

# **International Ocean Discovery Program Expeditions 367 and 368 Scientific Prospectus Addendum**

## **South China Sea Rifted Margin**

### **Testing hypotheses for lithosphere thinning during continental breakup: drilling at the South China Sea rifted margin**

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## Introduction

This addendum to the *Scientific Prospectus* of the International Ocean Discovery Program (IODP) South China Sea Rifted Margin Expeditions 367 and 368 (Sun et al., 2016) addresses a change of port-of-call and a two-day extension to Expedition 368 and modifications to some of the primary and alternate sites for both expeditions.

As of the date of publication of this addendum, Expedition 368 is scheduled to start in Hong Kong on 9 April 2017 and end in Shanghai on 11 June. The two-day extension allows for the additional transit to Shanghai at the end of the expedition without taking time away from scientific drilling operations.

## Drill sites

After consultation and guidance from the IODP Environmental Protection and Safety Panel (EPSP) and the Texas A&M University (TAMU) Safety Panel, the following changes have been made:

1. Primary Site SCSII-1A and alternate Sites SCSII-1B, SCSII-15A, SCSII-16A, and SCSII-43A have been dropped from the operations plan.
2. Site SCSII-20A has been relocated to Site SCSII-20B.
3. Site SCSII-11A (or SCSII-14A) now replaces former primary Site SCSII-1A on Expedition 367 because of the latter's close proximity to an underwater communications cable.
4. Limited drilling without coring has been approved for six sites, including two primary sites.

We present a revised list of primary and alternate sites in Table **T1**. All other details contained within the original *Scientific Prospectus* published by IODP in April 2016 (Sun et al., 2016) remain the same. Site locations are shown in Figures **F1** and **F2**.

## New alternate Site SCSII-20B

Site SCSII-20B (18.29986°N, 116.0921°E; 3784 m water depth) replaces Site SCSII-20A as alternate site to primary Site SCSII-8B. The location Site SCSII-20B is shown in Figures **F2**, **F3**, and **F4**. The operations plan, anticipated lithologies, and science objectives are provided in the *Scientific Prospectus* (Sun et al., 2016).

## Possibility of limited drilling without coring

The coring and drilling program for the South China Sea rifted margin program is distributed across Expeditions 367 and 368 of the R/V *JOIDES Resolution*. The program is designed to drill, core, and log four primary sites through thick sediment sections and, significantly, into the underlying basement. The detailed operations plan is described in the *Scientific Prospectus* (Sun et al., 2016).

Because the highest priority targets are the deepest sedimentary section and underlying basement, several sites were approved for the possibility of drilling through the uppermost section without coring. The sites at which this can be considered are Sites SCSII-8B, SCSII-9B, SCSII-20B, SCSII-21A, SCSII-30A, and SCSII-31A. The exact depths to which these sites could be drilled without coring are presented in Table **T1**.

## References

- Briaux, A., Patriat, P., and Tapponnier, P., 1993. Updated interpretation of magnetic anomalies and seafloor spreading stages in the South China Sea: implications for the Tertiary tectonics of Southeast Asia. *Journal of Geophysical Research: Solid Earth*, 98(B4):6299–6328.  
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- Sun, Z., Stock, J., Jian, Z., McIntosh, K., Alvarez-Zarikian, C.A., and Klaus, A., 2016. *Expedition 367/368 Scientific Prospectus: South China Sea Rifted Margin*. International Ocean Discovery Program.  
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Table T1. Primary and alternate proposed site locations, Expeditions 367 and 368. SCS = South China Sea, EPSP = Environmental Protection and Safety Panel. TWT = two-way traveltime. See the Expedition 367 and 368 Scientific Prospectus (Sun et al., 2016) for detailed scientific objectives, and operations plans and time estimates. Sites were approved at the IODP Environmental Protection and Safety Panel meeting in July 2016 at the JRSO in College Station, Texas.

Expedition	Site	Latitude	Longitude	Water depth (m)	Approved penetration depth (m)	Brief site specific scientific objectives and EPSP approval
367	Primary SCSII-11A	18.41089°N	115.88519°E	3770	1496	Determine nature of basement: exhumed serpentinized mantle? upper/lower continental crust or igneous basement? Determine time and environment of final breakup and subsequent subsidence. High priority for Objectives 1, 2, 3, and 4. Alternate to SCSII-1A. EPSP 07/16: approved; will need to be cored if primary site is not cored.
	SCSII-8B	18.30518°N	116.21953°E	3811	1698	Determine nature of basement: exhumed serpentinized mantle or igneous ocean crust? Determine paleodepth and initial subsidence of the very earliest SCS ocean basin. High priority for Objectives 1 and 2. EPSP 07/16: penetration depth approved as requested; approval to wash down to 5.5 s TWT (350 m).
368	SCSII-9B	18.14383°N	116.31410°E	3880	1827	Determine nature of oceanic crust: was a robust mantle-melting regime established shortly after breakup or not? High priority for Objectives 1 and 2. EPSP 07/16: approved as requested; approval to wash down to 5.6 s TWT (378 m).
	SCSII-41A	18.88488°N	115.76571°E	2870	882	Recover synrift and postrift sediments; constrain age, duration, and environment of rifting and breakup; determine subsidence history. High priority for Objectives 3 and 4. EPSP 07/16: approved to basement plus 10 m.
	Alternate SCSII-14A	18.40952°N	115.85979°E	3770	1444	Determine nature of basement: exhumed serpentinized mantle? Upper/lower continental crust or igneous basement? Determine time and environment of final breakup and subsequent subsidence. High priority for Objectives 1, 2, 3, and 4. <b>Alternate for SCSII-1A.</b> EPSP 07/16: approved; will need to be cored if primary site is not cored.
	SCSII-17A	18.46453°N	116.23063°E	3772	1053	Determine nature of basement: exhumed serpentinized mantle? Upper/lower continental crust or igneous basement? Determine time and environment of final breakup and subsequent subsidence. High priority for Objectives 1, 2, 3, and 4. <b>Alternate for SCSII-1A.</b> EPSP 07/16: approved; will need to be cored if primary site is not cored.
	SCSII-18A	18.45679°N	116.23505°E	3773	1260	Determine nature of basement: exhumed serpentinized mantle? Upper/lower continental crust or igneous basement? Determine time and environment of final breakup and subsequent subsidence. High priority for Objectives 1, 2, 3, and 4. <b>Alternate for SCSII-1A.</b> EPSP 07/16: approved; will need to be cored if primary site is not cored.
	SCSII-20B	18.29986°N	116.0921°E	3784	1864	Determine nature of basement: exhumed serpentinized mantle or igneous ocean crust? Determine paleodepth and initial subsidence of the very earliest SCS ocean basin. High priority for Objectives 1 and 2. <b>Alternate for SCSII-8B.</b> EPSP 07/16: Panel positioned site at CDP5600 on line 15eCLW8. Approved to wash down to 320 m (5.45 s TWT).
	SCSII-21A	18.32794°N	116.31058°E	3826	2054	Determine nature of basement: exhumed serpentinized mantle or igneous ocean crust? Determine paleodepth and initial subsidence of the very earliest SCS ocean basin. High priority for Objectives 1 and 2. <b>Alternate for SCSII-8B.</b> EPSP 07/16: approved as requested. Approved to wash down to 5.5 s TWT (340 m).
	SCSII-30A	18.13798°N	116.2753°E	3863	1860	Determine nature of oceanic crust: was a robust mantle-melting regime established shortly after breakup or not? High priority for Objectives 1 and 2. <b>Alternate for SCSII-9B.</b> EPSP 07/16: approved as requested. Approved to wash down to 5.6 s TWT (381 m).
	SCSII-31A	18.16994°N	116.39837°E	3890	1874	Determine nature of oceanic crust: was a robust mantle-melting regime established shortly after breakup or not? High priority for Objectives 1 and 2. <b>Alternate for SCSII-9B.</b> EPSP 07/16: approved as requested. Approval to wash down to 5.6 s TWT (342 m).
	SCSII-3D	18.9176°N	115.85897°E	2930	1352	Recover synrift and postrift sediments; constrain age, duration, and environment of rifting and breakup; determine subsidence history. High priority for Objectives 3 and 4. <b>Alternate to SCSII-41A.</b> EPSP 07/16: approved to basement plus 10 m.
	SCSII-40A	18.883819°N	115.74777°E	2890	631	Recover synrift and postrift sediments; constrain age, duration, and environment of rifting and breakup; determine subsidence history. High priority for Objectives 3 and 4. <b>Alternate to SCSII-41A.</b> EPSP 07/16: approved to basement plus 10 m.
	SCSII-42A	18.87879°N	115.75434°E	2920	684	Recover synrift and postrift sediments; constrain age, duration, and environment of rifting and breakup; determine subsidence history. High priority for Objectives 3 and 4. <b>Alternate to SCSII-41A.</b> EPSP 07/16: approved to basement plus 10 m.
	SCSII-44A (U1435)	18.55578°N	116.61029°E	3252	520	Recover synrift and postrift sediments; constrain age, duration, and environment of rifting and breakup; determine subsidence history. High priority for Objectives 3 and 4. <b>Alternate to SCSII-41A.</b> EPSP 07/16: approved drilling/coring to a depth of 520 mbsf.

Figure F1. Proposed Expeditions 367 and 368 sites and seismic data coverage and magnetic anomalies of the South China Sea Basin. Black lines = ocean-bottom seismometer data. Other seismic lines are mostly multichannel seismic reflection data. Site names in the top figure are abbreviated by deleting the prefix "SCSII-". Red solid stars = primary proposed drill sites, yellow stars = alternate proposed sites. ODP Leg 184 and IODP Expedition 349 drill sites are shown with site numbers. Magnetic lineations within the ocean crust are shown in red with interpreted chrons after Briaux et al. (1993). For more details, see Figure F2.

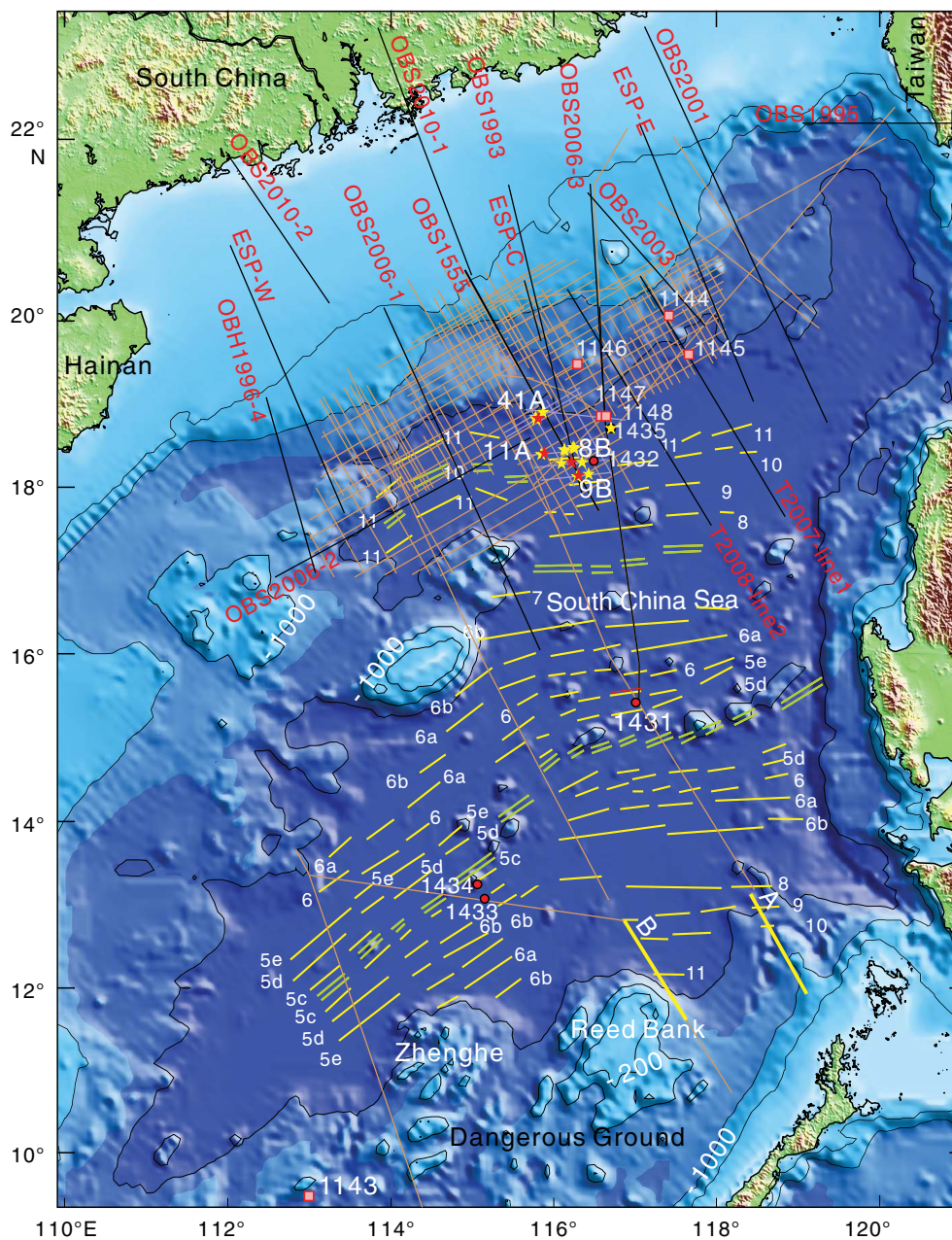




Figure F2. Northern South China Sea rifted margin with proposed drill site locations and seismic coverage of 2-D, time-migrated multichannel seismic reflection seismic data and ocean-bottom seismometer data (3-D data not shown). Expedition 367/368 proposed drill sites are shown (red solid stars = primary sites, white stars = alternate sites). Site names in the top figure are abbreviated by deleting the prefix "SCSII-". Previous ODP Leg 184 and IODP Expedition 349 sites are shown as orange or yellow squares. Magnetic lineations within the ocean crust are shown in red with interpreted chrons after Briaies et al. (1993).

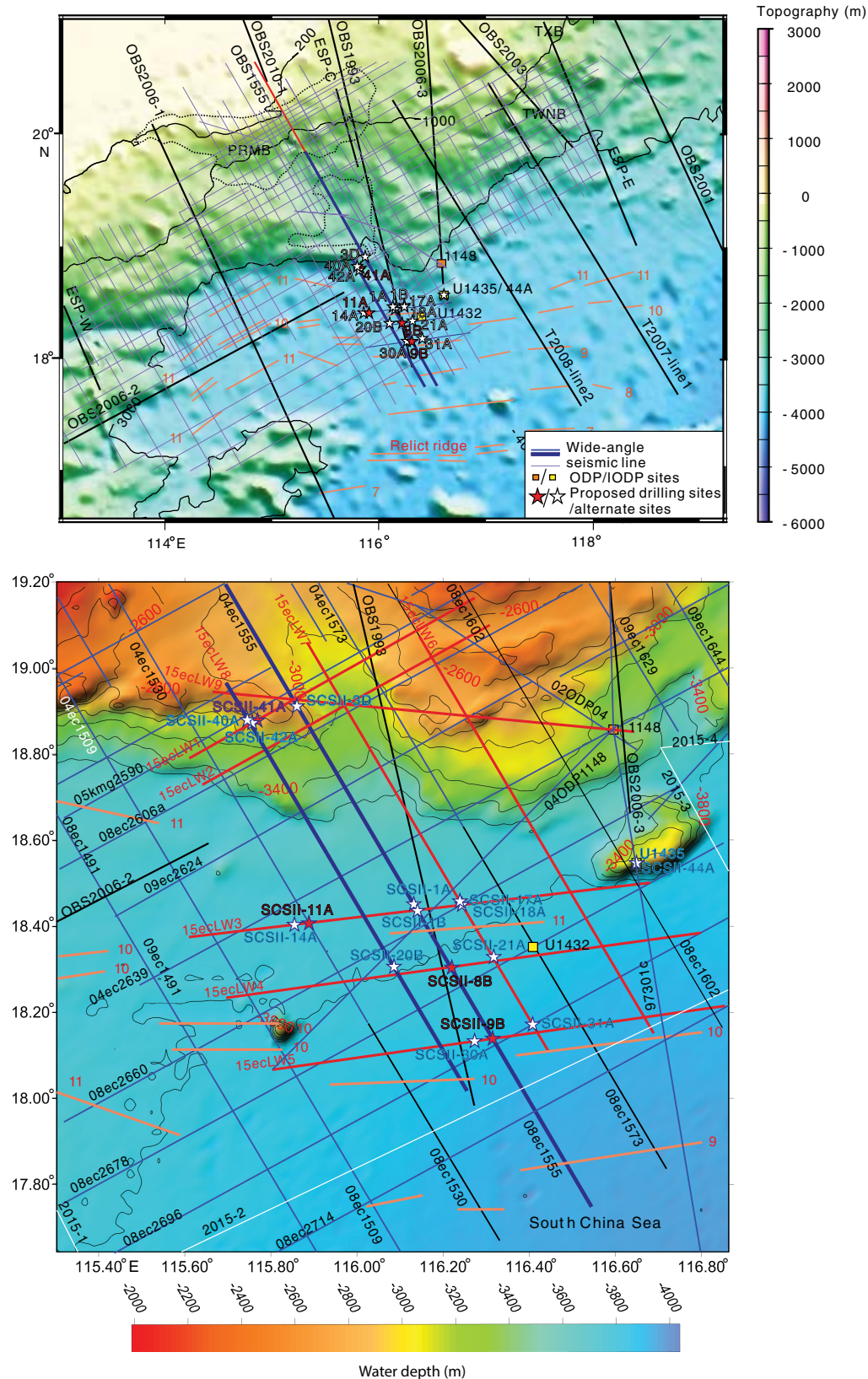


Figure F3. Bathymetry, primary and crossing lines of proposed Site SCSII-20B, and crossing with seismic Line 04ODP1148. Seismic lines are annotated with common depth point (CDP) numbers.

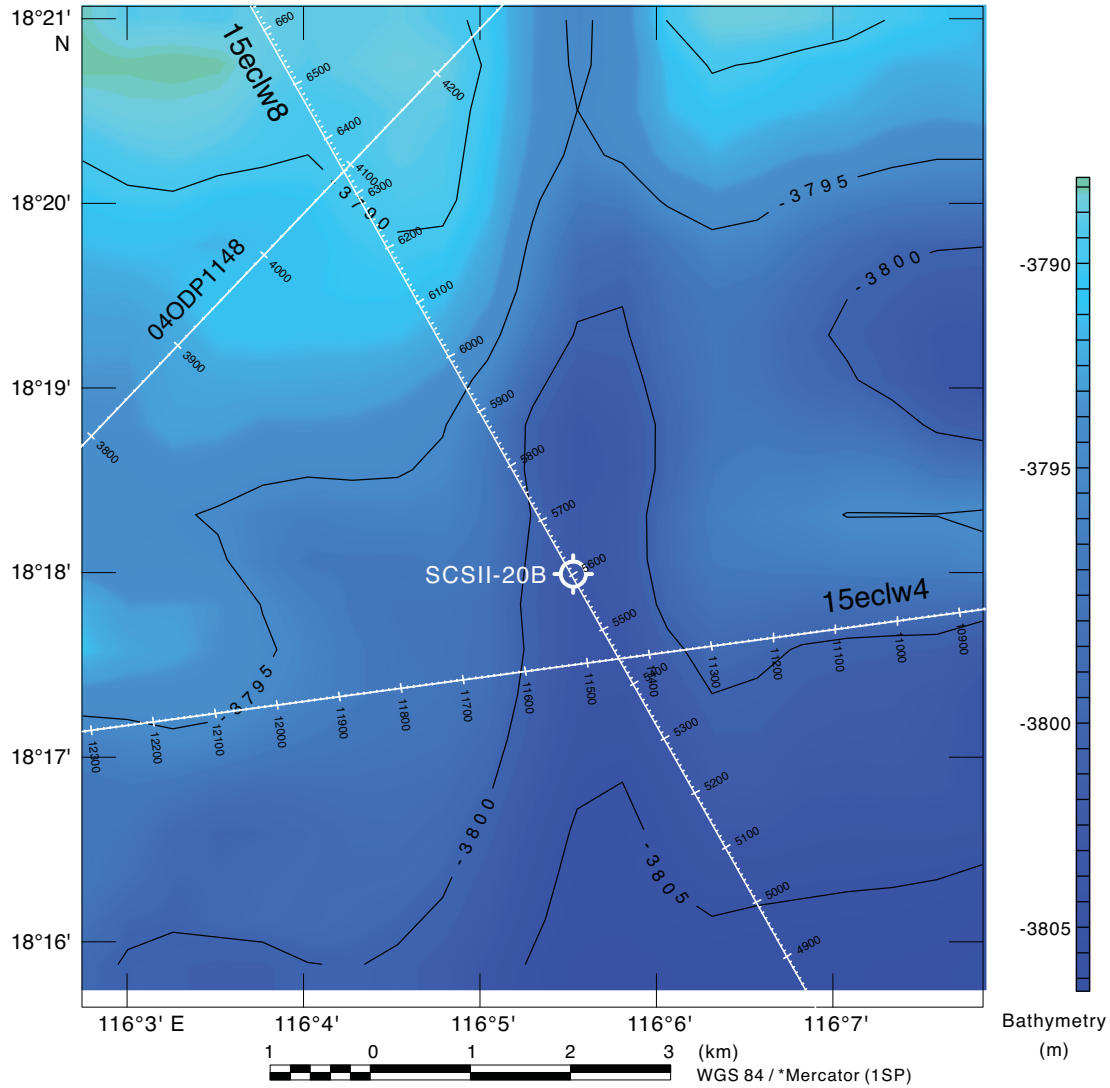


Figure F4. (A) Annotated primary seismic Line 15ecLW8 and (B) crossing Line 15ecLW4, proposed Site SCSII-20B. Crossing position of Line 04ecODP1148 is shown. The position of Site SCSII-20B on crossing Line LW4 is projected (see Figure F3). CDP = common depth point. Dashed lines = unconformities, solid red line = fault.

