

**Carbon sequestration in the Indonesian Seas and
its global significance: Generation of scientific knowledge for
formulating strategies for adaptation to climate change
(CISKA, Topic 2 of SPICE III)**

Report of Research Cruise MTK-2013



Ship: Motor vessel MatahariKu
Chief scientist: Dr. Bernhard Mayer
Co-chief scientist leg 1: Dr. Joko Samiaji
Co-chief scientist leg 2: Ir. H. Elizal



Dates and legs of cruise

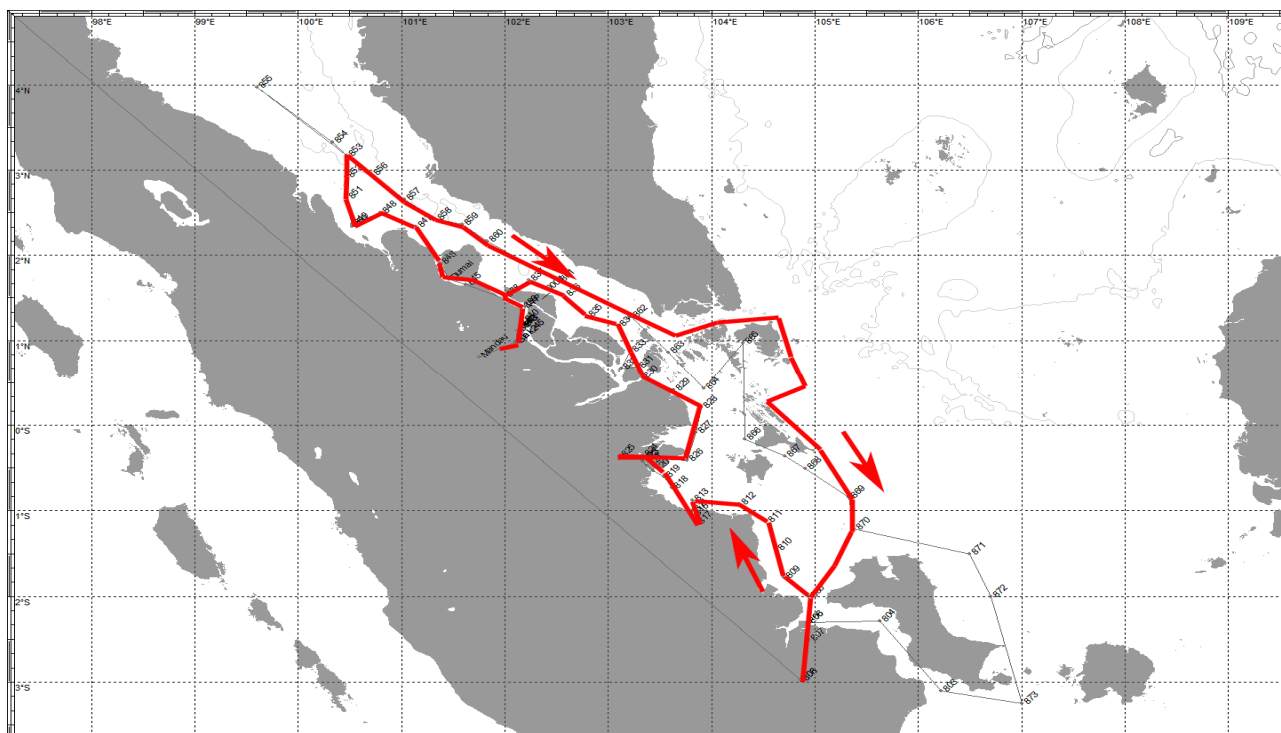
Start of cruise and leg 1:	02 Apr 2013 12:00	in Palembang, Sumatra
End of leg 1:	09 Apr 2013 16:00	in Dumai, Sumatra
Start of leg 2:	10 Apr 2013 20:30	in Dumai, Sumatra
End of leg 2 and cruise:	17 Apr 2013 11:00	in Palembang, Sumatra

The originally planned start of the cruise, 5 March 2013, was postponed to 2 April. Three German colleagues had to cancel their participation due to their tasks at home.

Purpose and route of cruise and necessary changes on the way

The original plan for this cruise was to perform carbon budget related measurements in oceanic, coastal, estuarine and riverine waters along a route from the Java Sea through the South China Sea into the Malacca Strait, up to north of Dumai, including the greatest rivers in Sumatra on this way. Planned observations were related to fish, fish larvae, plankton, primary production, sea grass, organic and inorganic carbon components and isotopes in water and sediment, suspended particulate matter and yellow substances content and radiation properties above and in the sea. Rivers were supposed to be investigated up to their fresh water limit.

In the Siak River, at the city of Siak, it was decided to skip the stations at Mandau River inflow into the Siak due to delayed arrival and for safety reasons: Siak River becomes narrow river-up behind city of Siak, too dangerous to go during darkness, and it was already shortly before sunset.



In Dumai, time-consuming problems during the harbour clearance led to a loss of one research day. As a consequence, the route had to be changed: the station track around Bangka Island was cancelled and a visit to the coasts of Bintan Island and Lingga Island for investigation on sea grass was inserted.

According to the security officer, the two most north western stations in the Malacca Strait had to be cancelled, because they would be located within the province Sumatera Utara and not part of the Security Clearance.

All scientific observations and samplings except the fish and fish larvae (no experts on board) were successfully performed. About three days before the end of cruise (at station 949, 14. Apr, 13:00), the grab was lost – it got probably caught on some stones on the sea bottom – and no sediment samples could be collected anymore except with the corer.

Our conclusive statement is that this research cruise was a very successful one with a pleasant, respectful and cooperative atmosphere on board.

List of participants

Leg 1: 02 Apr to 09 Apr 2013 from Palembang to Dumai

Indonesian participants (8 scientists + 1 officer)			
1	Let.tu Laut (KH) Umar Dahlan	Security Officer	Kementerian Pertahanan
2	Dr. Joko Samiaji	Scientist	Universitas Riau
3	Ganis Fia Kartika	Scientist	Universitas Riau
4	Fajar Sidik	Student/Scientist	Universitas Riau
5	Fani Fadli	Student/Scientist	Universitas Riau
6	Nuryani Widagti	Scientist	BPOL, Badan Litbang KP
7	Riswan Hasan	Technician	P3SDLP, Badan Litbang KP
8	Satria Adhiguna	Student/Scientist	Institut Teknologi Bandung
9	Didi Adisaputro	Student/Scientist	Universitas Diponegoro
German participants (6 scientists)			
1	Dr. Bernhard Mayer	Scientist	ZMAW
2	Dr. Harald Asmus	Scientist	AWI
3	Dominik Kneer	PhD-Student/Scientist	AWI
4	Dr. Herbert Siegel	Scientist	IOW
5	Iris Stottmeister	Scientist	IOW
6	Francisca Wit	PhD-Student/Scientist	ZMT

Leg 2: 10 Apr to 17 Apr 2013 from Dumai to Palembang

Indonesian participants (9 scientists + 1 officer)			
1	Let.tu Laut (KH) Umar Dahlan	Security Officer	Kementerian Pertahanan
2	Dr. Dessy Yoswati	Scientist	Universitas Riau
3	Ir. H Elizal	Scientist	Universitas Riau
4	Muhammad Rasyid Ridho	Student/Scientist	Universitas Riau
5	Taufik Candra	Student/Scientist	Universitas Riau

6	Nuryani Widagti	Scientist	BPOL, Badan Litbang KP
7	Riswan Hasan	Technician	P3SDLP, Badan Litbang KP
8	Dr. Susanna Nurdjaman	Scientist	Institut Teknologi Bandung
9	Satria Adhiguna	Student/Scientist	Institut Teknologi Bandung
10	Didi Adisaputro	Student/Scientist	Universitas Diponegoro
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Working groups

Working groups taking part in the cruise covered – in agreement to the *Plan of Cruise* - the scientific fields of planktonology, sea grass, primary production, marine biogeochemistry, sedimentology, remote sensing (radiation) and physical oceanography.

List of stations

Station- number	geograph. Position (start)			Station (start)		Location		
	Latitude			Longitude		local time WIT		
	° N	' N	N/S	° E	' E	date	time	
start	2	58,000	S	104	54,000	02 April 2013	12:00	Palembang
901	2	15,8125	S	104	55,491	03 April 2013	6:20	Musi River mouth
902	1	59,925	S	104	55,916	03 April 2013	10:21	N entrance to Bangka Strait
903	1	46,733	S	104	42,166	03 April 2013	13:47	Java Sea, close to E coast Sumatra
904	1	26,991	S	104	37,175	03 April 2013	17:31	Java Sea, close to E coast Sumatra
905	1	7,858	S	104	31,807	03 April 2013	21:59	Java Sea, close to E coast Sumatra
906	0	52,758	S	103	48,542	04 April 2013	6:44	10 sm E of Batanghari River mouth
907	1	0,011	S	103	48,593	04 April 2013	9:53	Batanghari River mouth
907.1	1	4,383	S	103	49,092	04 April 2013	11:25	SB for Batanghari
907.2	1	2,902	S	103	48,890	04 April 2013	12:15	SB for Batanghari
907.3	0	59,072	S	103	48,216	04 April 2013	13:15	SB for Batanghari
908	0	42,860	S	103	37,973	04 April 2013	22:05	NW of Bananghari River mouth
909	0	36,034	S	103	32,004	05 April 2013	0:27	7 sm east of Indragiri River mouth
910	0	31,641	S	103	26,339	05 April 2013	7:35	Indragiri River mouth
911	0	18,049	S	103	14,823	05 April 2013	13:53	Indragiri River
912	0	22,406	S	103	24,187	05 April 2013	20:05	Indragiri River
913	0	20,970	S	103	27,081	05 April 2013	21:13	Indragiri River
914	0	13,922	S	103	30,931	05 April 2013	23:02	Indragiri River
915	0	5,321	N	103	51,052	06 April 2013	7:13	E of Indragiri River mouth
916	0	12,645	N	103	53,952	06 April 2013	11:05	E of Kateman Island
917	0	24,655	N	103	37,740	06 April 2013	15:31	E of Burung Island
918	0	34,670	N	103	21,961	06 April 2013	21:25	E of S Kampar mouth
919	0	52,894	N	103	12,699	07 April 2013	2:25	N of N Kampar mouth
920	1	10,727	N	103	5,527	07 April 2013	8:13	Malacca Strait, N of Rangsang Island



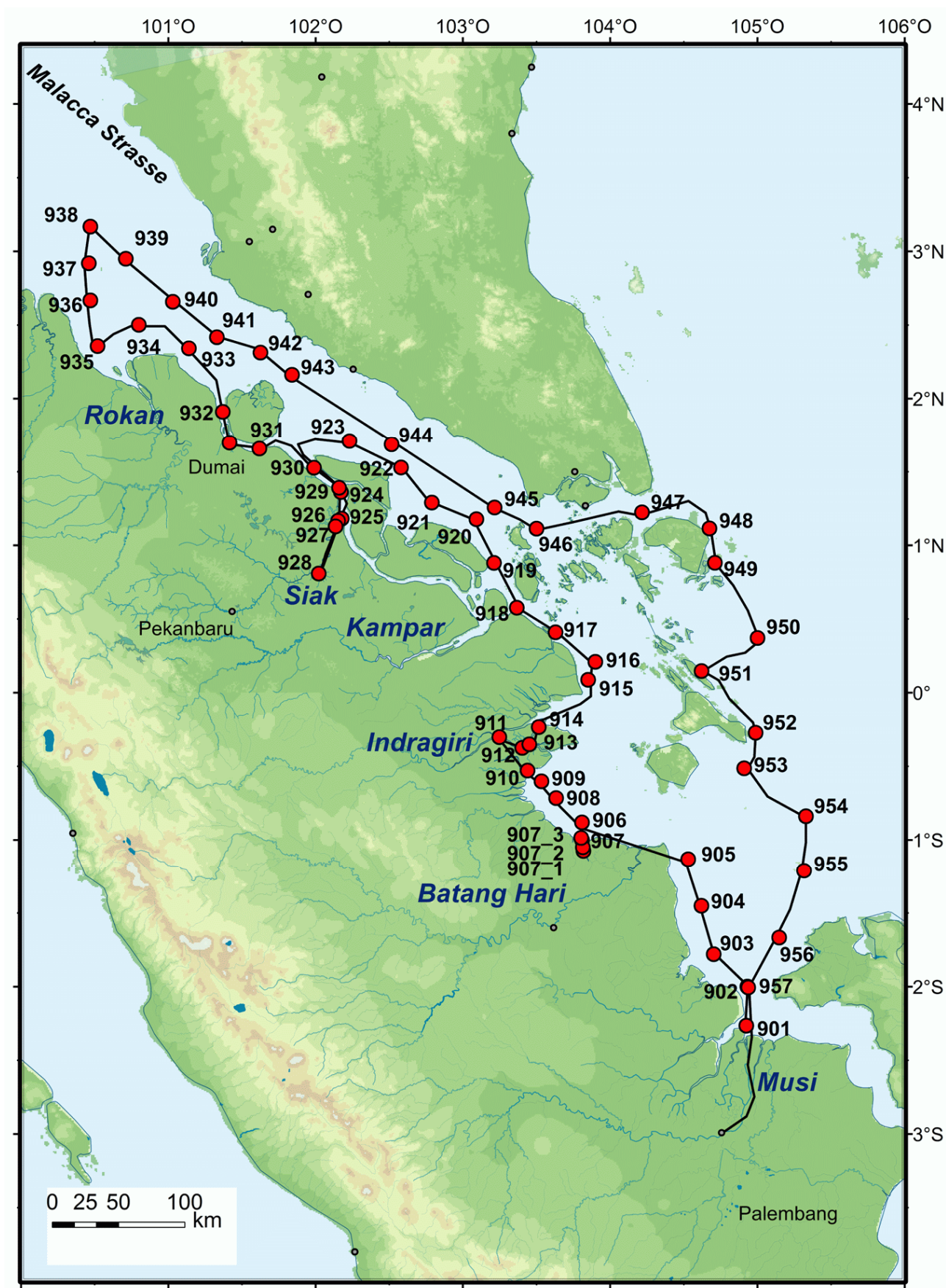
921	1	17,482	N	102	47,345	07 April 2013	12:19	Malacca Strait, N of Rangsang Island
922	1	31,781	N	102	34,810	07 April 2013	15:29	Malacca Strait, N of Bengkalis Island
923	1	42,673	N	102	13,804	07 April 2013	20:27	Malacca Strait, N of Bengkalis Island
924	1	21,753	N	102	10,296	08 April 2013	6:52	Siak River mouth
925	1	10,950	N	102	10,662	08 April 2013	8:55	Siak River 20 psu
926	1	10,045	N	102	9,167	08 April 2013	9:35	Siak River 15 psu
927	1	7,776	N	102	8,169	08 April 2013	10:24	Siak River 10 psu
928	0	48,551	N	102	1,290	08 April 2013	17:33	Siak River at Siak City
929	1	23,509	N	102	9,532	09 April 2013	7:20	Bengkalis Strait
930	1	31,695	N	101	59,359	09 April 2013	10:32	Bengkalis Strait
931	1	39,555	N	101	37,108	09 April 2013	14:10	Rupat Strait
Dumai	1	41,929	N	101	24,958	09 April 2013	16:00	Dumai
932	1	54,677	N	101	22,174	10 April 2013	22:54	Rupat Strait
933	2	20,564	N	101	8,365	11 April 2013	6:15	Malacca Strait, E of Rokan River mouth
934	2	30,175	N	100	47,960	11 April 2013	10:59	Malacca Strait, N of Rokan River mouth
935	2	21,517	N	100	31,176	11 April 2013	14:07	N of Rokan River mouth
936	2	40,140	N	100	28,271	11 April 2013	18:45	Malacca Strait, N of Rokan River mouth
937	2	55,243	N	100	27,611	11 April 2013	21:48	Malacca Strait, N of Rokan River mouth
938	3	10,142	N	100	28,230	12 April 2013	0:46	Malacca Strait, N of Rokan River mouth
939	2	57,070	N	100	42,675	12 April 2013	6:08	Malacca Strait
940	2	39,534	N	101	1,829	12 April 2013	10:31	Malacca Strait
941	2	25,107	N	101	19,770	12 April 2013	14:52	Malacca Strait
942	2	18,839	N	101	37,566	12 April 2013	17:57	Malacca Strait
943	2	9,806	N	101	50,378	12 April 2013	20:17	Malacca Strait
944	1	41,265	N	102	30,981	13 April 2013	5:58	Malacca Strait
945	1	15,478	N	103	12,933	13 April 2013	13:00	Malacca Strait
946	1	6,835	N	103	29,789	13 April 2013	16:48	Singapore Strait close to Malacca Strait
947	1	13,495	N	104	12,971	14 April 2013	0:46	Sin. Strait, betw. Batam and Bintan Isl.
948	1	6,971	N	104	40,458	14 April 2013	9:37	South China Sea, E of Bintan Island
949	0	52,943	N	104	42,650	14 April 2013	13:00	South China Sea, E of Bintan Island
950	0	22,344	N	105	0,043	14 April 2013	21:42	South China Sea, S of Bintan Island
951	0	8,875	N	104	37,248	15 April 2013	7:02	South China Sea, NE Sebangka Island
952	0	16,257	S	104	59,265	15 April 2013	16:34	South China Sea, S tip of Lingga Island
953	0	30,743	S	104	54,588	15 April 2013	20:19	Java Sea, S of Lingga Island
954	0	50,287	S	105	19,775	16 April 2013	6:15	Java Sea
955	1	12,602	S	105	19,003	16 April 2013	10:12	Java Sea, Tuju Islands
956	1	39,902	S	105	8,865	16 April 2013	18:48	Java Sea, N of Bangka Island
957	2	0,310	S	104	56,253	16 April 2013	22:32	N entrance to Bangka Strait
end	2	58,000	S	104	54,000	17 April 2013	11:00	Palembang

WIT: Western Indonesian Time --- N, S, W, E: north/northern, south/southern etc.

SB: Tour with speedboat: Batanghari River (stations 907.1, .2, .3), E coast of Bintan Island between stations 948 and 949, and NE coasts of Sebangka Island and Lingga Island between stations 951 and 952.

All working groups were doing measurements according to the *Plan of Cruise* during all stations. Radiation data and CTD data were not collected on the speed boat tours, radiation data also not during darkness. The grab was lost on station 949, since then, no sediment could be sampled.

Station map



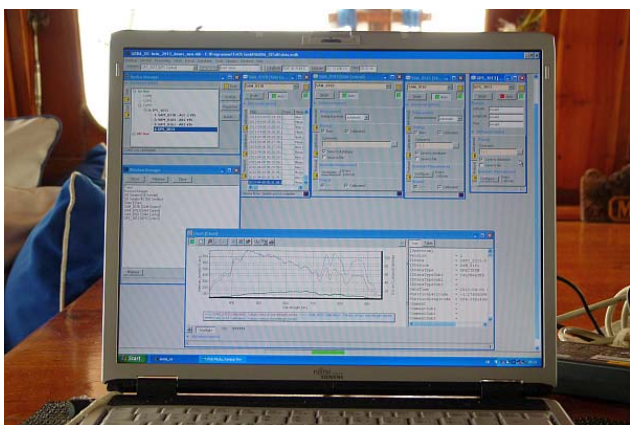
Some pictures displaying the work on board



The wet laboratories on board for water filtering, measurement of different water properties and preparation of samples.



CTD with Niskin bottle for surface water samples and UCTD, a profile from the UCTD.



Underway and on station radiation measurements.

Secchi disk for underwater visibility and colour scale for ocean colour.



Permanent and underway surface water measurement of pCO₂, pH, salinity and temperature.



Measurement of primary production under different predefined light conditions – measurement of light intensity.



Plankton net filtration.



Underwater camera to view the ocean bottom.



Sediment corer and sediment core.



Speedboat tour to Batanghari River.



Sea grass investigation.



Usage of grab to collect sediment and its passing through a coarse sieve.

Acknowledgements

We would like to thank the crew of the ship *MatahariKu* for their great help and kindness and for being available and supportive at any time. It was a great pleasure for us to be on board.

We express our special thanks to the German Ministry of Education and Research for funding this cruise, to Dr. Widodo Pranowo, who helped us in many ways to make this cruise possible on the Indonesian side, and to Let.tu Laut (KH) Umar Dahlan, who was generously and kindly helpful in many situations on board.

For the picture contributions to this report, we are most thankful to Dessy Yoswaty, Fajar Sidik, Francisca Wit, Ganis Fia Kartika, Harald Asmus, Herbert Siegel and Nuryani Widagti (in alphabetical order).

Furthermore, we thank Herbert Siegel and Iris Stottmeister for the route and station maps.

On board of MatahariKu, Indonesia, April 2013

Dr. Bernhard Mayer