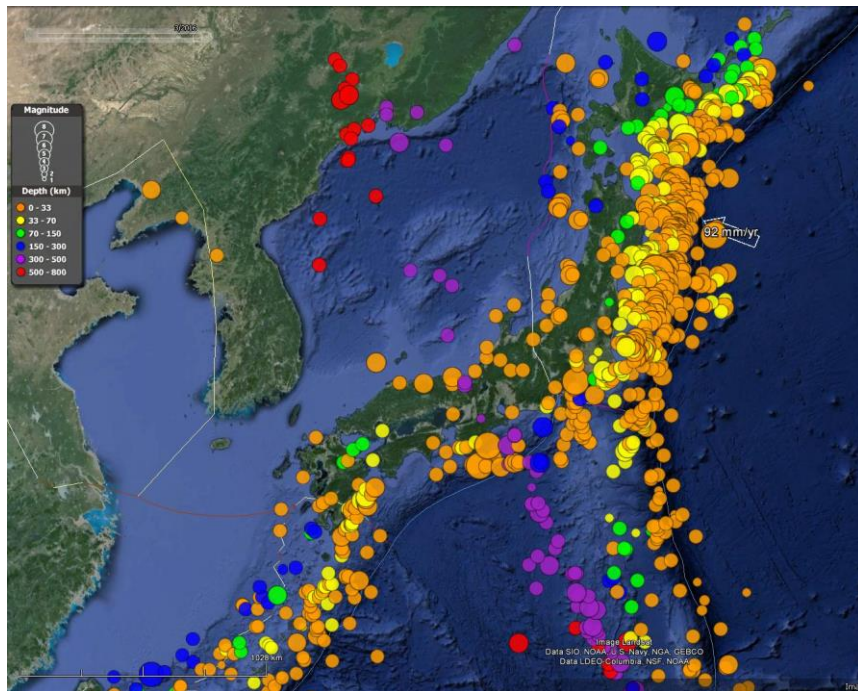


Table 1
Hypothetical fault planes along Manila trench issued by USGS.

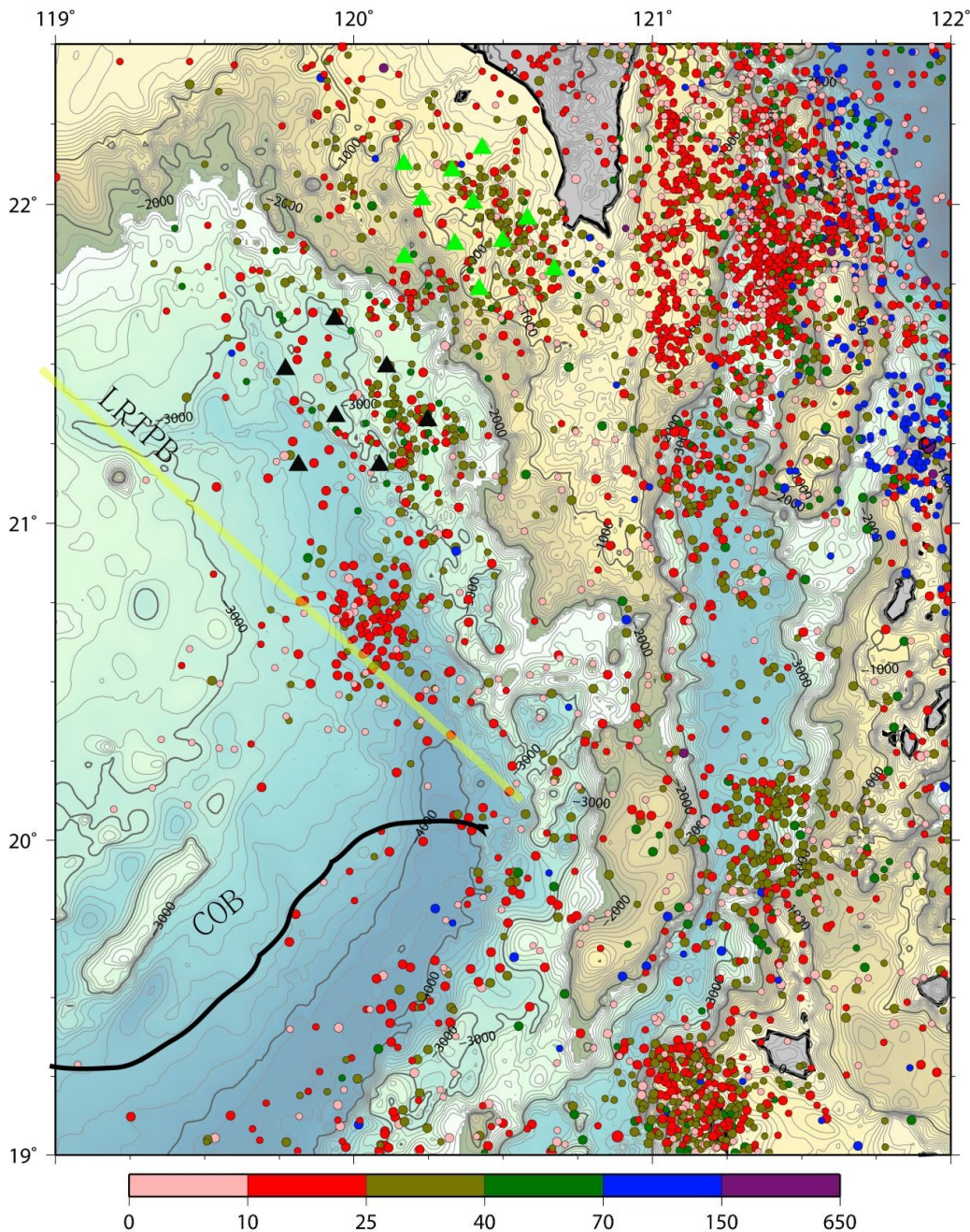
Fault	Lon	Lat	Length (km)	Strike	Dip	Rate
E1	120.5	20.2	160	10	10	90
E2	119.8	18.7	180	35	20	90
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Manila Fault	M_w	Length (km)	Width (km)	Dislocation (m)	Depth (km)
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Fig. 1A. Fault distribution along Manila trench (Map provided by USGS).

International seismological center (ISC)



OBS 海底地震儀 (Ocean Bottom Seismometer)

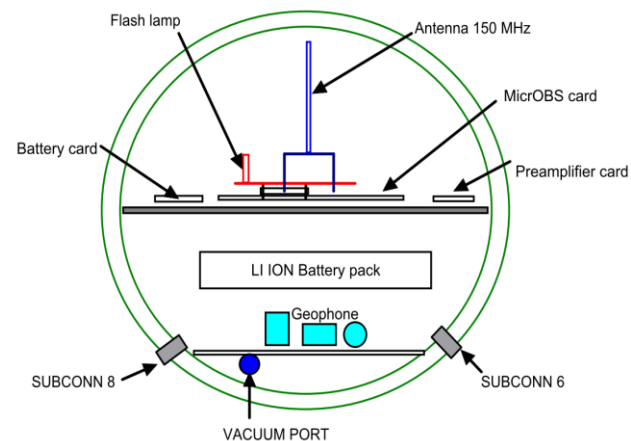


水中受波器

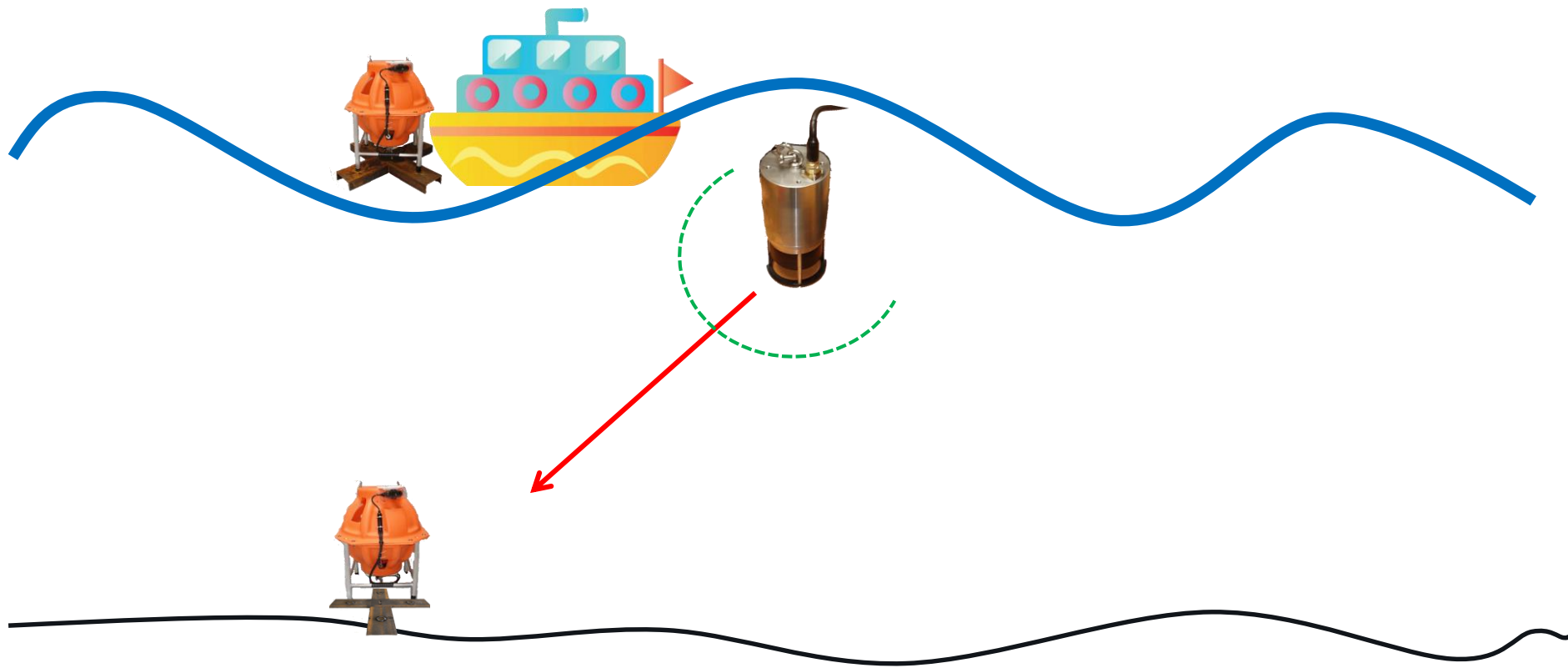
主體
36kg
真空玻璃球

重錘
28kg

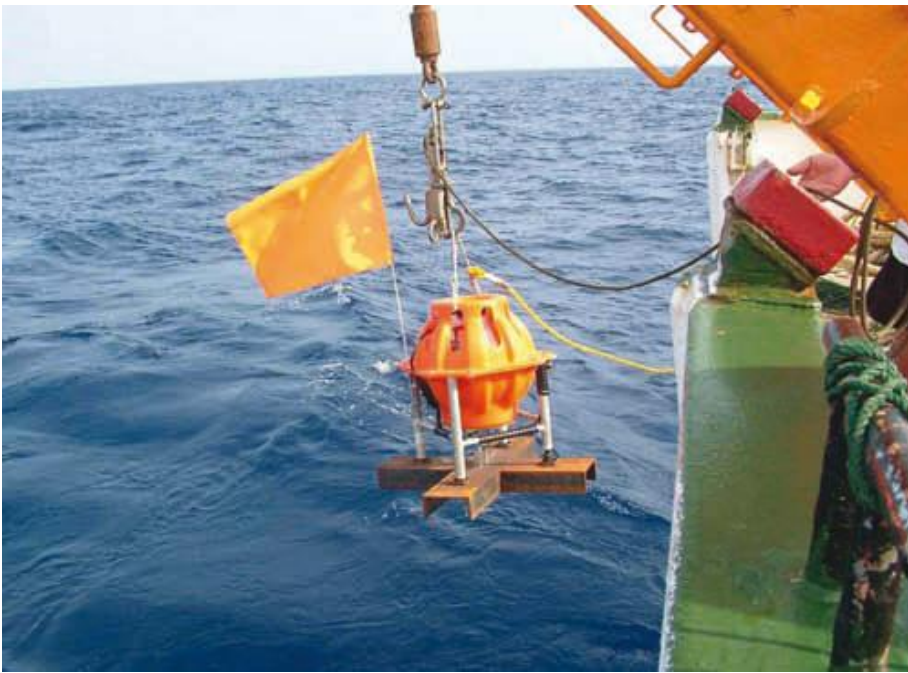
內部介紹

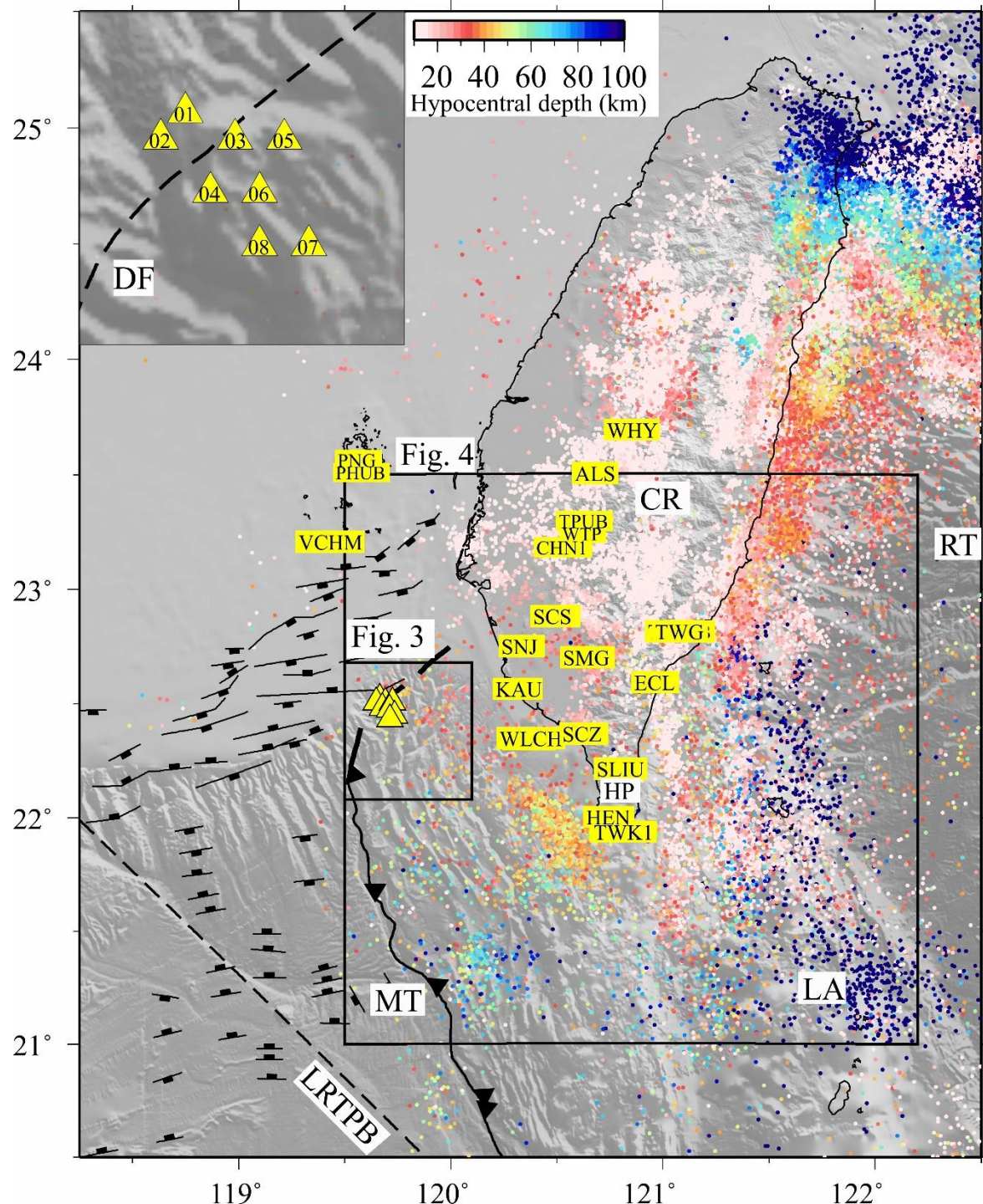


OBS簡介

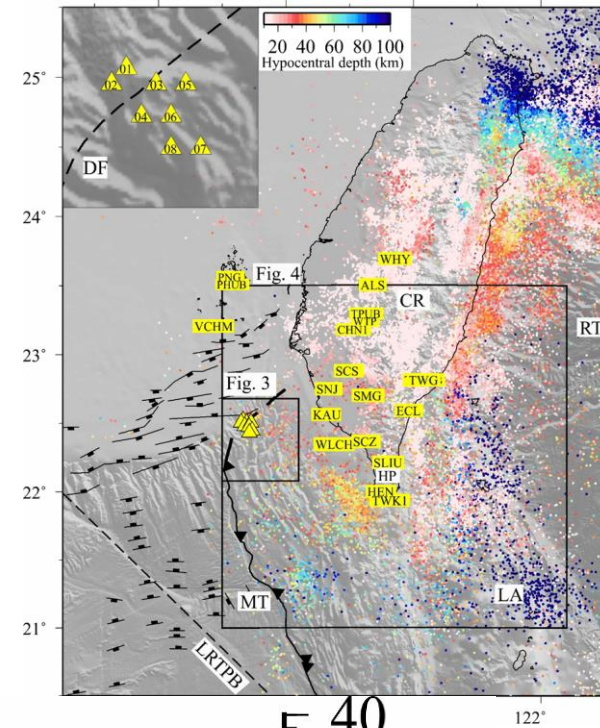
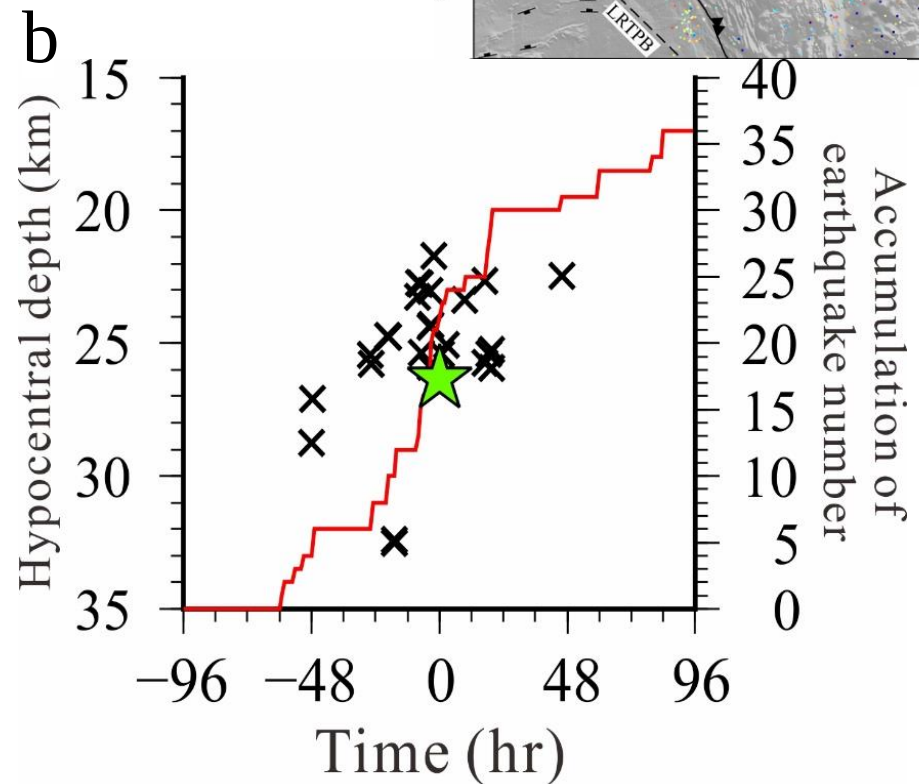
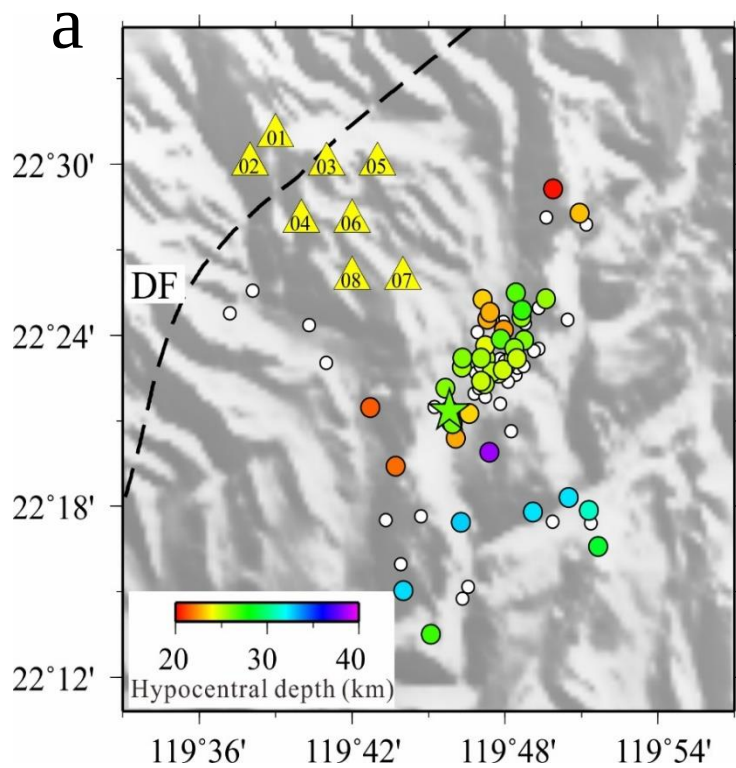


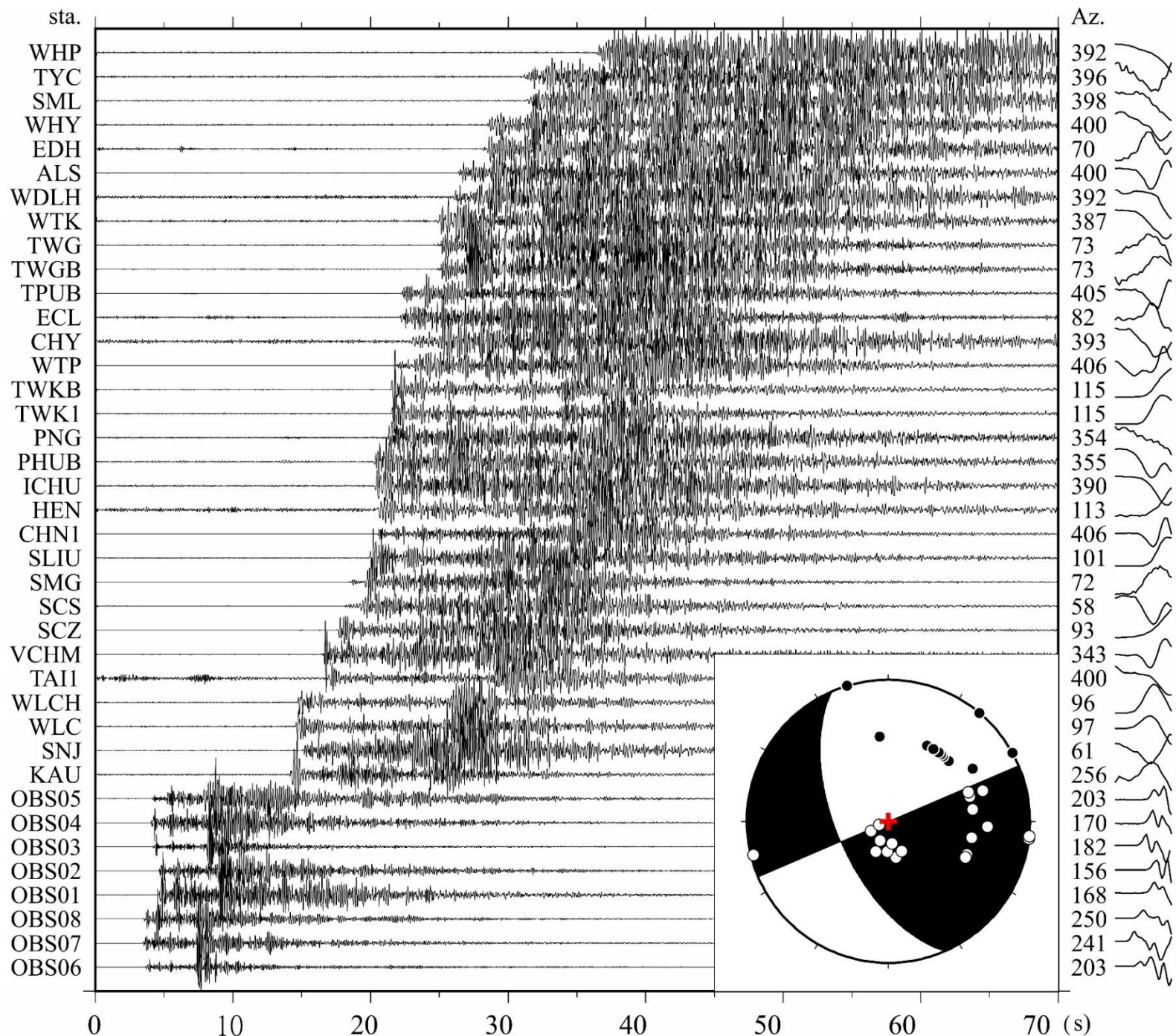
台灣東部外海 2009

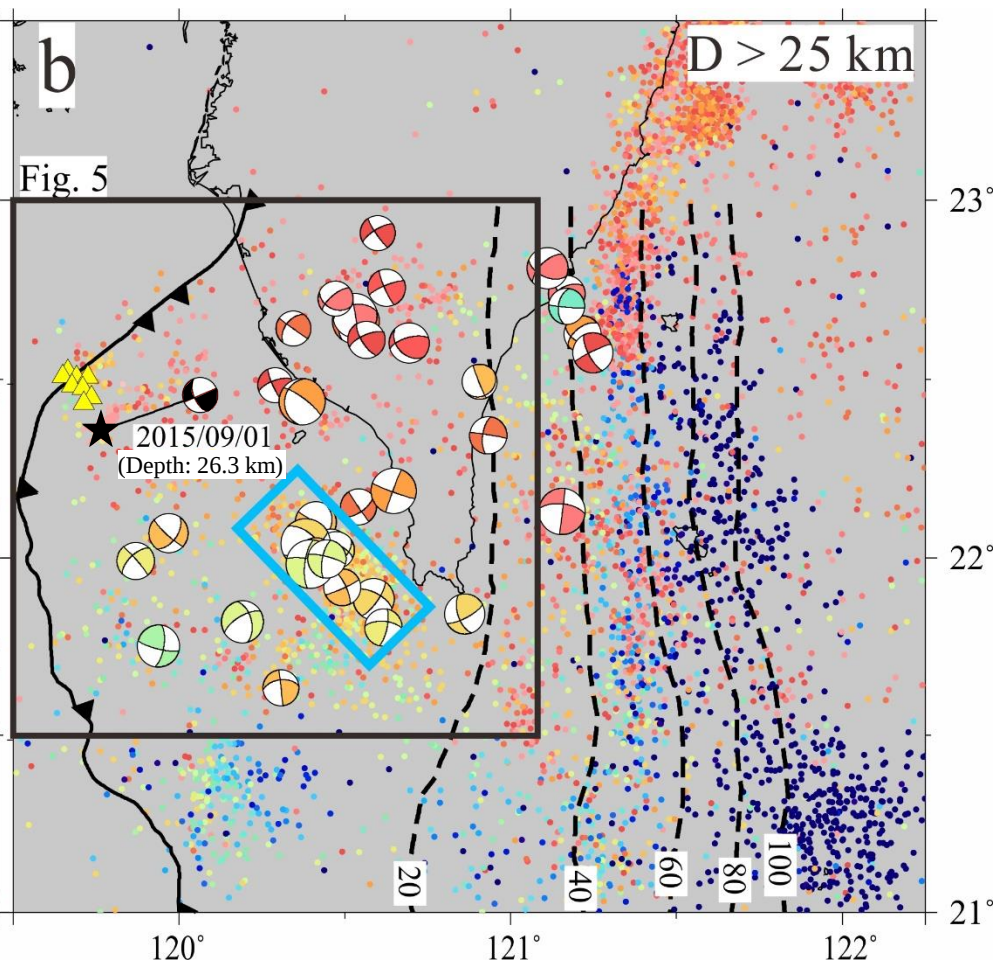
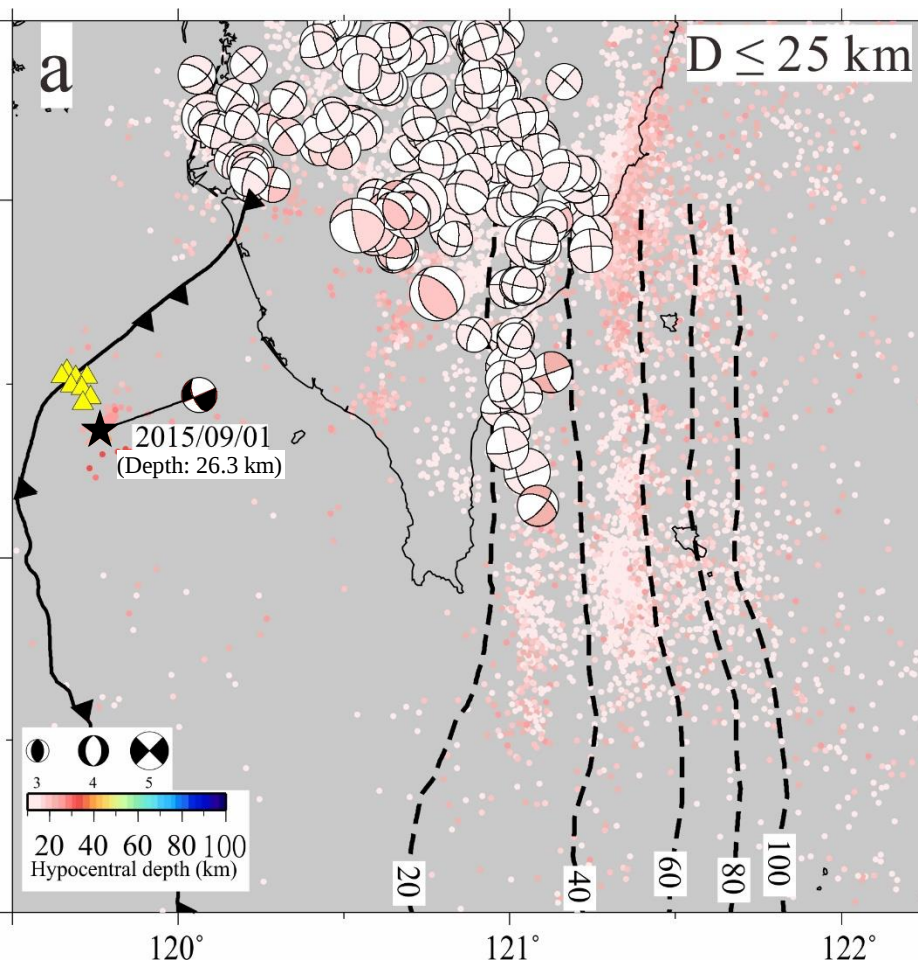


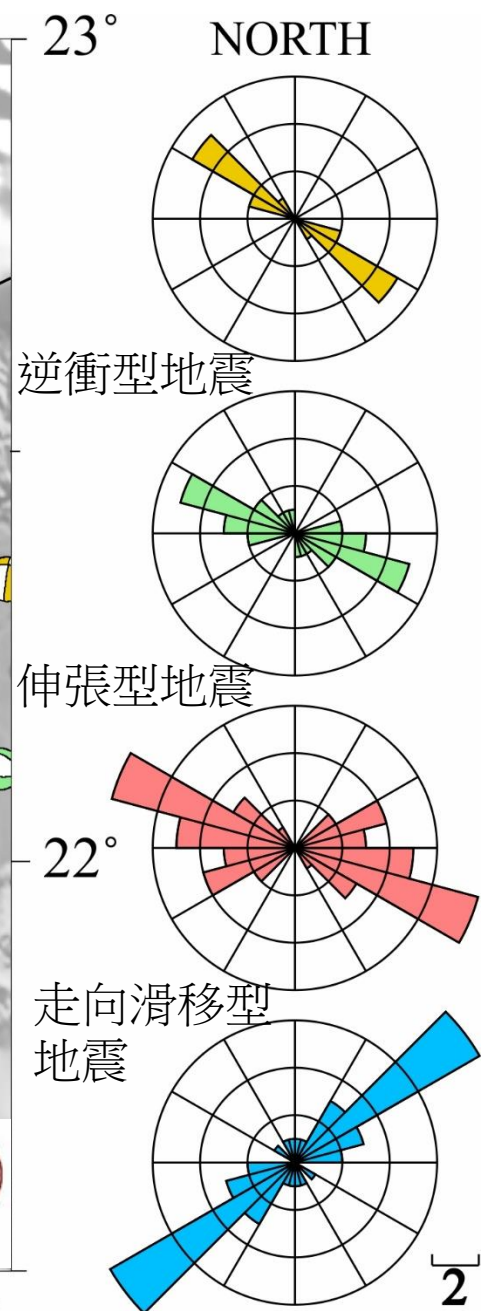
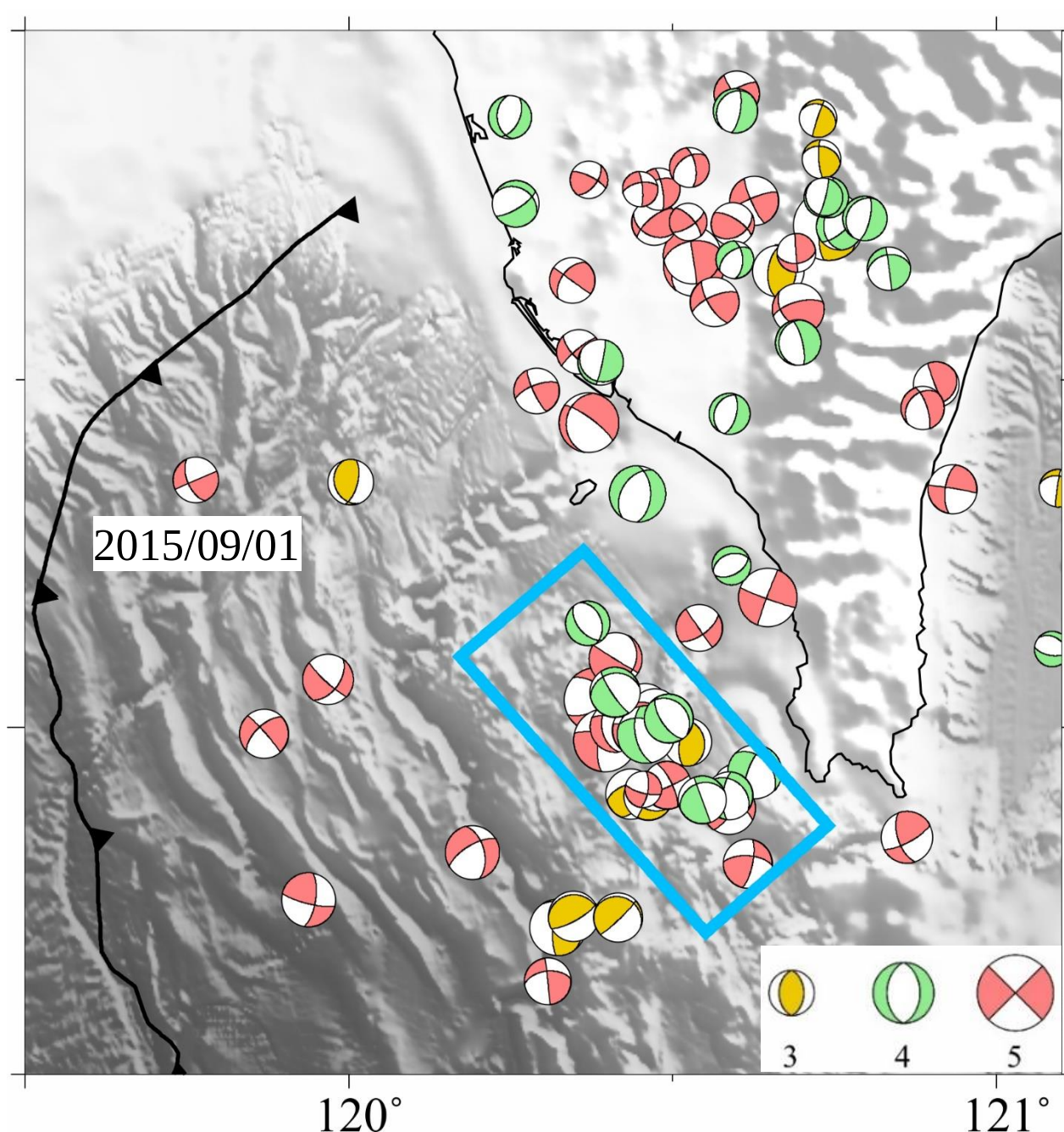


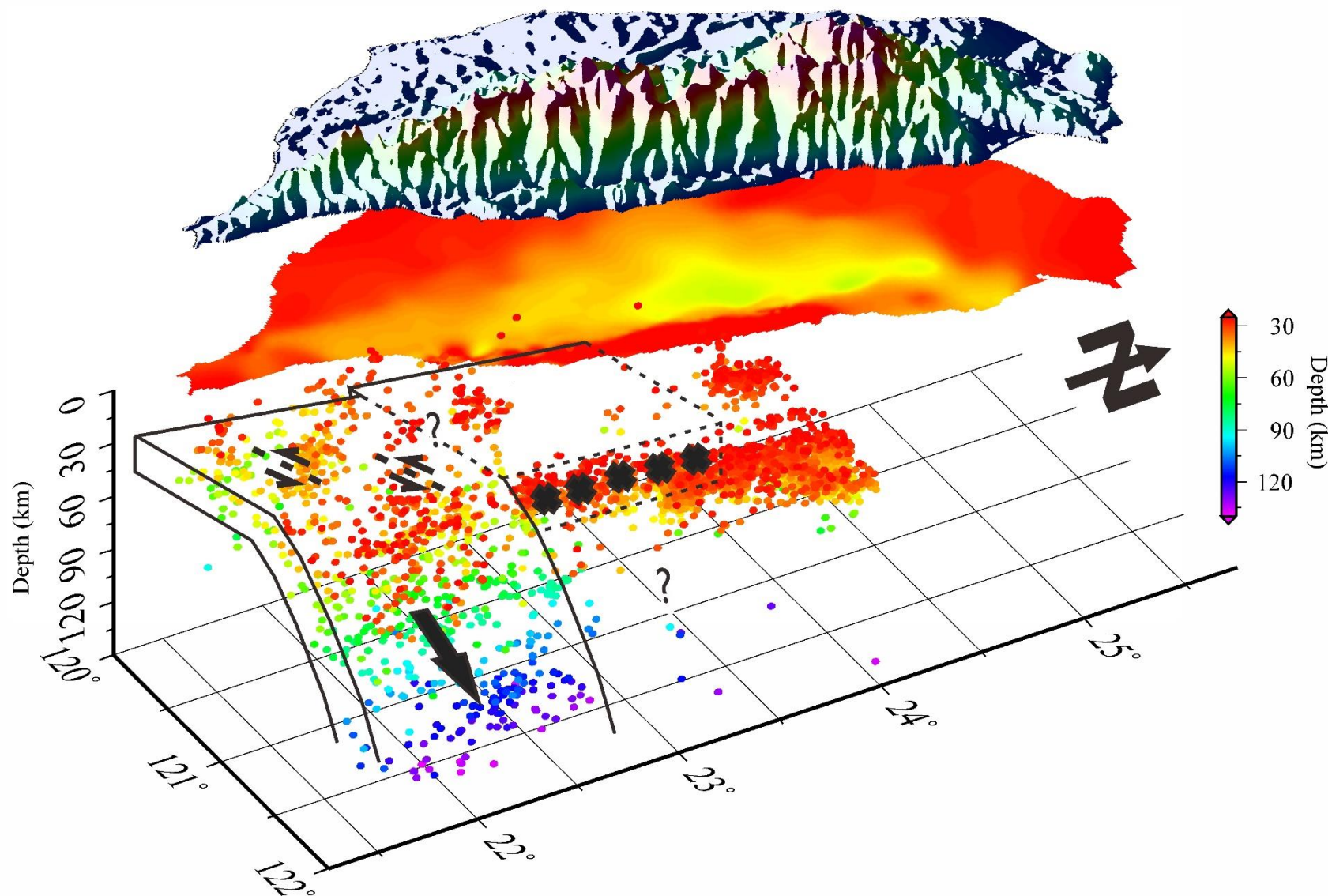
2015 M_L 4.1 earthquake





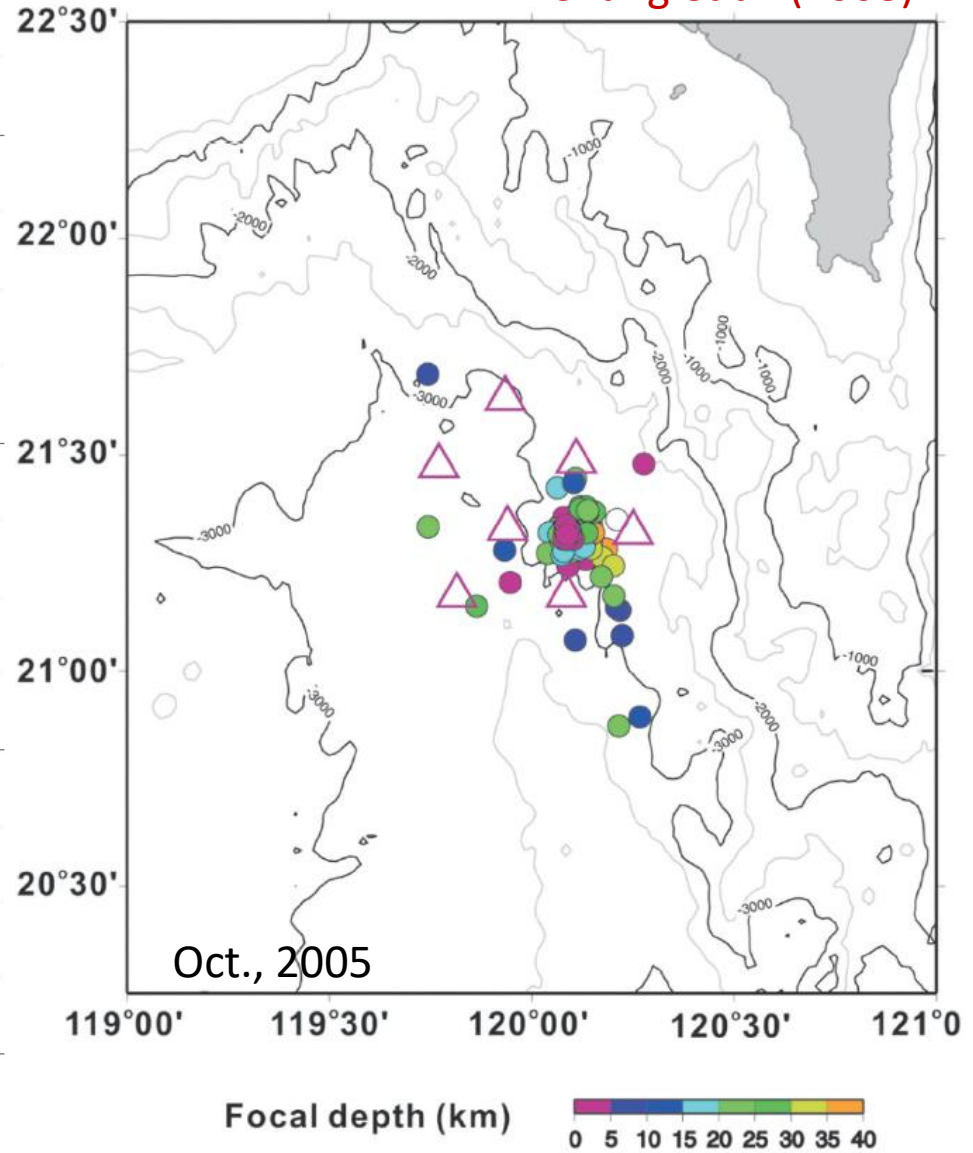
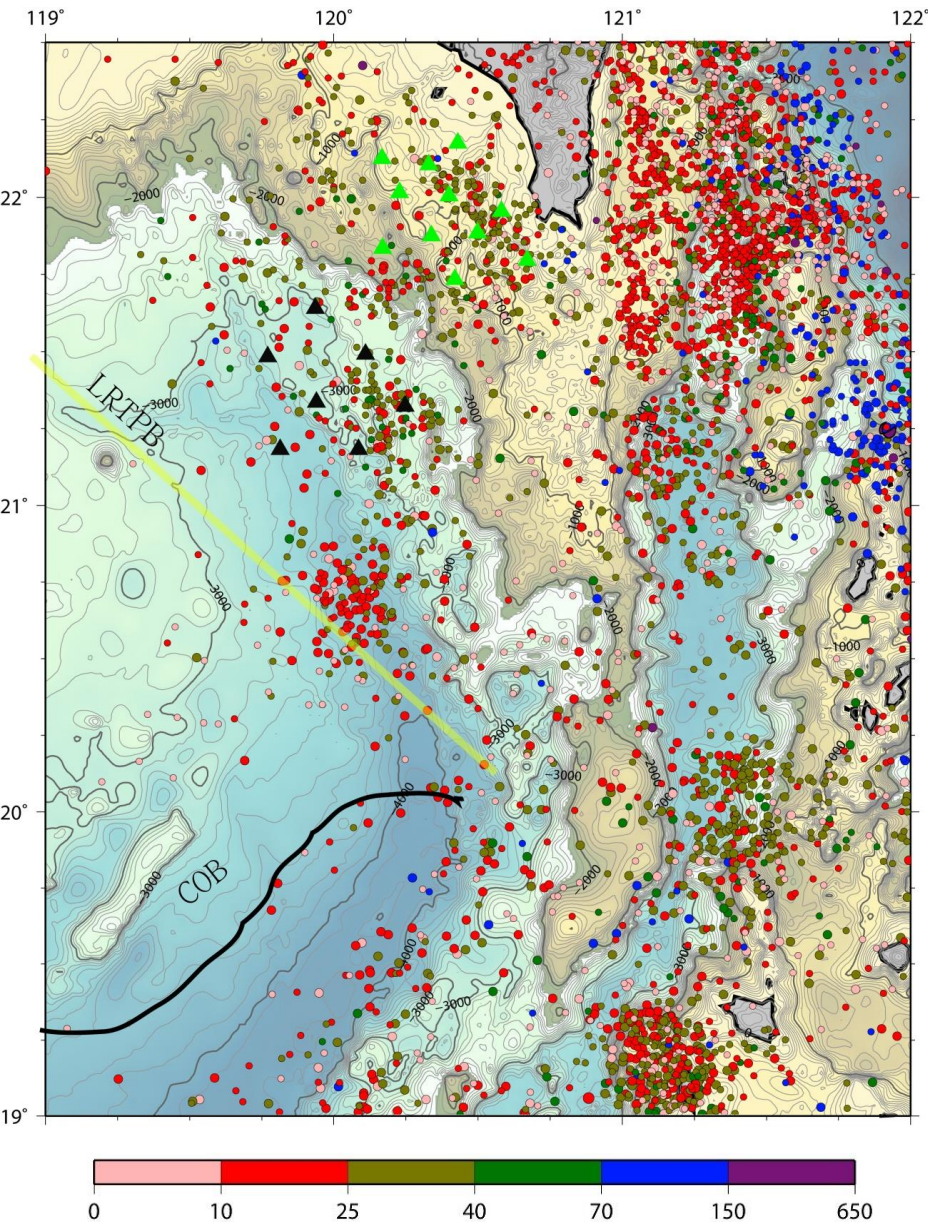




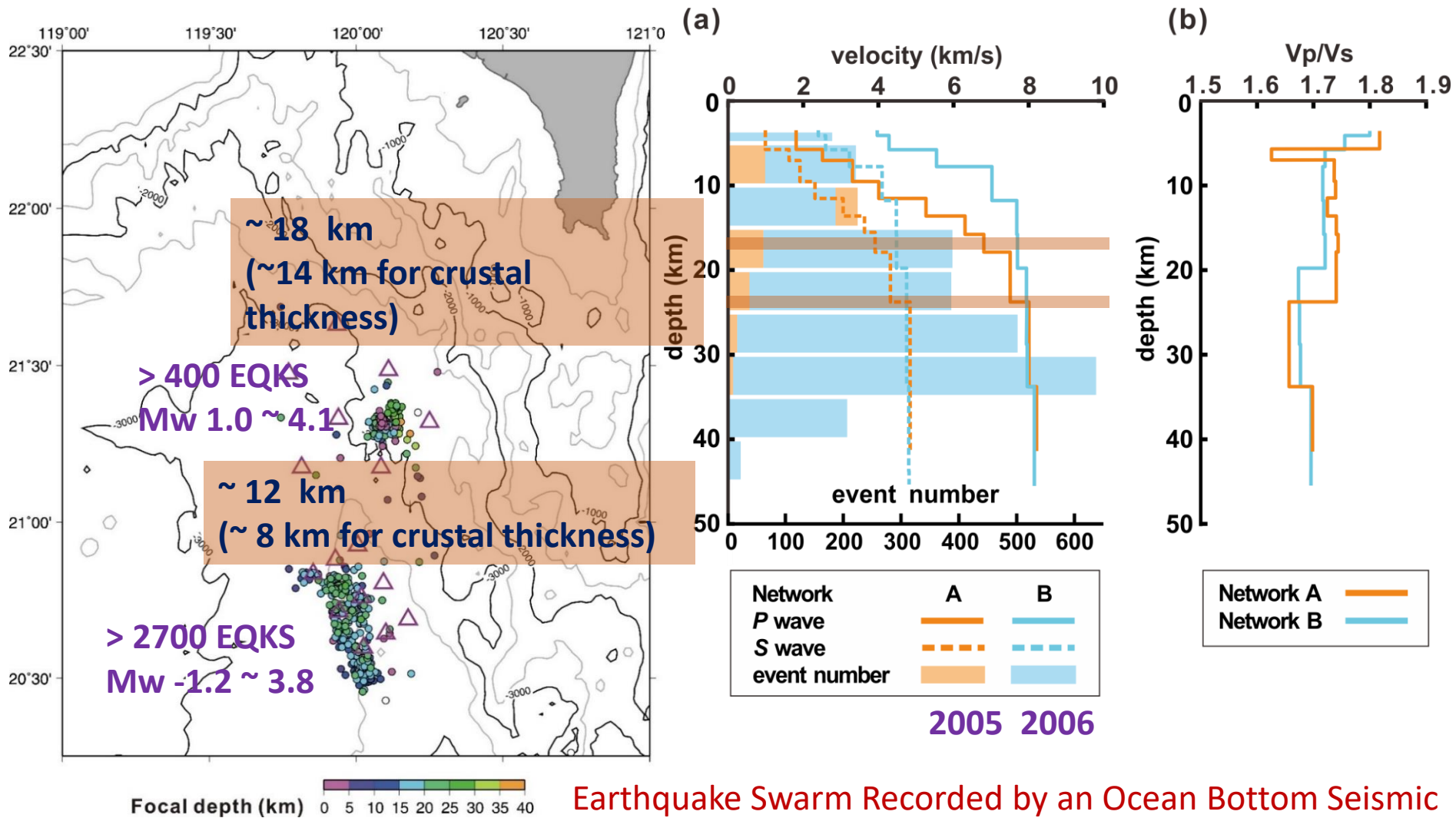


Earthquake Swarm Recorded by an Ocean Bottom Seismic Array in Southwest Offshore of Taiwan in October, 2005

Chang et al. (2008)



Resultant hypocenters and layered velocity model



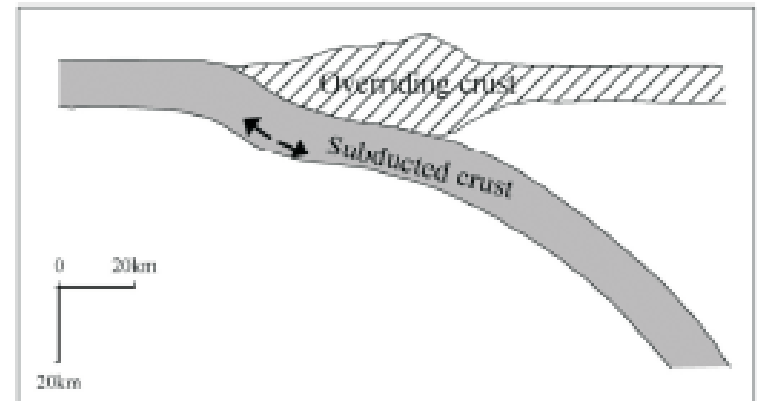
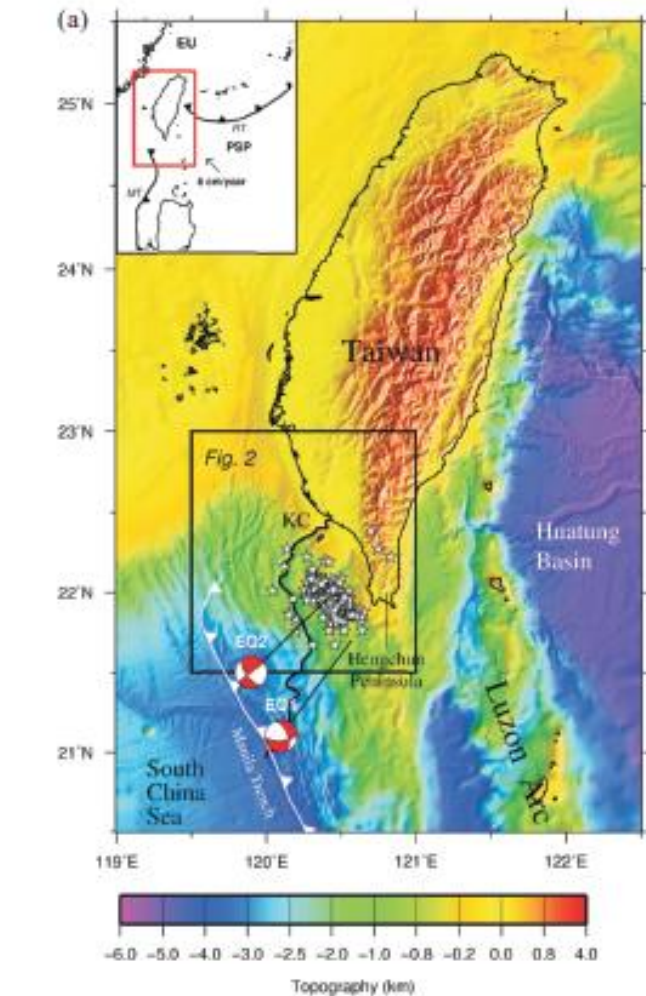
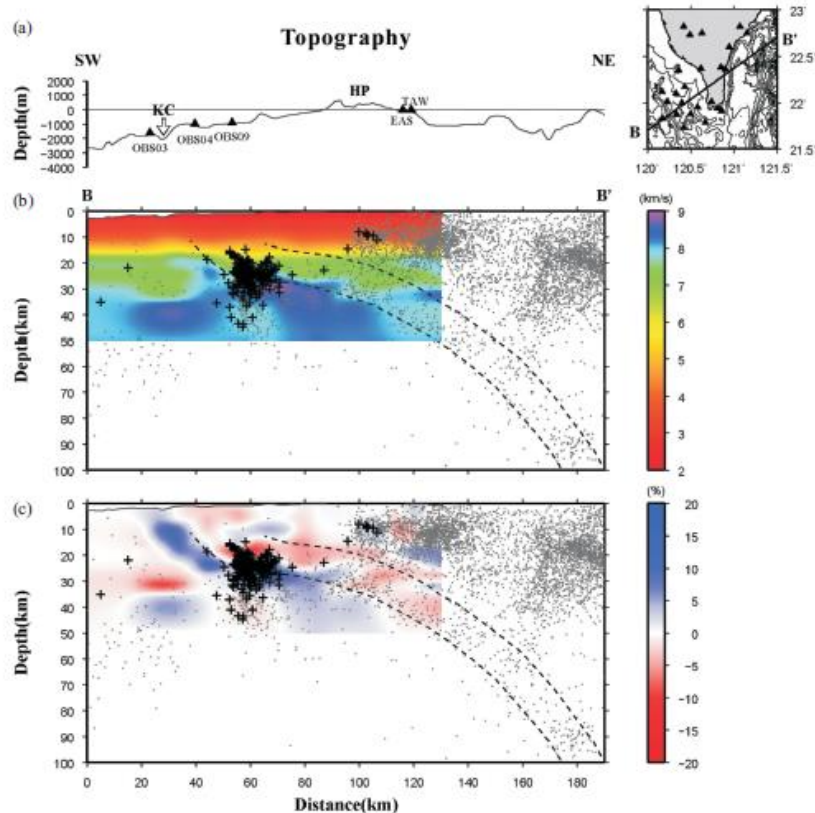
Earthquake Swarm Recorded by an Ocean Bottom Seismic Array in Southwest Offshore of Taiwan in October, 2005
Chang et al. (2008)

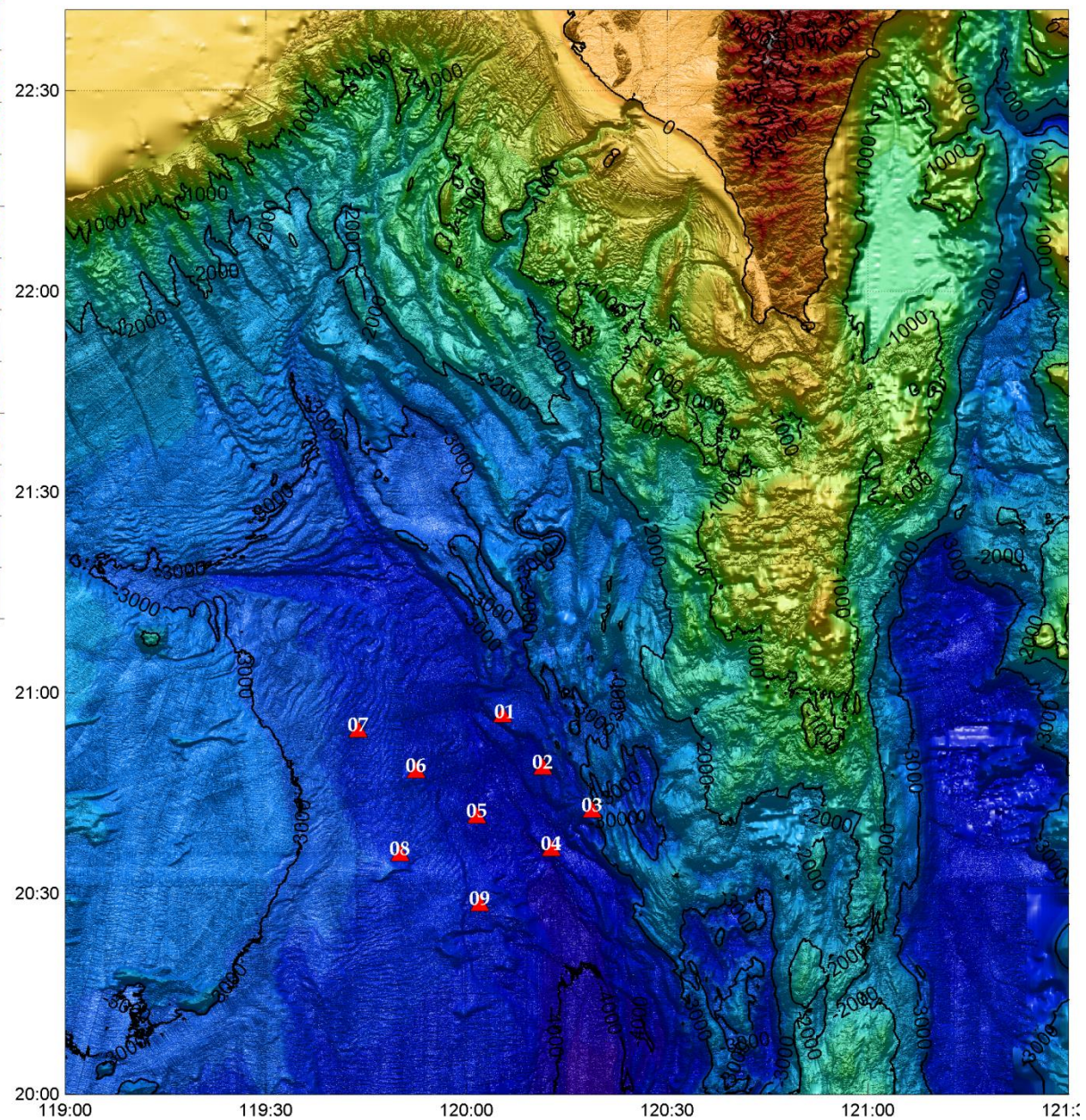
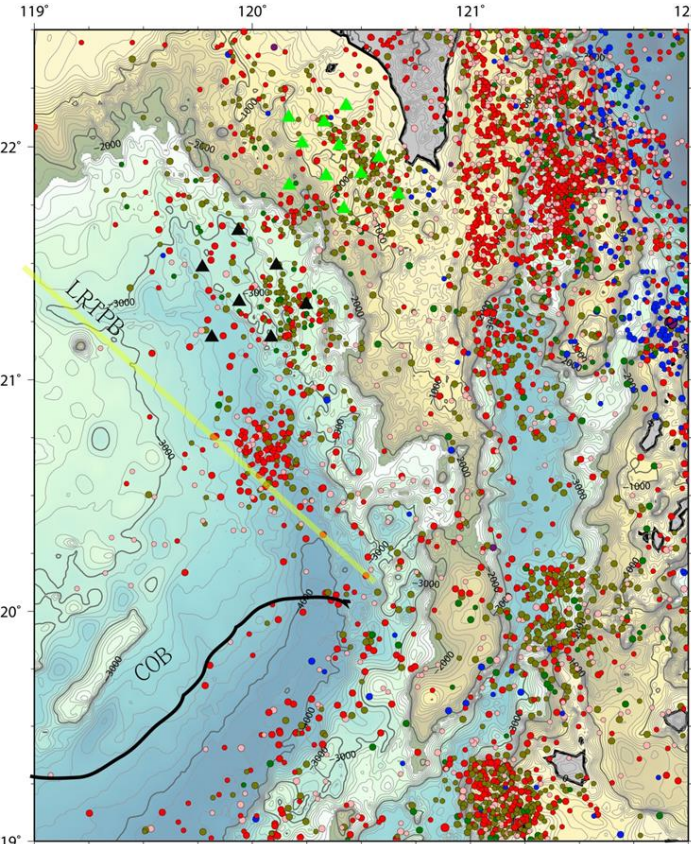
Pingtung earthquake Mw 7.0

2006/12/26

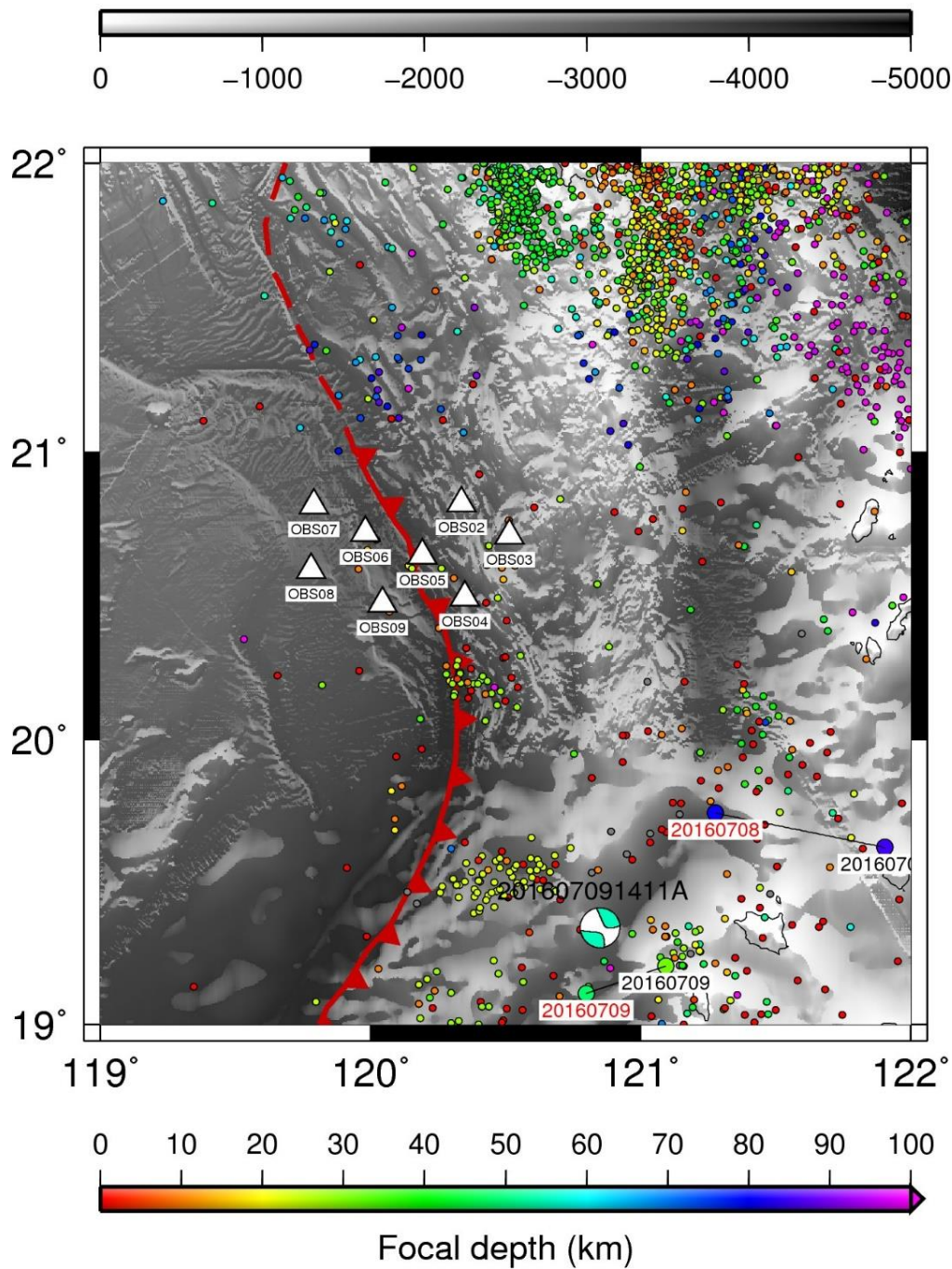
Seismic Tomography off SW Taiwan: A Joint Inversion from OBS and Onshore Data of 2006 Pingtung Aftershocks

Liao et al. 2008





Bathymetry (m)



ISC2 earthquake events &
Focal mechanism from
GCMT

ISC2

Research condition :

period :

2014.01.01~2018.01.01

area : 19N~22N

119E~122E

GCMT

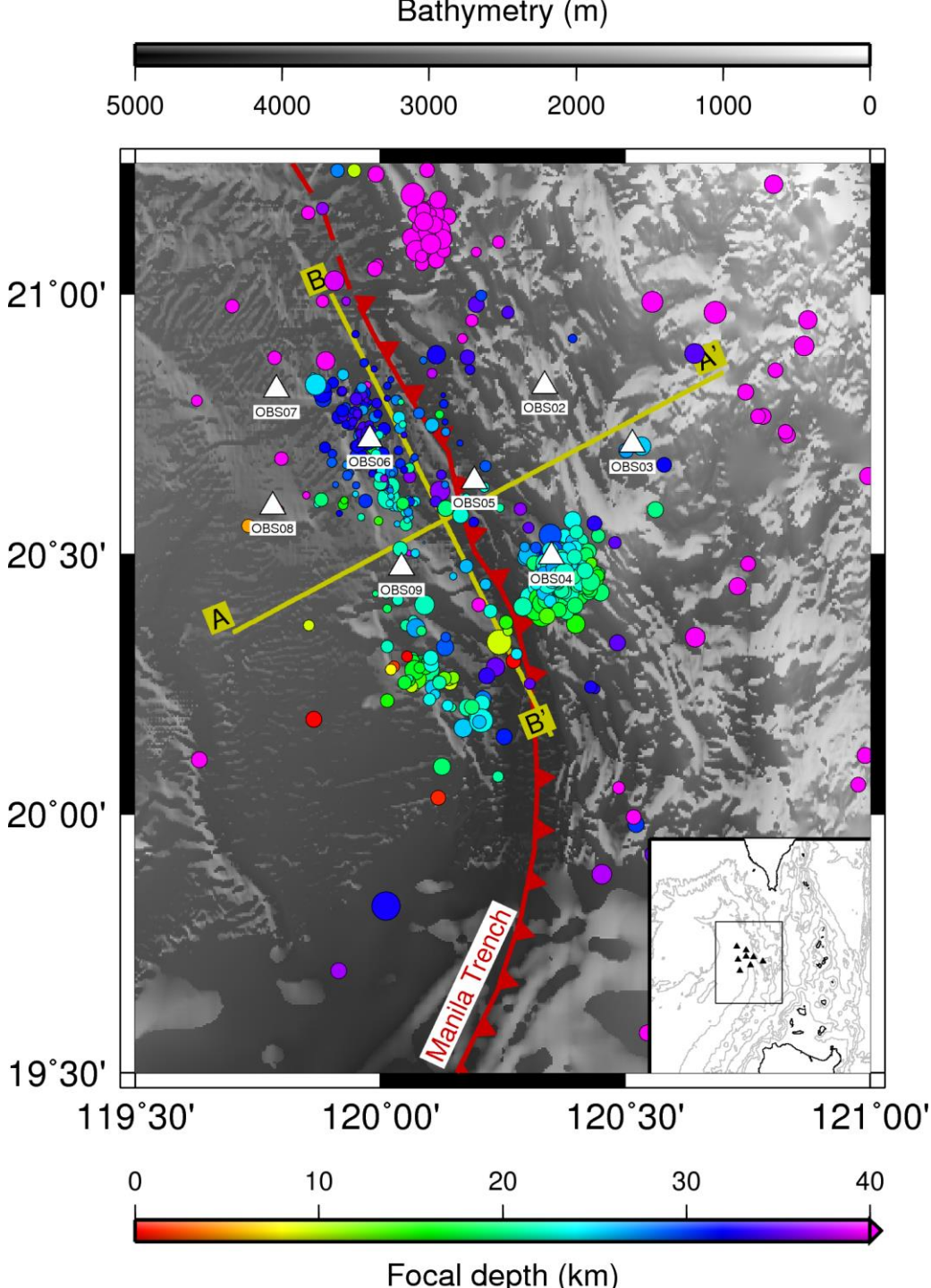
Research condition :

period :

2016.06.22~2016.07.13

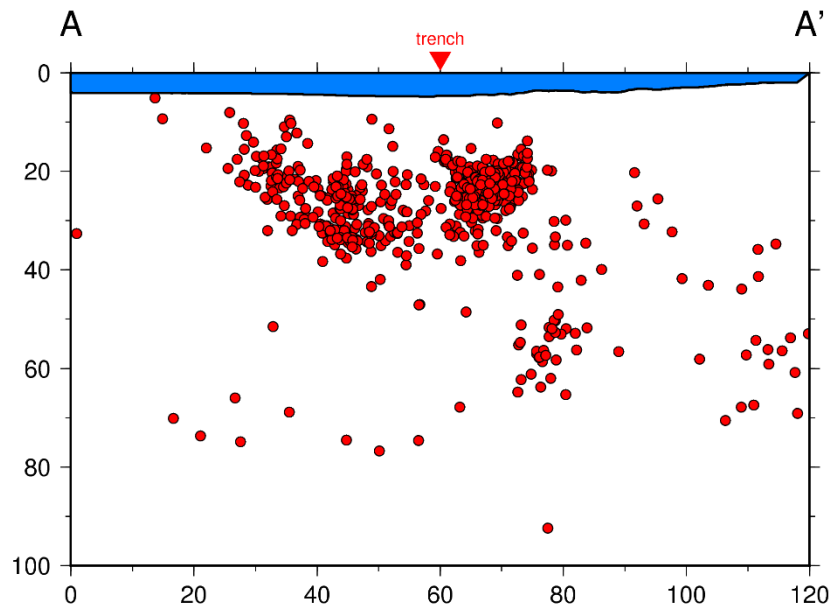
area : 19N~21N

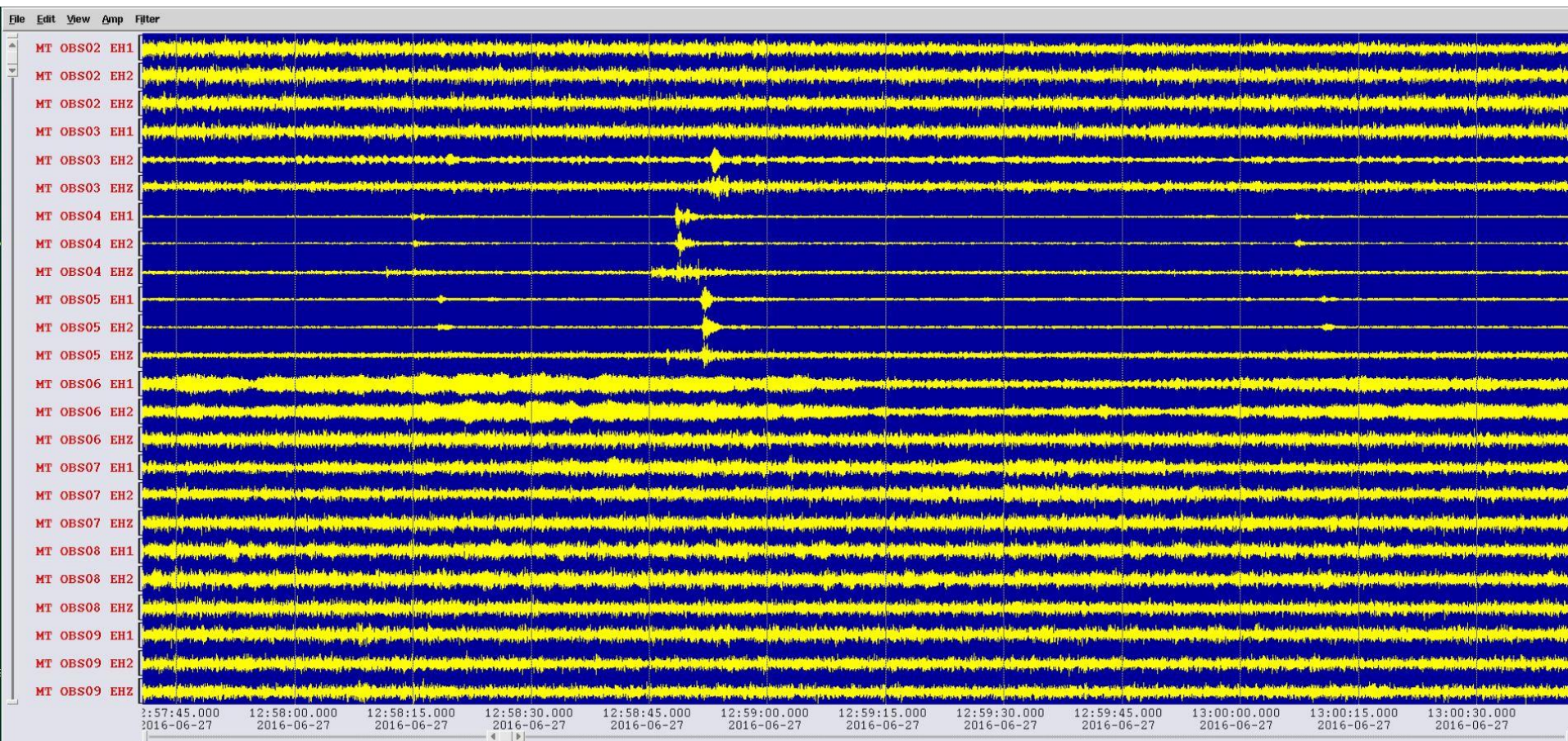
119E~121E

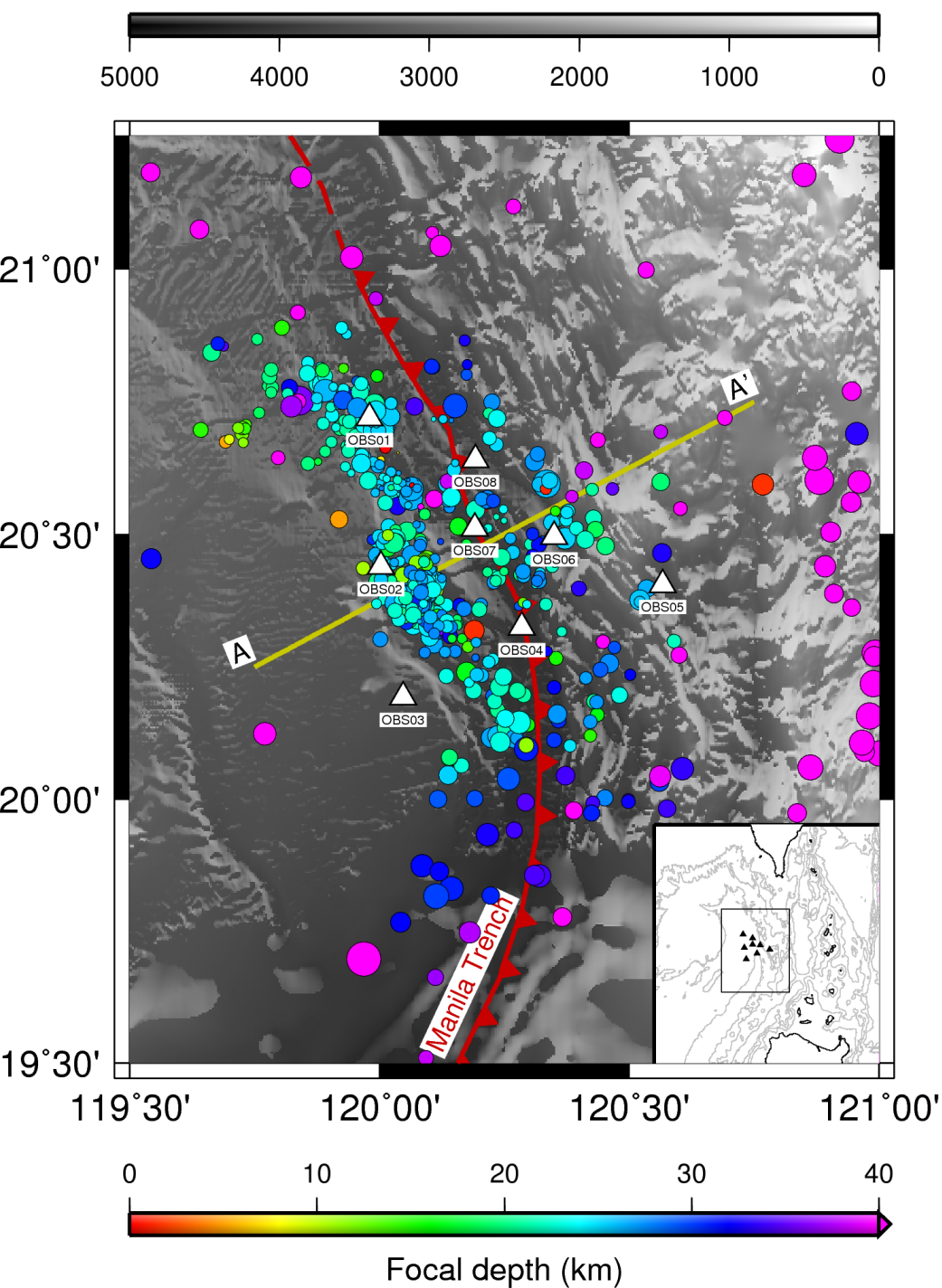


Initial Located Events in MT

- Data set : OR3-1940
- OBSs : 8
- period : 2016.6.22 5:00am to 2016.7.13 12:00am (total 22 days)
- events : 732

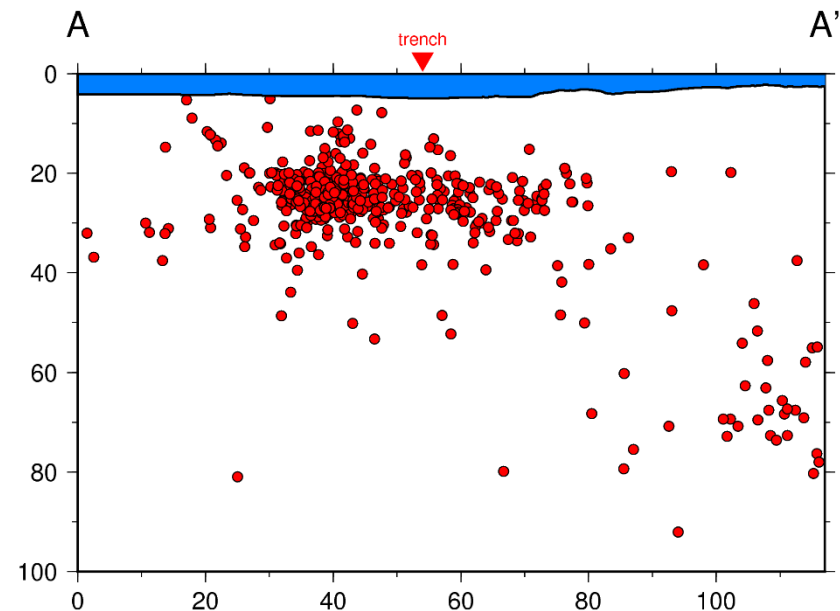


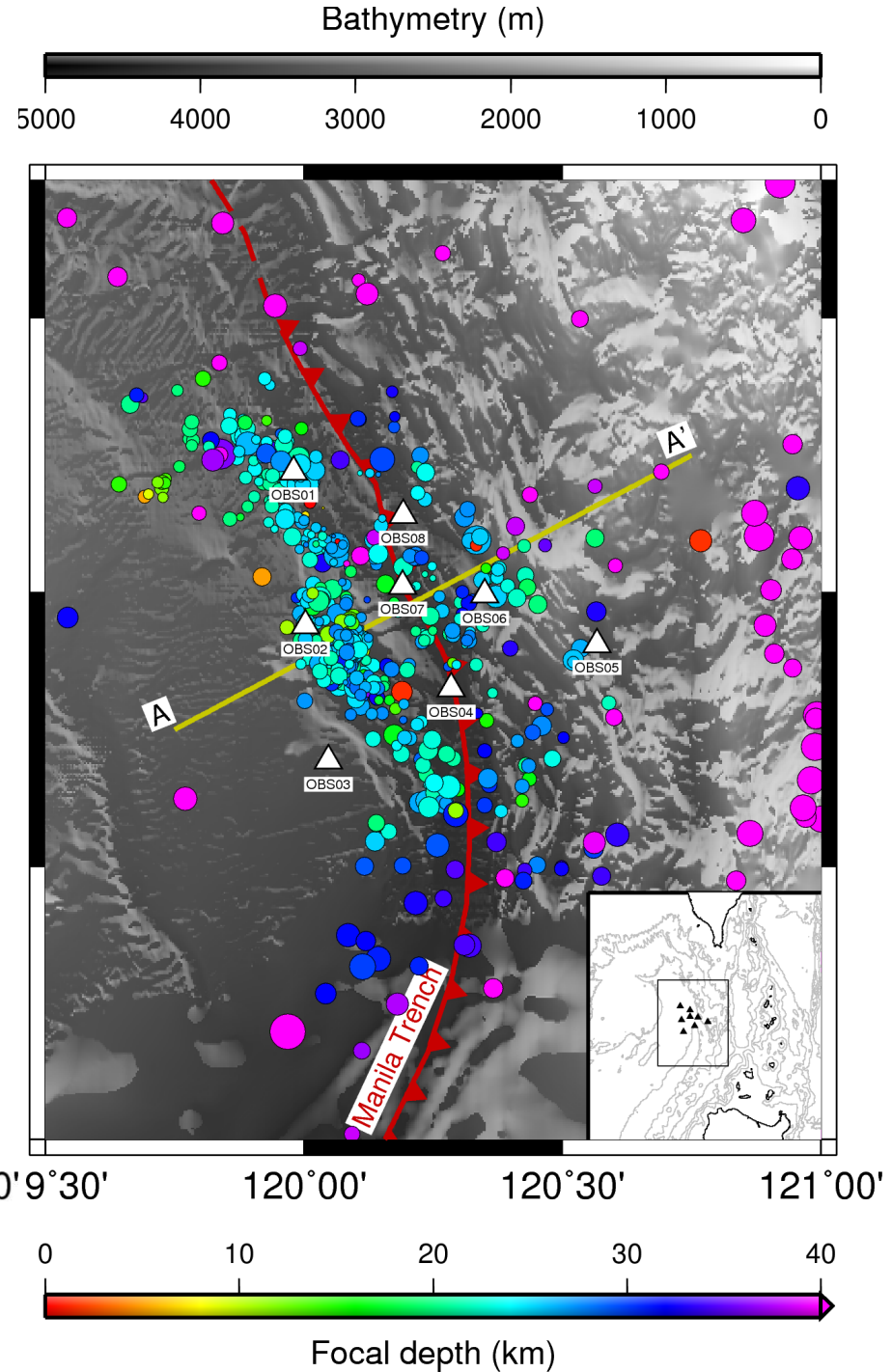
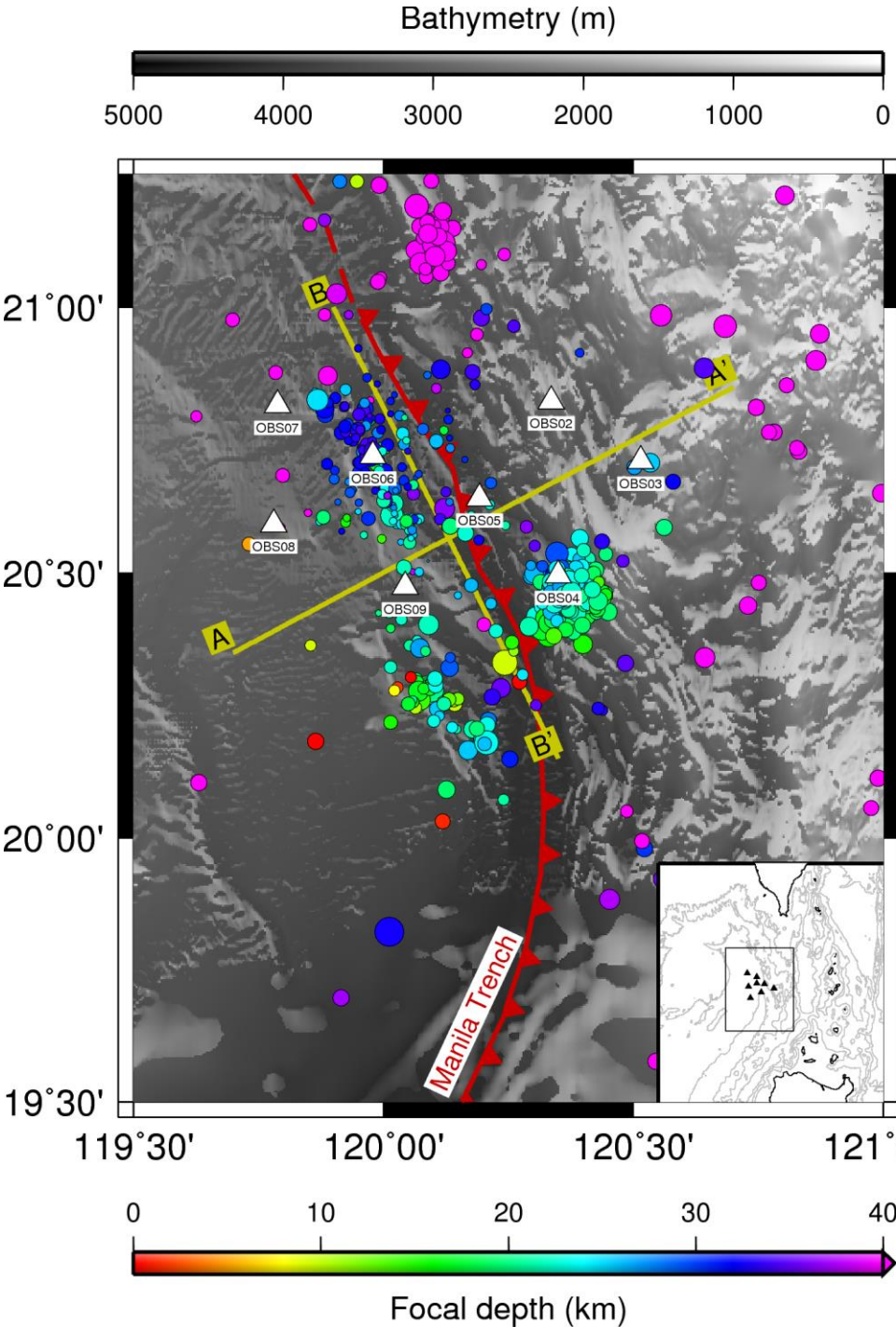


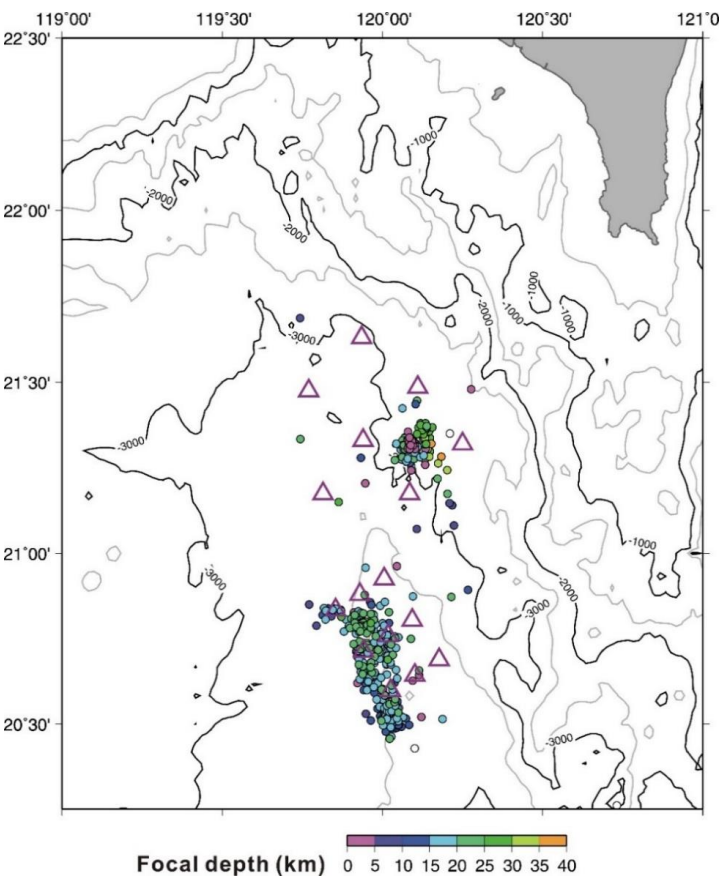


Initial Located Events in MT

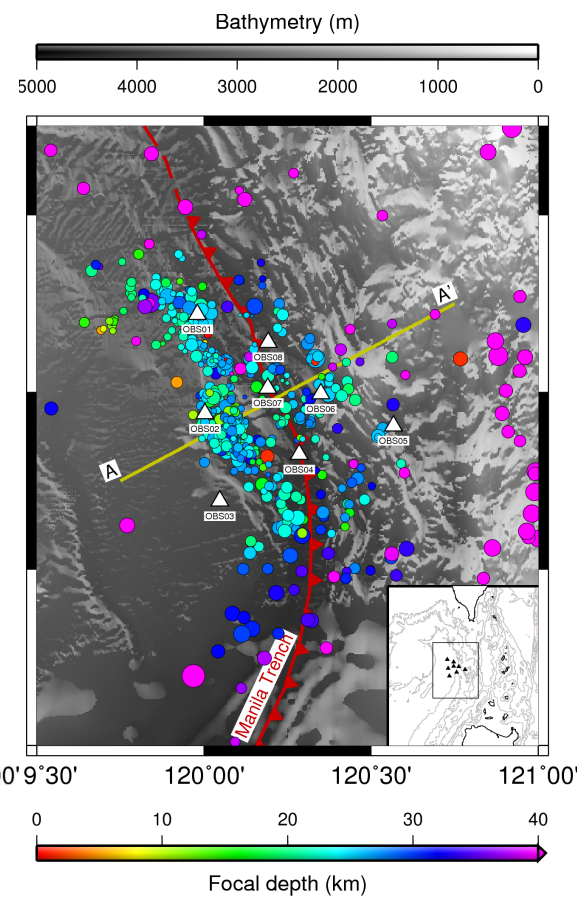
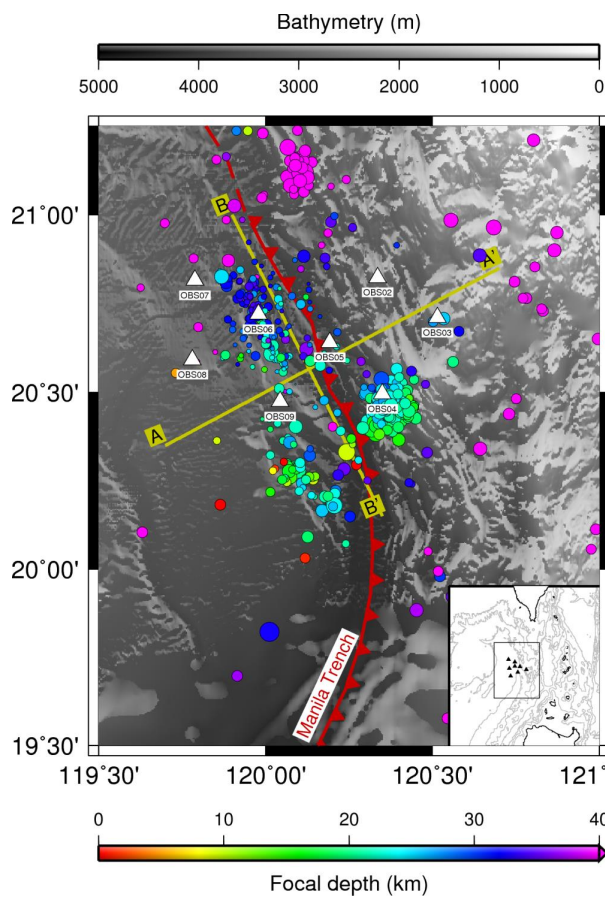
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- OBSs : 8
- period : 2017.6.27 11:00am to 2017.7.20 11:00am (total 22 days)
- events : 723

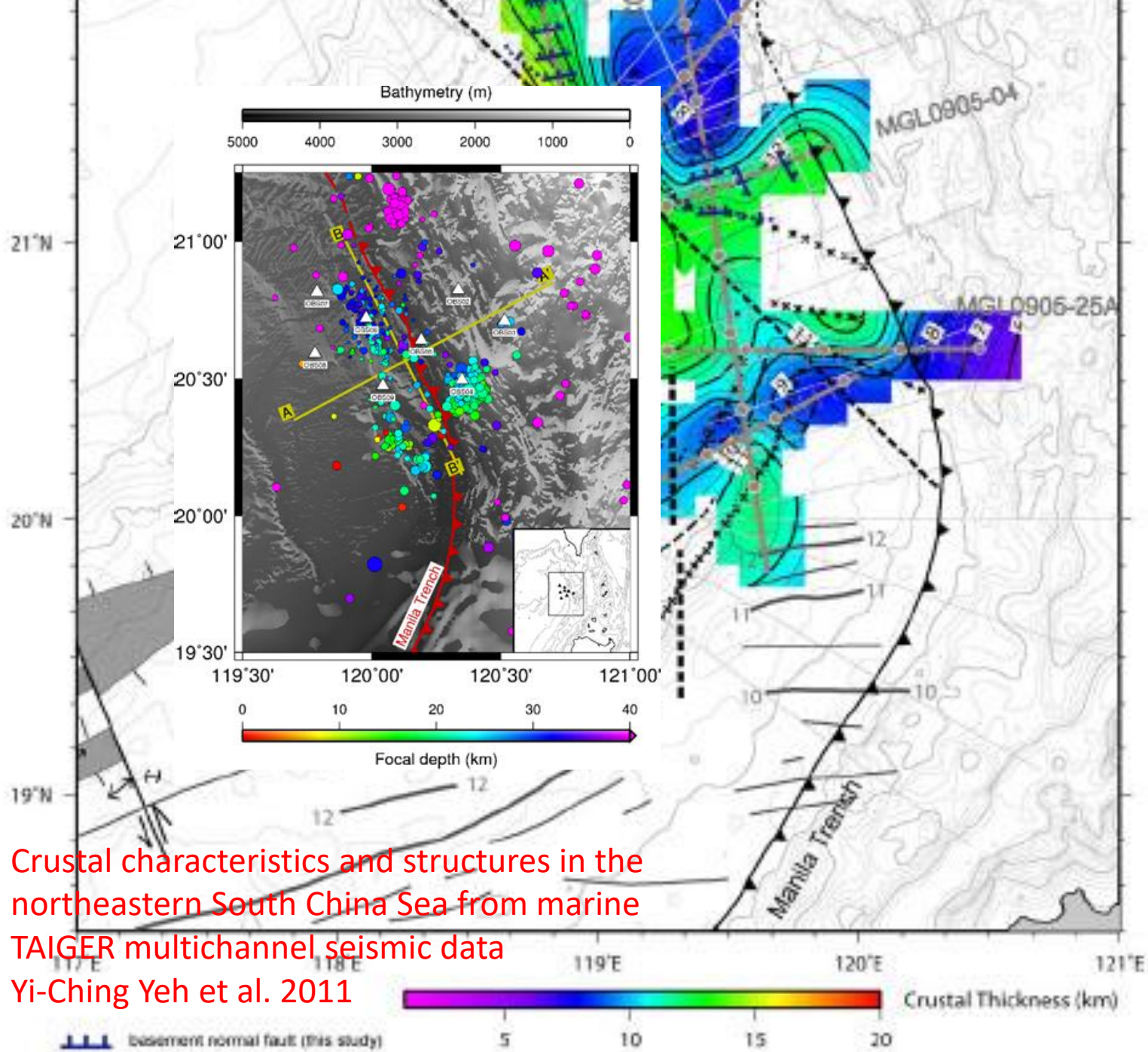




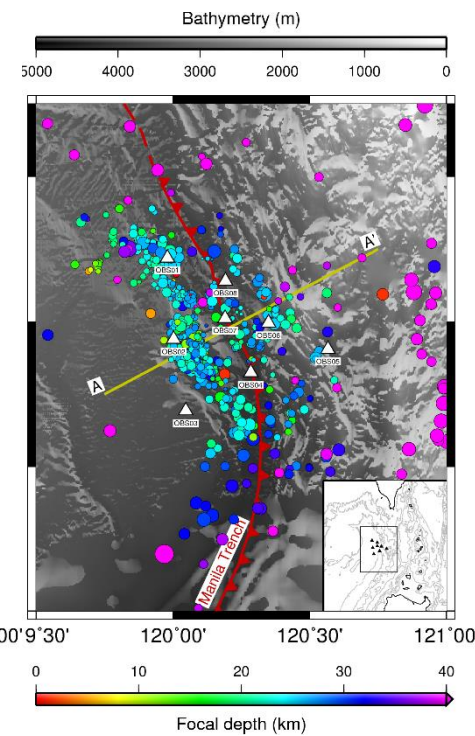
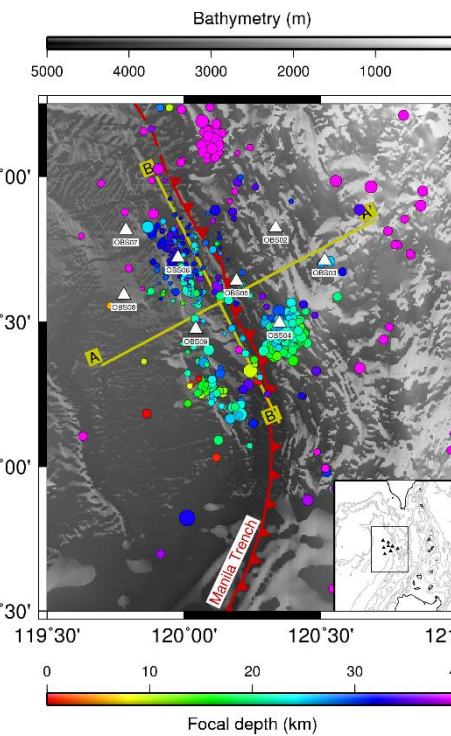
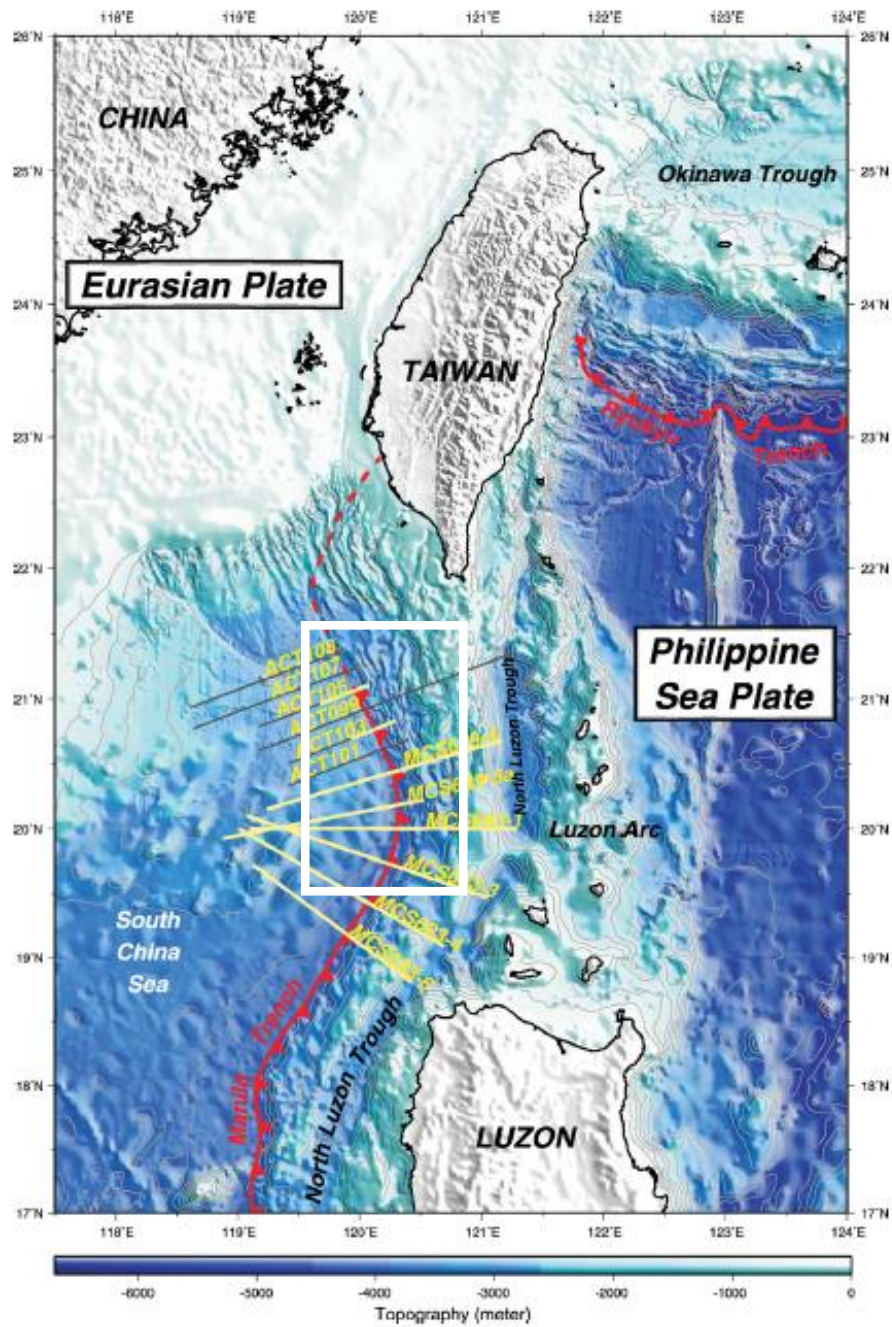


Chang et al. (2008)

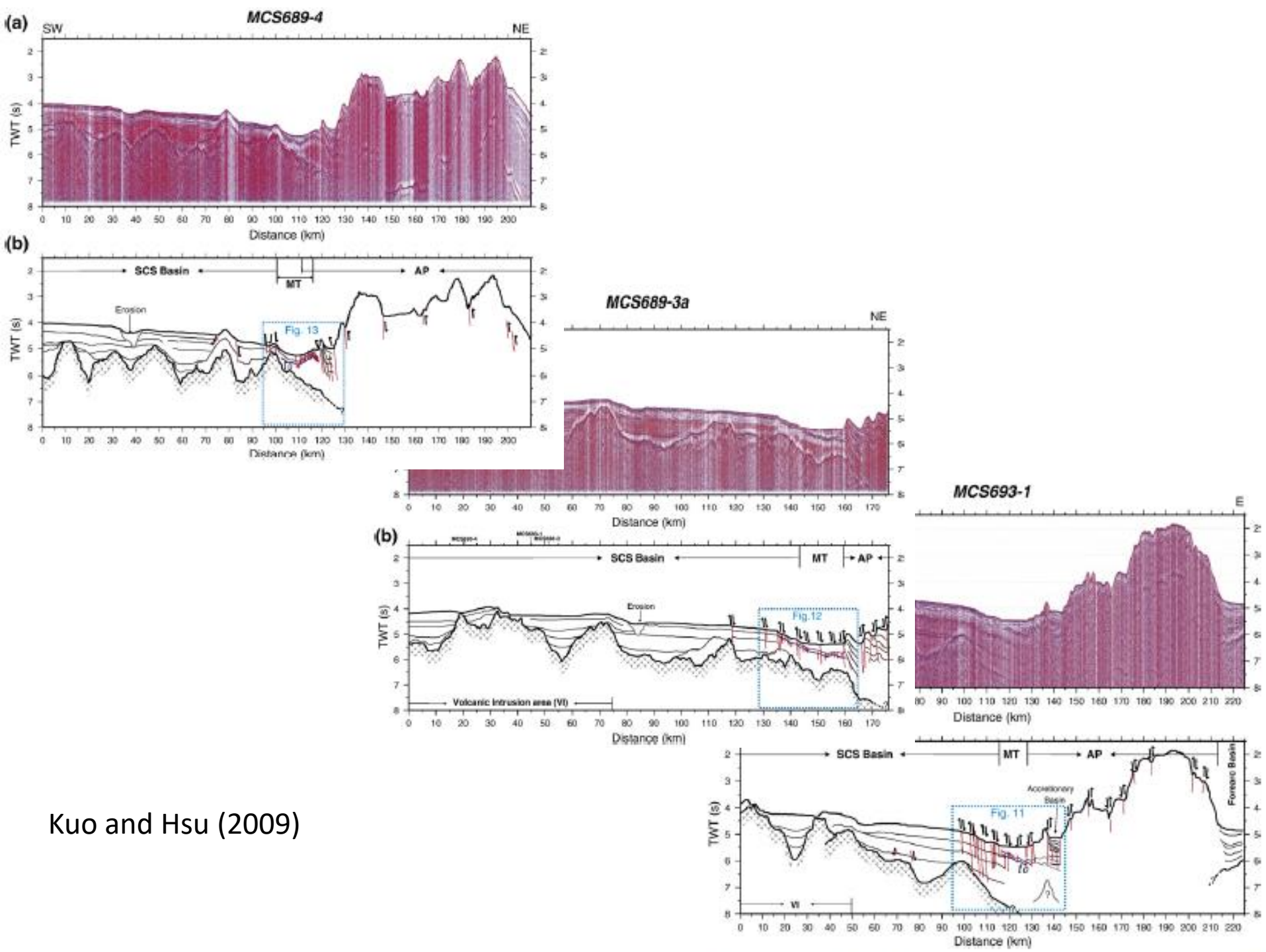




Crustal characteristics and structures in the
northeastern South China Sea from marine
TAIGER multichannel seismic data
Yi-Ching Yeh et al. 2011



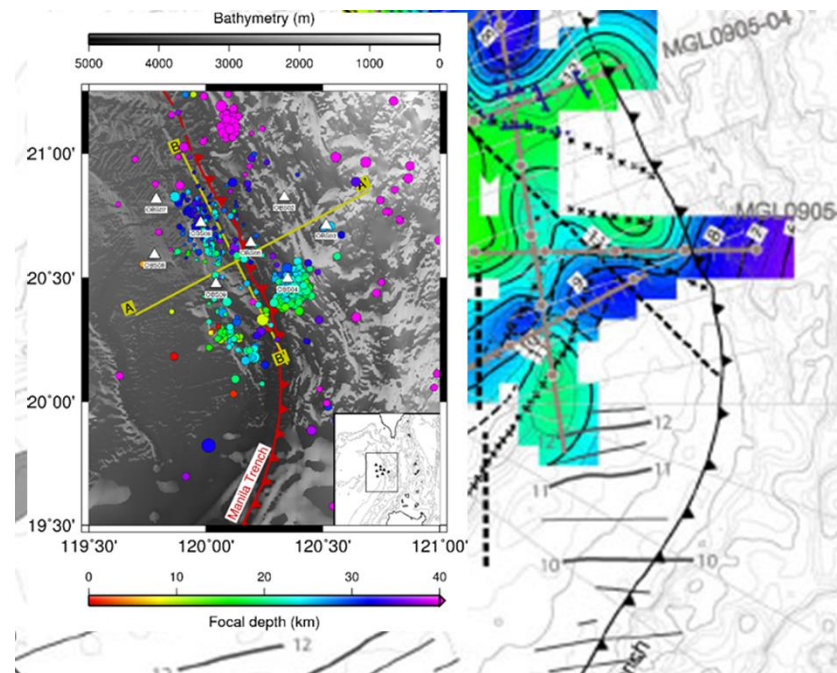
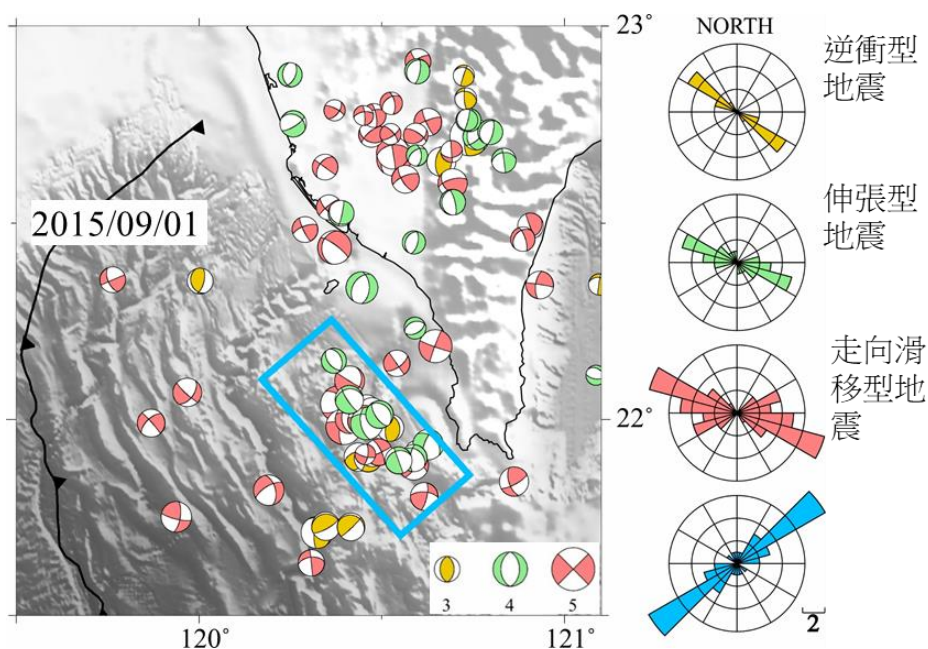
Kuo and Hsu (2009)



Kuo and Hsu (2009)

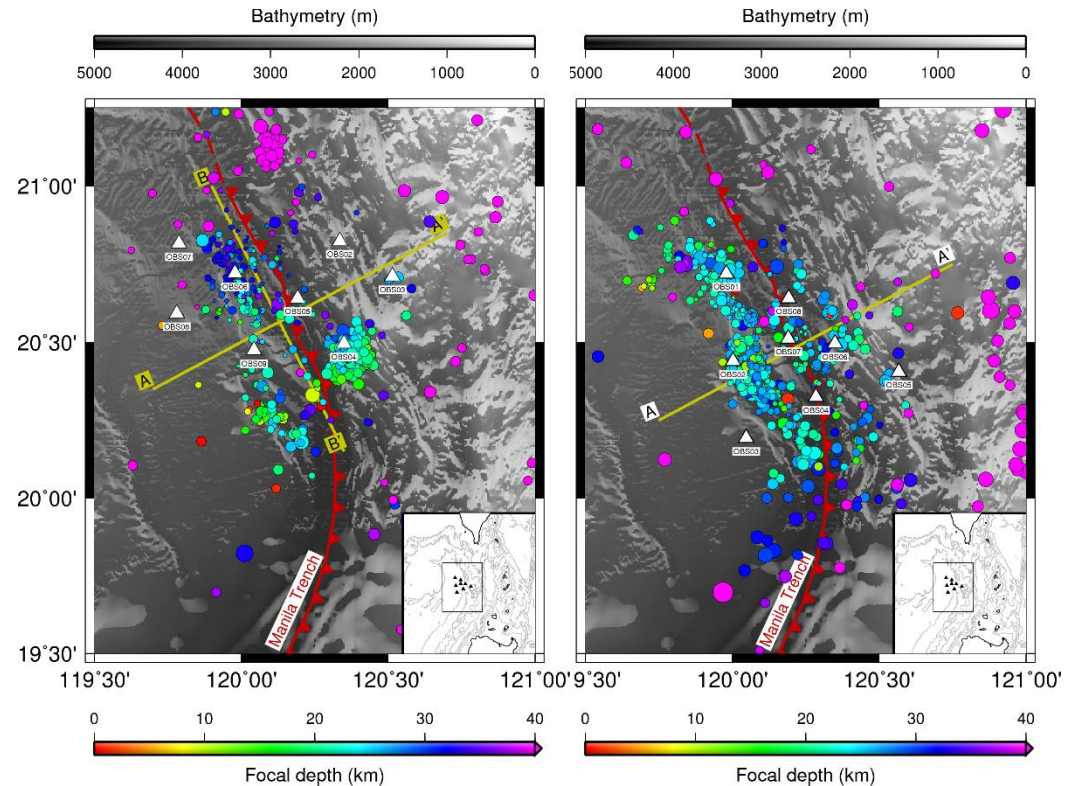
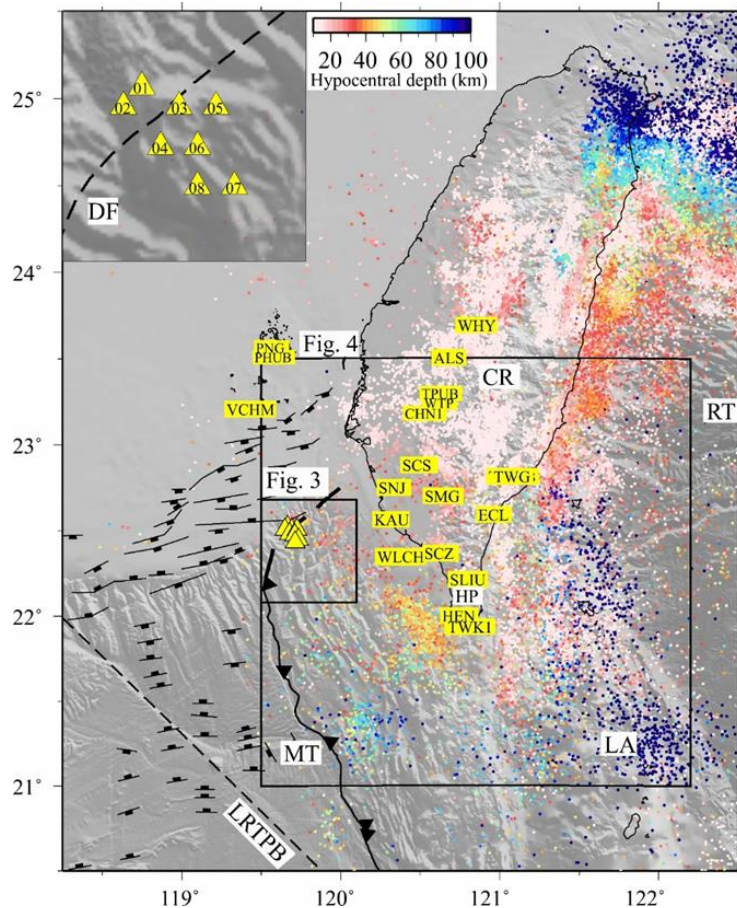
初步成果

- 研究西南外海地震發現應力分佈以西北-東南走向伸張應力為主，與傳統認知隱沒帶地震應有與板塊碰撞方向或隱沒方向一致的擠壓應力不同；
- 馬尼拉海溝地震活動可能受板塊厚度和南海擴張時所產生之既有正斷層構造有關，進而可能會影響海溝分段和破裂行為



後續工作：

- 地震重新定位
- 與其他地球物理資料比對
- 繼續馬尼拉海溝的地震活動監測工作（隱沒帶地震）



後續工作：台灣東南部地震監測工作

WIKIPEDIA

1959年恆春地震

維基百科，自由的百科全書

1959年恆春地震發生於台灣時間1959年8月15日，芮氏地震規模7.1，總共造成16人（有說法指17人）死亡。

目錄

- 經過
- 傷亡與損失
- 參見
- 參考資料

經過

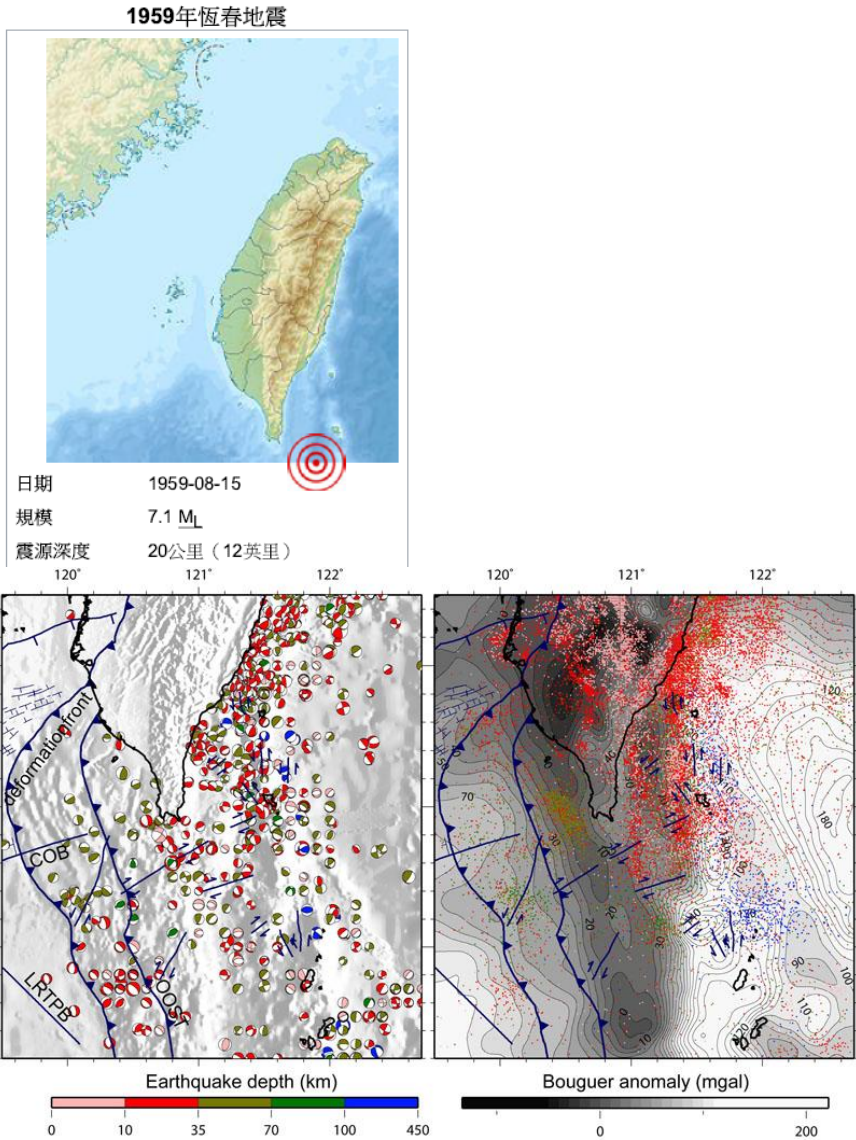
該地震發生於1959年8月15日（星期六）當地時間16:57（UTC+8）。震央位於鵝鑾鼻東南方50公里處。其芮氏地震規模7.1，震源深度20公里。在港口溪的入海處，有疑似海嘯的現象。該次地震在全台灣和澎湖群島都感受到不同程度搖晃^[1]。地震發生時有地聲。震區出現山崩、地裂、噴沙、冒水等現象。砂島附近發生岩崩，約3000方立米。高雄煉鋼廠廠房建築為磚或鋼筋混凝土結構，牆約50厘米厚，大震後出現裂縫無數。室內外出現地裂，噴泥沙。海口村的地裂自海邊起長約1公里，最大寬度達1米。高雄市一住戶磚牆被震移1米多，部分電桿被震斷。8月至12月共發生餘震420多次，其中有感餘震60次。

傷亡與損失

屏東縣的建築物損壞極多，釀成極大的災害及傷亡。由於此地區房屋簡陋、破舊，震後颱風又襲擊災區，餘震不斷，地震害擴大。災民16088人，其中無家可歸者5322人，根據中央氣象局的資料，該地震傷亡與損失如下^[1]：

- 17人死亡
- 33人重傷
- 35人輕傷
- 1,214間房屋全倒
- 1,375間房屋半倒

1959年8月15日恆春東南方規模7.1和
1996年9月5日恆春與蘭嶼間規模為7.07
地震



感謝聆聽~