

# **Organic geochemical screening data on Mesozoic and Upper Palaeozoic outcrop and core samples from Southern Vietnam and Cambodia**

A study solicited by Sarawak Shell Berhad & Shell  
International exploration and production Inc.

Jørgen A. Bojesen-Koefoed, Michael B. W. Fyhn  
& Lars Henrik Nielsen

GEOLOGICAL SURVEY OF DENMARK AND GREENLAND  
DANISH MINISTRY OF CLIMATE, ENERGY AND BUILDING



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## **1. Introduction**

This report tabulates organic geochemical screening data for samples collected from outcrops in southern Vietnam and Cambodia during various fieldtrips as listed below, and from the ENRECA-2 corehole (37 samples) drilled on Phu Quoc Island (Vietnam) in 2006. Sampling locations are shown in Fig. 1.1, and tabulated in tables 1.1 and 1.2.

A total of 59 outcrop samples were collected:

- In 2005 during a reconnaissance trip to southern Vietnam and Phu Quoc Island as a preparatory for the drilling of the ENRECA-2 corehole in 2006
- In 2006 during a reconnaissance trip to Phu Quoc Island
- In 2008 during a ENRECA fieldwork on Hon Nge Island some distance west of Phu Quoc Island
- In 2012 during ENRECA fieldwork in southern Vietnam and Cambodia

Additional samples from the area were collected during the CCOP/ENRECA field trip to southern Cambodia in 2007. Data from these samples are reported separately by Bojesen-Koefoed et al. (2007), which is included as a pdf-file on the CD-ROM accompanying this report.

Data reported here include:

- TC, Total Carbon (wt-%)
- TOC, Total Organic Carbon (wt-%)
- TS, Total Sulphur (wt-%)
- Tmax (°C) from Rock-Eval type screening pyrolysis
- S1 (mg hydrocarbons/g rock) from Rock-Eval type screening pyrolysis
- S2 (mg hydrocarbons/g rock) from Rock-Eval type screening pyrolysis
- HI, Hydrogen Index from Rock-Eval type screening pyrolysis
- PI, Production Index from Rock-Eval type screening pyrolysis
- PC, Pyrolysable Carbon from Rock-Eval type screening pyrolysis

For definition of Rock-Eval parameters, see Espitalié et al. (1985a, b). Total Carbon (TC), Total Sulphur (TS) and Total Organic Carbon (TOC) contents were determined by combustion, using a LECO CS-200 induction furnace. TOC was determined after treatment of the sample with hot hydrochloric acid. Rock-Eval type screening pyrolysis was carried out using a Humble Instruments and Services Source Rock analyzer, calibrated by the IFP 160000 standard and operated in accordance with the Rock-Eval cycle 1 pyrolysis

program. Test have shown that data obtained by the source rock analyzer when operated as stated are identical to results obtained by Rock-Eval 6 analysis.

Except for two coal samples collected on Phu Quoc Island, all samples are low or very low in organic Carbon (fig. 1.2), and show low pyrolysis yields (fig. 1.3). Except for the coal samples mentioned only two samples yield TOC>1%. Likewise, except for the two coal samples, only one sample yields S<sub>2</sub>>1 mg HC/g. Despite generally low pyrolysis yields, a few samples seem to show non-zero values of HI (fig. 1.4). Except for the coals, such HI-values are mostly technical artifacts resulting from dividing one small number (S<sub>2</sub>) by another small number (TOC) and multiplying the result by 100 to calculate HI.

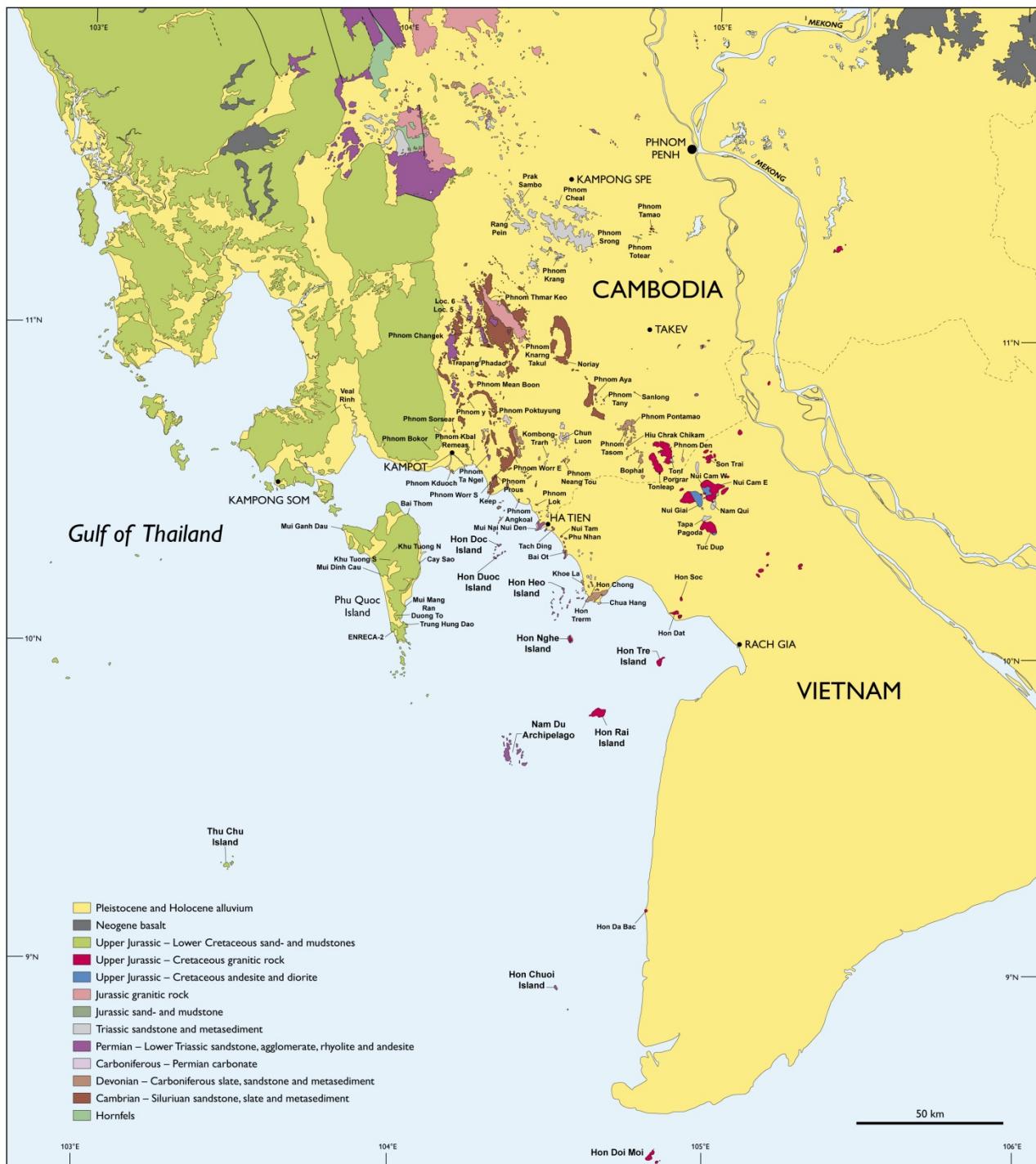


Fig. 1.1 Location map.

Outcrop samples							
Lab. #	Sample #	Locality	Latitude N	Longitude E	Exposure	Lithology	Expected age
23245	538303	Phu Quoc Khu Tuong N	10°17'37.7"	103°58'53.4"	Road cut	Mudstone	Cretaceous
23246	538306	Phu Quoc Khu Tuong N	10°17'37.7"	103°58'53.4"	Road cut	Mudstone	Cretaceous
23247	538312	Phu Quoc Khu Tuong N	10°17'37.7"	103°58'53.4"	Road cut	Mudstone	Cretaceous
23248	538381	Sanlong	10°47'56.8"	104°45'12.14"	Quarry	Slate	Triassic?
23249	538382	Sanlong	10°47'56.8"	104°45'12.14"	Quarry	Slate	Triassic?
23250	538387	Chun Luon	10°41'04.2"	104°31'44.0"	Quarry	Carbonate	Permian
23251	538388	Chun Luon	10°41'04.2"	104°31'44.0"	Quarry	Carbonate/sandy marl	Permian
23252	538389	Chun Luon	10°41'04.2"	104°31'44.0"	Quarry	Carbonate	Permian
23253	538396	Kombongtranh	10°34'23.4"	104°28'26.5"	Quarry	Carbonate	Permian
23254	538708	Phnom Lok	10°26'56.3"	104°26'36.8"	Quarry	Sandstone	Devonian?
23255	538714	Phnom Kbal Remeas	10°37'02.3"	104°14'36.1"	Quarry	Carbonate	Permian
23256	538715	Phnom Kbal Remeas	10°37'02.3"	104°14'36.1"	Quarry	Carbonate	Permian
23257	538716	Phnom Kbal Remeas	10°37'02.3"	104°14'36.1"	Quarry	Carbonate	Permian
23258	538738	Vealrinh	10°43'33.5"	103°47'50.2"	Road cut	Mudstone	Cretaceous
23259	538740	Vealrinh	10°43'33.5"	103°47'50.2"	Road cut	Mudstone	Cretaceous
23260	538741	Vealrinh	10°43'33.5"	103°47'50.2"	Road cut	Mudstone	Cretaceous
23261	538742	Vealrinh	10°43'33.5"	103°47'50.2"	Road cut	Mudstone	Cretaceous
23262	538743	Vealrinh	10°43'33.5"	103°47'50.2"	Road cut	Mudstone	Cretaceous
23263	538744	Vealrinh	10°43'33.5"	103°47'50.2"	Road cut	Mudstone	Cretaceous
23264	538746	Vealrinh	10°43'38.4"	103°47'40.1"	Cliffs	Mudstone	Cretaceous
23265	538748	Vealrinh	10°43'33.5"	103°47'50.2"	Cliffs	Mudstone	Cretaceous
23266	538750	Rang Pein	11°22'41.1"	104°21'05.6"	Quarry	Schist	Triassic
23267	538752	Prak Sambo	11°23'55.6"	104°23'13.7"	Quarry	Schist	Triassic
23268	538755	Phnom Cheal	10°15'56.87"	104°26'36.8"	Quarry	Schist	Triassic
23269	538759	Phnom Srong	11°15'55.5"	104°36'34.9"	Quarry	Schist	Triassic
23270	538760	Phnom Srong	11°15'55.5"	104°36'34.9"	Quarry	Schist	Triassic
23271	538817	Phnom Sorsear	10°34'01.4"	104°17'03.6"	Quarry	Carbonate	Permian
23272	538825	Phnom Bokor	10°36'24.8"	104°05'07.1"	Road cut	Mudstone	Lower Cretaceous
23273	538826	Phnom Bokor	10°36'22.5"	104°05'12.3"	Road cut	Mudstone	Lower Cretaceous
23274	538827	Phnom Bokor	10°36'21.8"	104°05'49.0"	Road cut	Mudstone	Lower Cretaceous
23275	538828	Phnom Bokor	10°36'23.7"	104°05'22.3"	Road cut	Mudstone	Lower Cretaceous
23276	538829	Phnom Bokor	10°06'26.1"	104°05'24.1"	Road cut	Mudstone	Lower Cretaceous
23277	538830	Phnom Bokor	10°36'29.2"	104°04'21.5"	Road cut	Mudstone	Lower Cretaceous
23278	538832	Phnom Bokor	10°36'20.1"	104°05'41.2"	Road cut	Mudstone	Lower Cretaceous
23279	538835	Phnom Bokor	10°36'28.1"	104°06'15.2"	Road cut	Mudstone	Lower Cretaceous
23280	538837	Phnom Bokor	10°37'06.0"	104°05'41.0"	Road cut	Mudstone	Lower Cretaceous
23281	538843	Phnom Bokor	10°37'09.3"	104°05'47.5"	Road cut	Mudstone	Lower Cretaceous
23282	538844	Phnom Bokor	10°37'15.9"	104°04'37.6"	Road cut	Mudstone	Lower Cretaceous
23283	538845	Phnom Bokor	10°37'15.9"	104°04'37.6"	Road cut	Mudstone	Lower Cretaceous
23284	538848	Phnom Bokor	10°37'09.9"	104°05'08.2"	Road cut	Mudstone	Lower Cretaceous
23285	538849	Phnom Bokor	10°37'25.6"	104°04'08.3"	Road cut	Mudstone	Lower Cretaceous
23286	538850	Phnom Bokor	10°37'23.1"	104°05'80.9"	Road cut	Mudstone	Lower Cretaceous
23287	538851	Phnom Bokor	10°37'36.7"	104°05'35.5"	Road cut	Mudstone	Lower Cretaceous
23288	538852	Phnom Bokor	10°37'28.0"	104°05'47.1"	Road cut	Mudstone	Lower Cretaceous
23289	538853	Phnom Bokor	10°37'49.5"	104°05'17.4"	Road cut	Mudstone	Lower Cretaceous
23290	538854	Phnom Bokor	10°37'42.9"	104°05'34.0"	Road cut	Mudstone	Lower Cretaceous
23291	538855	Phnom Bokor	10°37'42.9"	104°05'34.0"	Road cut	Mudstone	Lower Cretaceous
12739	07-03-06-01	Phu Quoc Island	*	*	Road cut	Mudstone	Lower Cretaceous
12740	11-03-06-01	Phu Quoc Island	*	*	Road cut	Coal	Lower Cretaceous
12741	11-03-06-02	Phu Quoc Island	*	*	Road cut	Mudstone	Lower Cretaceous
12742	11-03-06-03	Phu Quoc Island	*	*	Road cut	Mudstone	Lower Cretaceous
12743	11-03-06-04	Phu Quoc Island	*	*	Road cut	Mudstone	Lower Cretaceous
12744	11-03-06-06	Phu Quoc Island	*	*	Road cut	Mudstone	Lower Cretaceous
11284	16-01-2005-01	Ba Hón	10°12'34.1"	104°35'35.5"	Coastal outcrop	Grey Carbonate	Permian
11285	17-01-2005-01	Phu Quoc Island	10°17'24.7"	103°58'21.8"	Excavation	Coal	Lower Cretaceous
15432	453018	Hon Nge Island	10°02'09".90	104°32'54".35	Coastal outcrop	Mudstone	Triassic
15433	453019	Hon Nge Island	10°02'09".77	104°32'53".79	Coastal outcrop	Mudstone	Triassic
15434	453021	Hon Nge Island	10°02'09".38	104°32'53".04	Coastal outcrop	Mudstone	Triassic
15435	453024	Hon Nge Island	10°02'07".10	104°32'51".13	Coastal outcrop	Mudstone	Triassic

\* Collected from small road cuts exposing the Phu Quoc Fm in the southern and middle part of the Phu Quoc Island during reconnaissance trip in 2006, no coordinates available

Table 1.1.

**Core samples, Phu Quoc Island**

Locality	Lab. #	Depth (m)	Latitude N	Longitude E	Exposure	Lithology	Expected age
ENRECA-2 drillsite	12745	15,50	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12746	16,60	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12747	27,45	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12748	36,00	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12749	56,30	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12750	68,80	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12751	78,40	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12752	93,60	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12753	128,50	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12754	137,70	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12755	138,25	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12756	140,70	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12757	155,05	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12758	155,80	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12759	157,05	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12760	159,25	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12761	213,95	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12762	219,60	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12763	233,75	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12764	281,30	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12765	314,85	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12766	315,45	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12767	316,45	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12768	349,30	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12769	352,00	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12770	382,90	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12771	391,70	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12772	395,00	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12773	398,10	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12774	405,60	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12775	411,50	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12776	455,05	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12777	460,40	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12778	484,40	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12779	495,10	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12780	500,00	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous
ENRECA-2 drillsite	12781	501,05	10°02'48"	103°59'59"	Core	Mudstone	Cretaceous

Table 1.2.

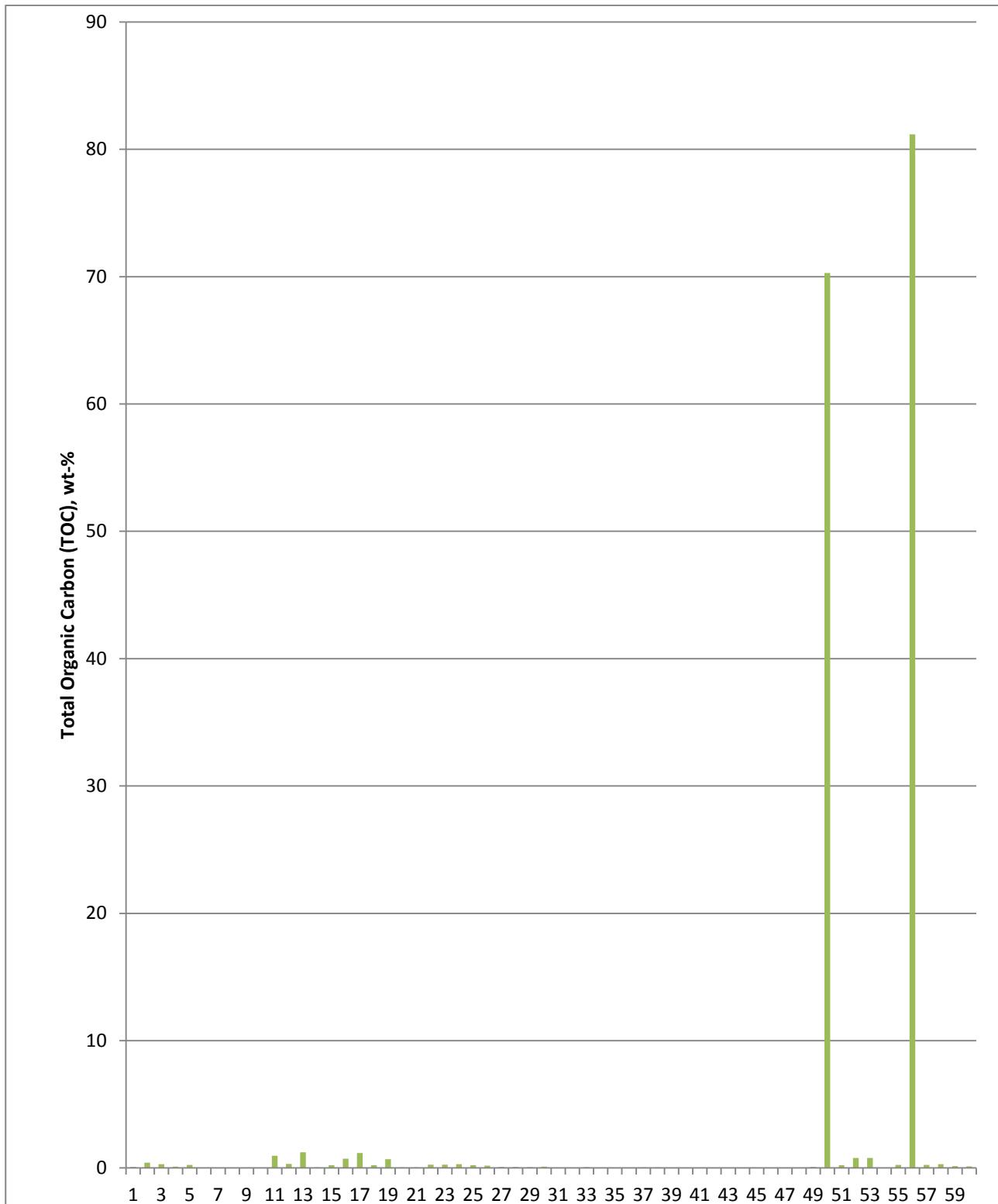


Fig. 1.2 TOC for all outcrop samples. Note only two coal samples from Phu Quoc Island yield TOC levels significantly larger than 1%

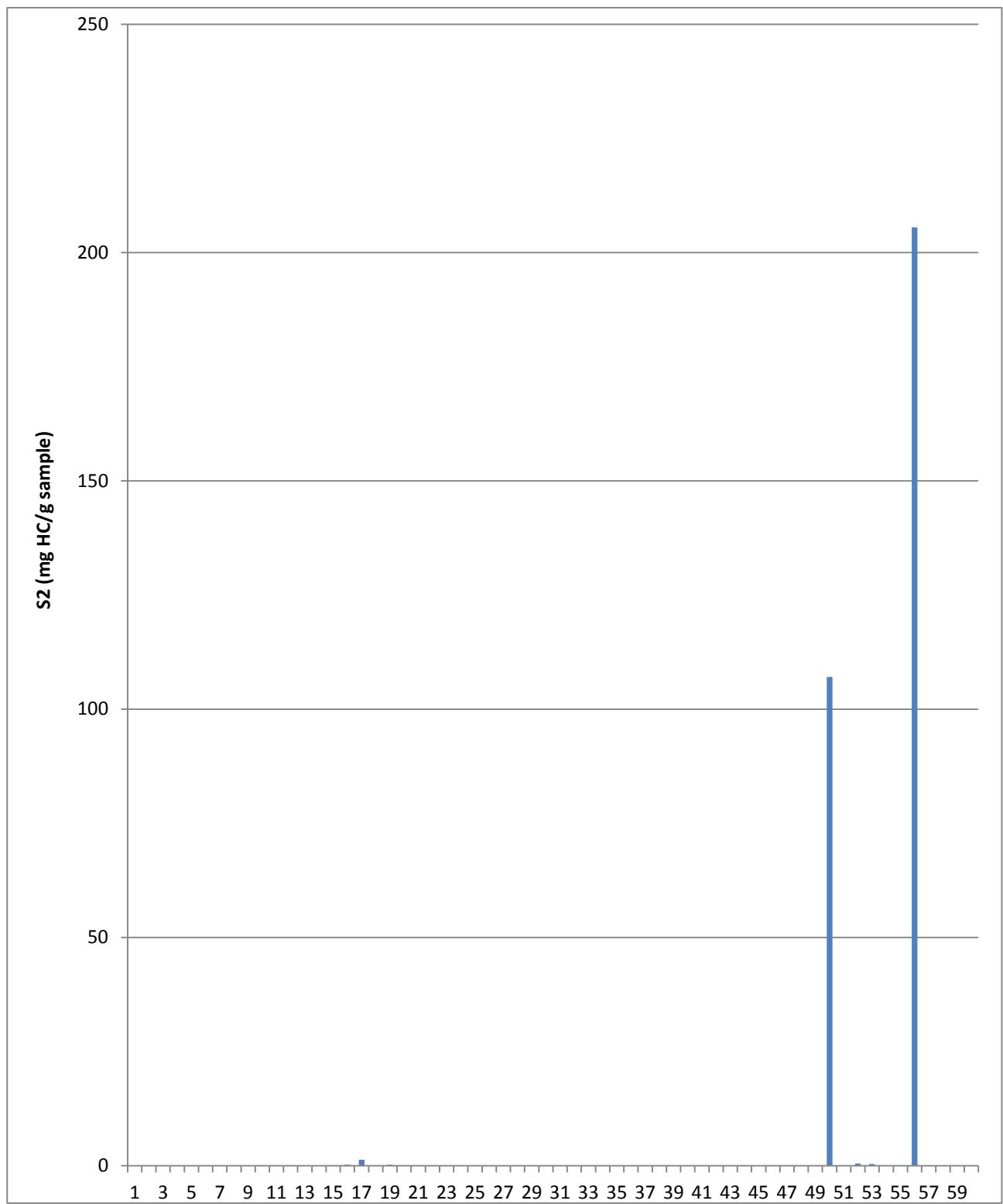


Fig. 1.3. S2 for all outcrop samples. Note only two coal samples from Phu Quoc Island yield S" significantly larger than 1 mg/g

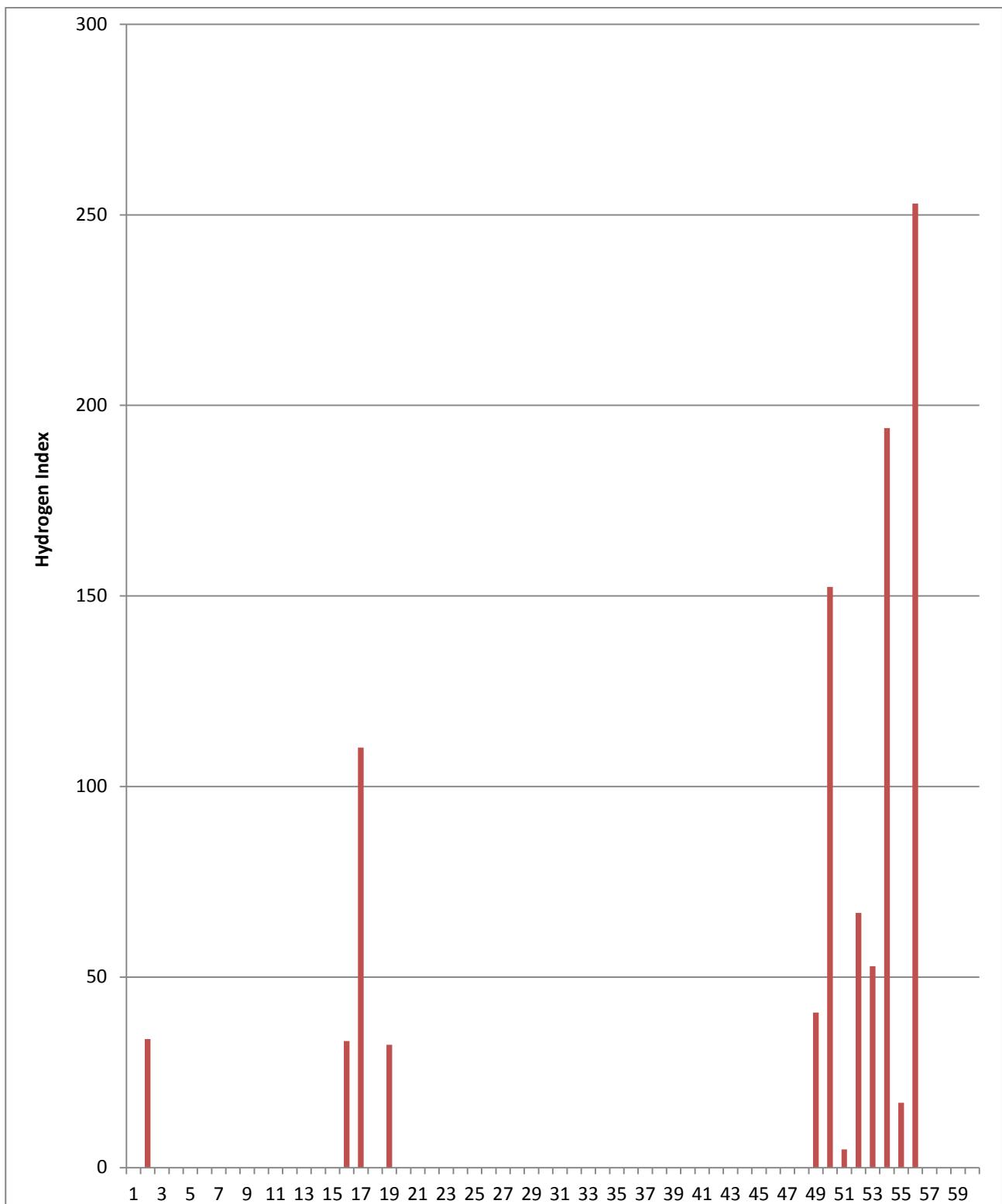


Fig. 1.4 HI for all outcrop samples. Except for two coal samples from Phu Quoc Island most non-zero values are artifacts, see text and tables.

## 2. Samples from southern Vietnam

Samples from southern Vietnam include a series of drillcore samples collected from the ENRECA-2 corewell drilled on Phu Quoc Island plus a small number of outcrop samples collected during fieldtrip in 2005, 2006, 2008 and 2012.

Data on samples from the ENRECA-2 corehole are tabulated in Table 2.1. A sedimentological log of the ENRECA-2 core is shown in fig. 2.1a,b. Plots of data versus depth, Tmax vs. HI and TOC vs. S2 are shown in figs 2.2 – 2.4

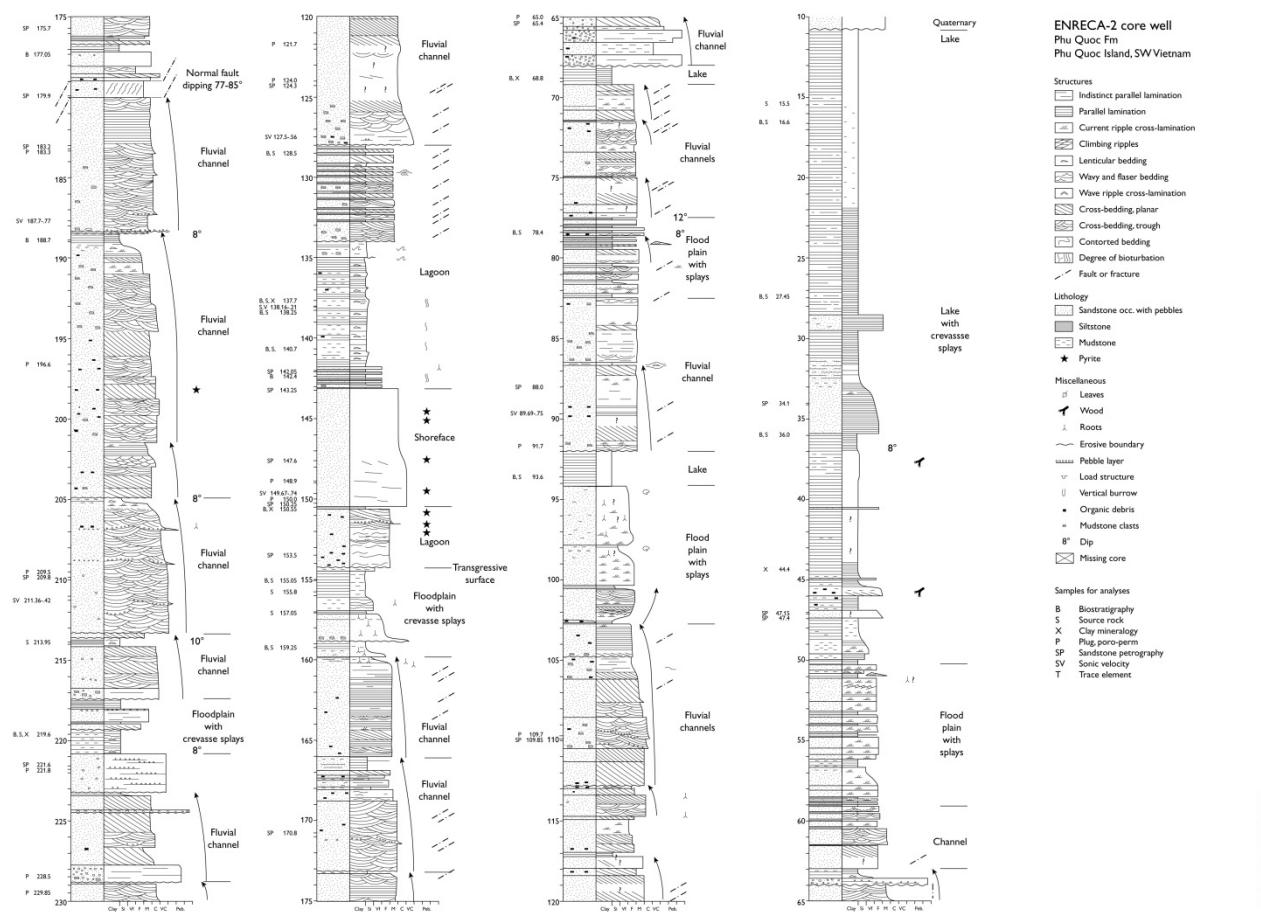


Fig 2.1a Sedimentological log of the ENRECA-2 core, upper part

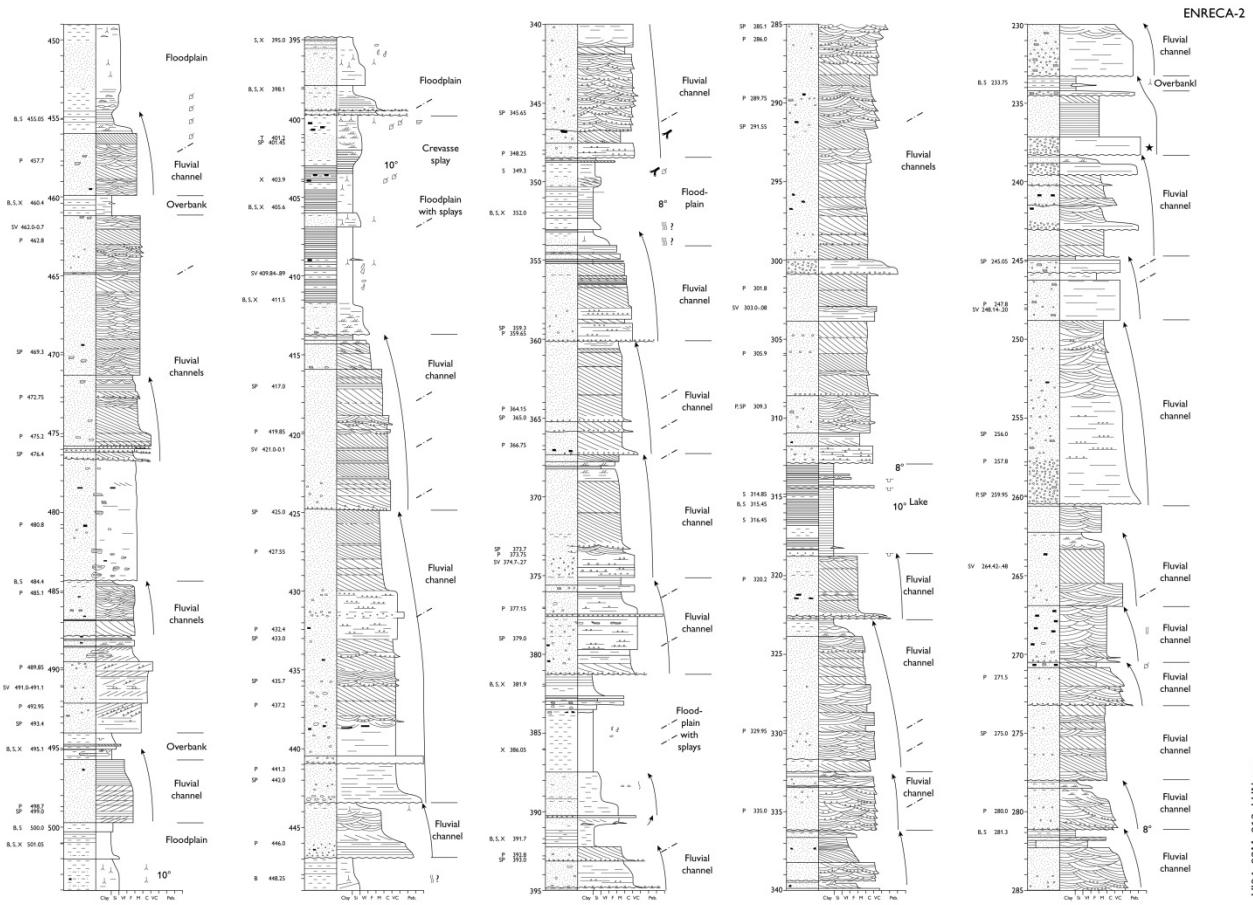


Fig 2.1b Sedimentological log of the ENRECA-2 core, deeper part

**Core samples, Phu Quoc Island**

Locality	Country	Lab. #	Depth (m) #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
ENRECA-2 drillsite	Vietnam	12745	15,50	0,02	0,01	0,01	514	0,00	0,00	0	0,00	0,00
ENRECA-2 drillsite	Vietnam	12746	16,60	0,01	0,09	0,01	477	0,00	0,01	85	0,00	0,00
ENRECA-2 drillsite	Vietnam	12747	27,45	0,05	0,11	0,03	305	0,18	0,05	107	0,78	0,02
ENRECA-2 drillsite	Vietnam	12748	36,00	0,13	0,03	0,20	463	0,00	0,01	8	0,00	0,00
ENRECA-2 drillsite	Vietnam	12749	56,30	0,45	0,30	0,06	436	0,00	0,16	35	0,00	0,01
ENRECA-2 drillsite	Vietnam	12750	68,80	0,45	0,46	0,02	437	0,00	0,41	91	0,00	0,03
ENRECA-2 drillsite	Vietnam	12751	78,40	0,21	0,22	0,07	434	0,00	0,13	62	0,00	0,01
ENRECA-2 drillsite	Vietnam	12752	93,60	0,22	0,03	0,04	453	0,00	0,01	5	0,00	0,00
ENRECA-2 drillsite	Vietnam	12753	128,50	0,41	0,41	0,02	441	0,00	0,24	59	0,00	0,02
ENRECA-2 drillsite	Vietnam	12754	137,70	0,18	0,51	0,04	443	0,00	0,09	49	0,00	0,01
ENRECA-2 drillsite	Vietnam	12755	138,25	0,36	0,52	0,07	443	0,00	0,23	64	0,00	0,02
ENRECA-2 drillsite	Vietnam	12756	140,70	0,36	0,39	0,06	439	0,00	0,22	61	0,00	0,02
ENRECA-2 drillsite	Vietnam	12757	155,05	0,03	0,21	0,04	443	0,00	0,01	37	0,00	0,00
ENRECA-2 drillsite	Vietnam	12758	155,80	0,02	0,16	0,11	290	0,05	0,01	40	0,83	0,00
ENRECA-2 drillsite	Vietnam	12759	157,05	0,54	0,67	0,03	440	0,01	0,42	77	0,02	0,04
ENRECA-2 drillsite	Vietnam	12760	159,25	0,02	0,06	0,19	318	0,00	0,00	0	0,00	0,00
ENRECA-2 drillsite	Vietnam	12761	213,95	0,64	0,65	0,03	439	0,01	0,53	82	0,02	0,04
ENRECA-2 drillsite	Vietnam	12762	219,60	0,94	1,13	0,03	443	0,00	0,77	82	0,00	0,06
ENRECA-2 drillsite	Vietnam	12763	233,75	0,11	0,17	0,06	443	0,07	0,04	38	0,64	0,01
ENRECA-2 drillsite	Vietnam	12764	281,30	0,85	0,98	0,04	443	0,90	1,02	120	0,47	0,16
ENRECA-2 drillsite	Vietnam	12765	314,85	0,79	2,33	0,02	440	0,29	0,62	79	0,32	0,08
ENRECA-2 drillsite	Vietnam	12766	315,45	0,61	0,74	0,03	439	0,28	0,42	69	0,40	0,06
ENRECA-2 drillsite	Vietnam	12767	316,45	0,40	0,95	0,02	441	0,02	0,24	60	0,08	0,02
ENRECA-2 drillsite	Vietnam	12768	349,30	0,03	0,05	0,02	355	0,00	0,01	30	0,00	0,00
ENRECA-2 drillsite	Vietnam	12769	352,00	0,03	0,03	0,00	524	0,00	0,00	0	0,00	0,00
ENRECA-2 drillsite	Vietnam	12770	382,90	0,08	0,09	0,03	518	0,00	0,00	0	0,00	0,00
ENRECA-2 drillsite	Vietnam	12771	391,70	0,04	0,10	0,01	298	0,36	0,08	178	0,82	0,04
ENRECA-2 drillsite	Vietnam	12772	395,00	0,05	0,06	0,01	310	0,14	0,04	88	0,78	0,01
ENRECA-2 drillsite	Vietnam	12773	398,10	0,04	0,03	0,00	348	0,00	0,00	0	0,00	0,00
ENRECA-2 drillsite	Vietnam	12774	405,60	0,06	0,11	0,01	303	0,20	0,05	81	0,80	0,02
ENRECA-2 drillsite	Vietnam	12775	411,50	0,05	0,04	0,02	513	0,00	0,00	0	0,00	0,00
ENRECA-2 drillsite	Vietnam	12776	455,05	0,53	0,63	0,01	443	0,07	0,41	77	0,15	0,04
ENRECA-2 drillsite	Vietnam	12777	460,40	0,56	0,60	0,02	446	0,00	0,34	61	0,00	0,03
ENRECA-2 drillsite	Vietnam	12778	484,40	0,53	0,55	0,04	443	0,00	0,28	53	0,00	0,02
ENRECA-2 drillsite	Vietnam	12779	495,10	0,07	0,13	0,03	370	0,00	0,01	15	0,00	0,00
ENRECA-2 drillsite	Vietnam	12780	500,00	0,04	0,04	0,05	383	0,00	0,01	26	0,00	0,00
ENRECA-2 drillsite	Vietnam	12781	501,05	0,04	0,05	0,01	383	0,00	0,02	45	0,00	0,00

Table 2.1

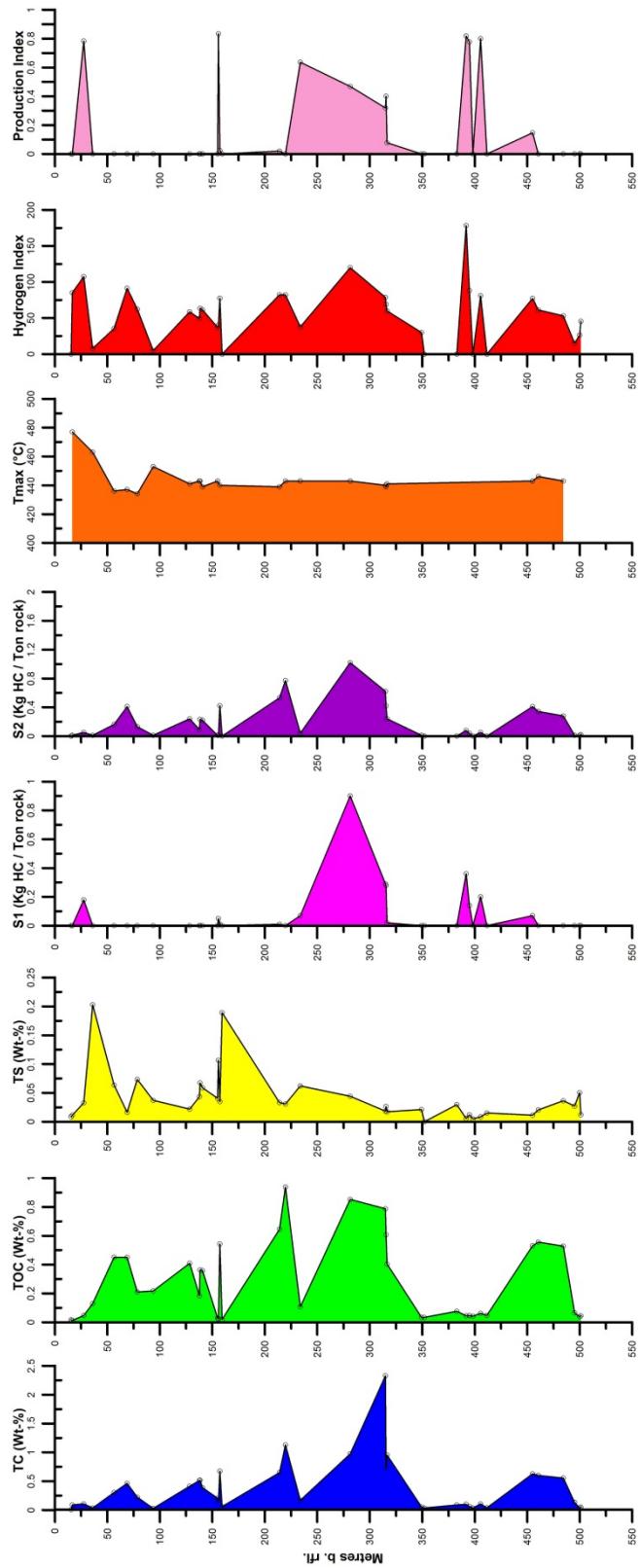


Fig. 2.2 Screening data from the ENRECA-2 corehole versus depth. Data are listed in table 2.1

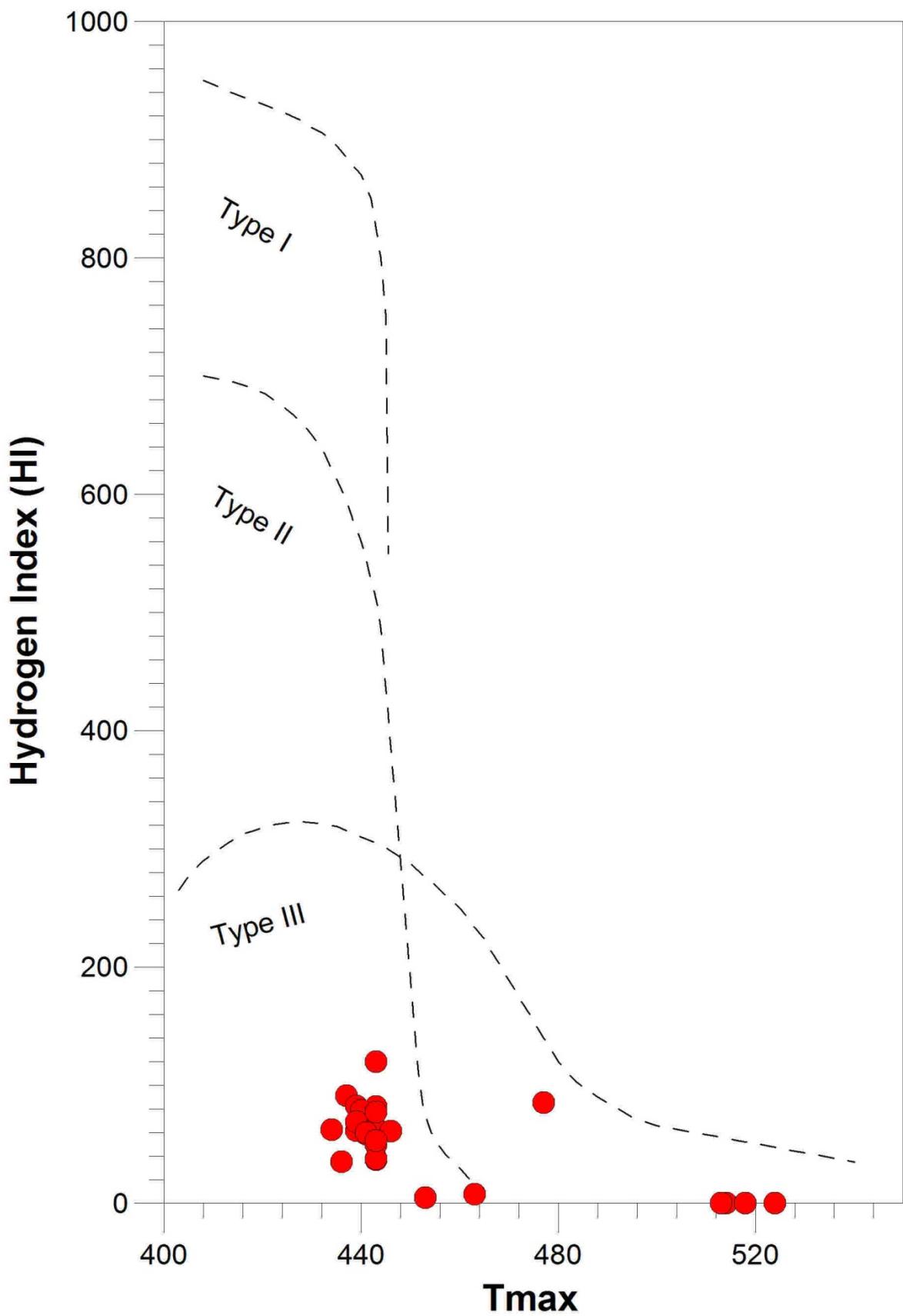


Fig. 2.3. Tmax versus HI for samples from the ENRECA-2 corehole. Data are listed in table 2.1

S2 (kg hydrocarbons/ton rock)

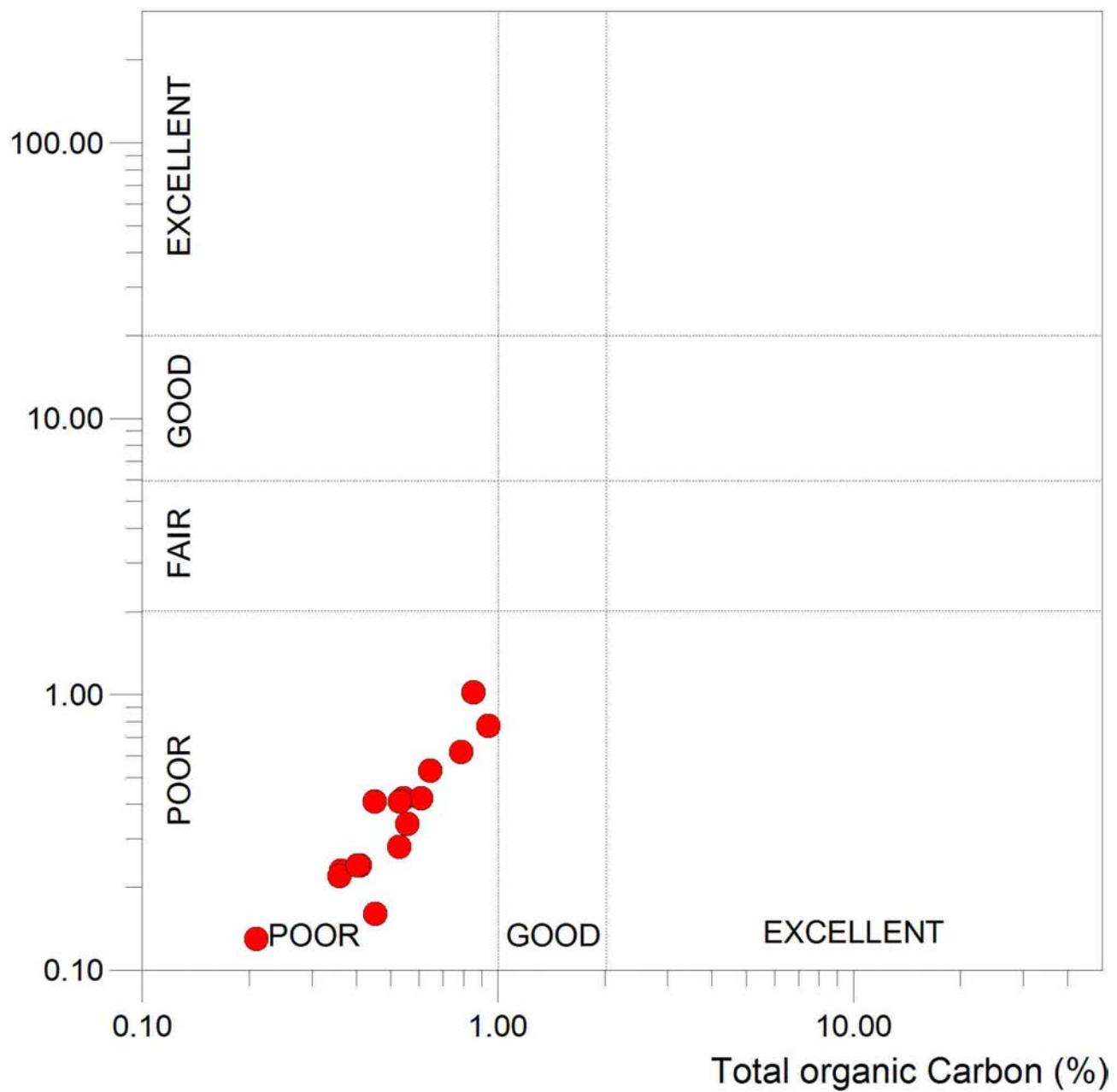


Fig. 2.4 TOC versus S2 for samples from the ENRECA-2 corehole. Data are listed in table 2.1

Outcrop samples (tables 2.2 – 2.5) analyzed are mostly very low in TOC and pyrolysis yield. Hence standard plots can only be prepared for part of the samples.

Outcrop samples, Phu Quoc Island and Ba Hón, collected 2005												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Ba Hón	Vietnam	11284	16-01-2005-01	0,24	10,96	0,01	479	0,01	0,04	17	0,20	0
Phu Quoc Island	Vietnam	11285	17-01-2005-01	81,17	78,99	0,44	424	0,78	205,53	253	0,00	17,12

Table 2.2

Outcrop samples, Phu Quoc Island, collected 2006												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phu Quoc Island	Vietnam	12739	07-03-06-01	0,07	0,08	0,02	475	0,01	0,03	41	0,25	0,00
Phu Quoc Island	Vietnam	12740	11-03-06-01	70,28	72,34	0,37	436	0,41	107,08	152	0,00	8,92
Phu Quoc Island	Vietnam	12741	11-03-06-02	0,21	0,24	0,01	499	0,05	0,01	5	0,83	0,00
Phu Quoc Island	Vietnam	12742	11-03-06-03	0,79	0,89	0,09	440	0,02	0,53	67	0,04	0,05
Phu Quoc Island	Vietnam	12743	11-03-06-04	0,78	0,86	0,02	438	0,02	0,41	53	0,05	0,04
Phu Quoc Island	Vietnam	12744	11-03-06-06	0,03	0,02	0,02	339	0,02	0,06	194	0,25	0,01

Table 2.3

Outcrop samples, Hon Nge Island, collected 2008												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Hon Nge Island	Vietnam	15432	453018	0,24	0,35	0,01	337	0,00	0,00			
Hon Nge Island	Vietnam	15433	453019	0,30	0,41	0,02	373	0,00	0,00			
Hon Nge Island	Vietnam	15434	453021	0,14	1,36	0,03	406	0,00	0,00			
Hon Nge Island	Vietnam	15435	453024	0,13	0,63	0,01	451	0,00	0,00			

Table 2.4

Outcrop samples, Phu Quoc Island, collected 2012												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phuquoc Khu Tuong N	Vietnam	23245	538303	0,08	0,13	0,02	465	0	0	0	-	
Phuquoc Khu Tuong N	Vietnam	23246	538306	0,41	0,45	0,03	438	0,03	0,14	34	0,18	0,01
Phuquoc Khu Tuong N	Vietnam	23247	538312	0,29	0,35	0,02	437	0,10	0	0	1	0,01

Table 2.5

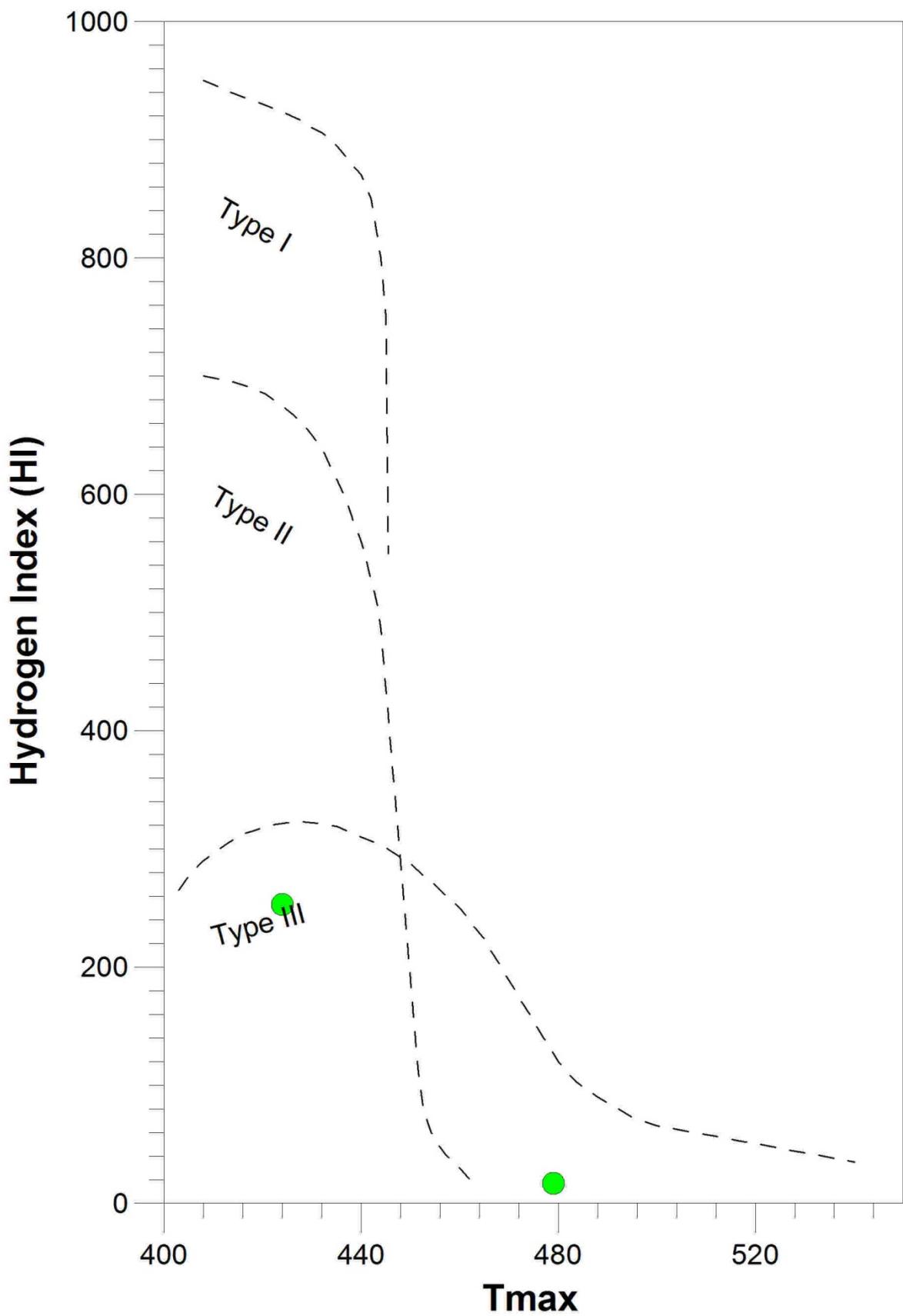


Fig. 2.5. Tmax versus HI for outcrop samples collected in 2005. Data are listed in table 2.2

S2 (kg hydrocarbons/ton rock)

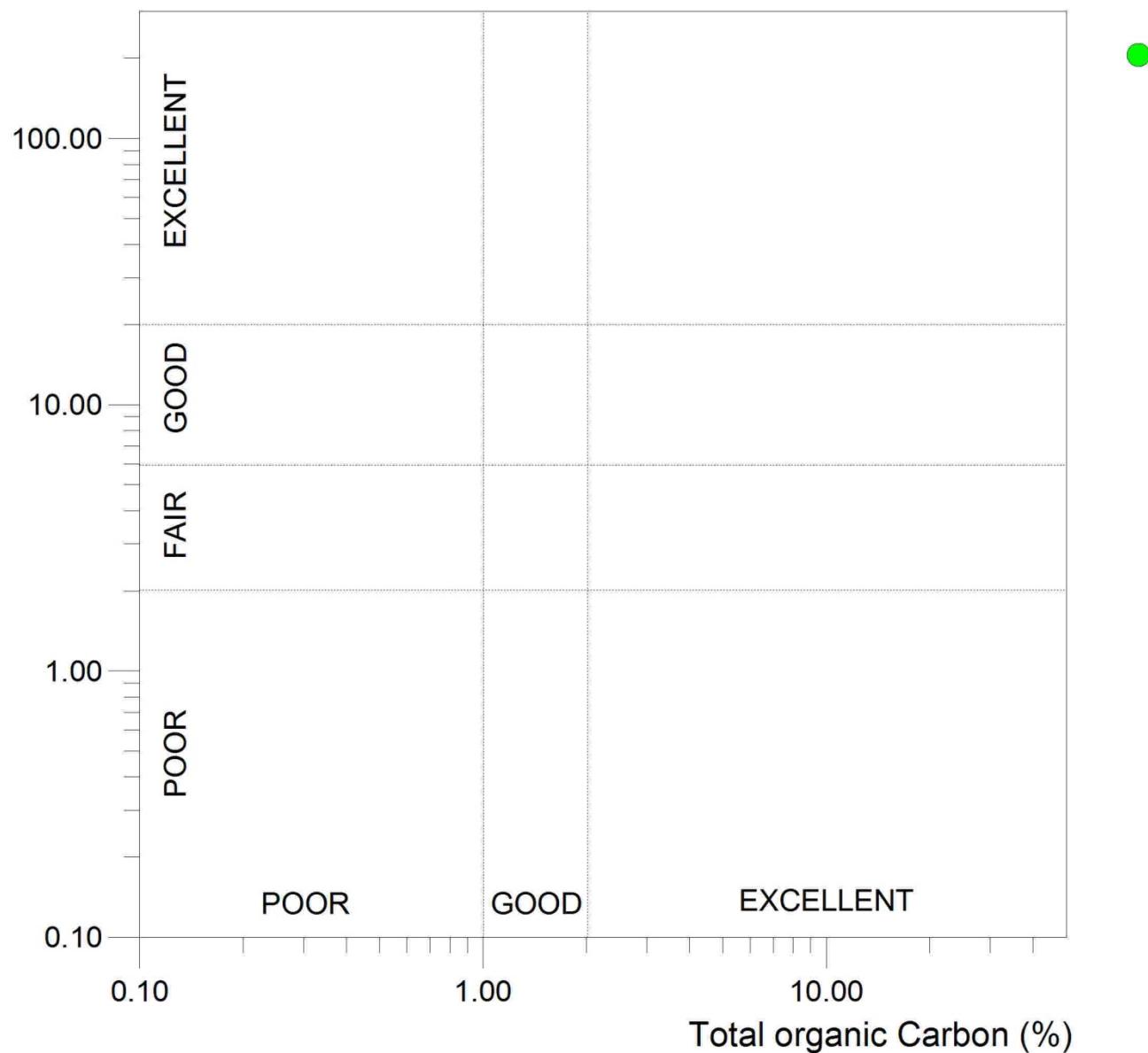


Fig. 2.6 TOC versus S2 for outcrop samples collected in 2005. Note that a coal sample from Phu Quoc Island falls outside the standard plot. Data are listed in table 2.2

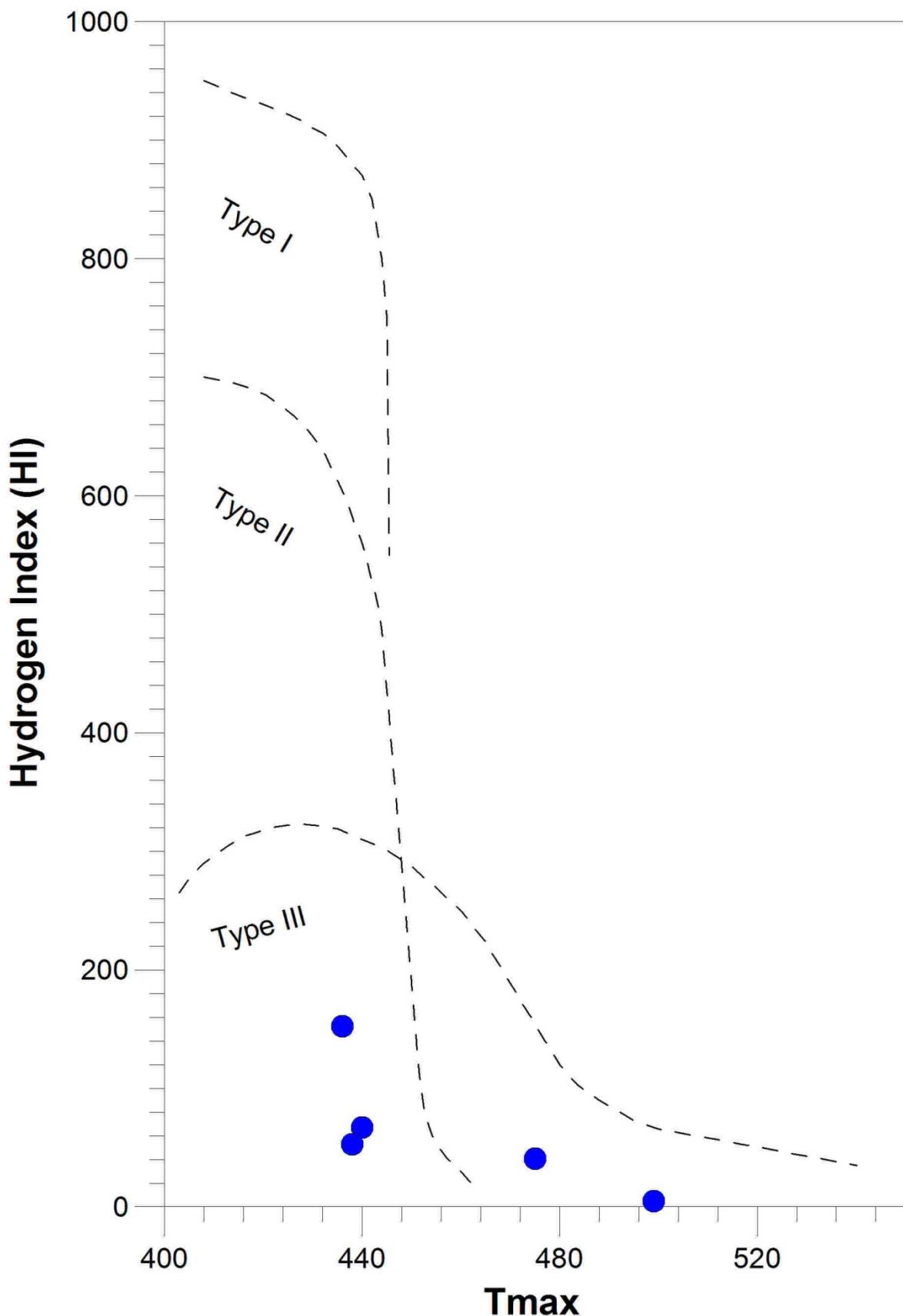


Fig. 2.7. Tmax versus HI for outcrop samples collected in 2006. Data are listed in table 2.3

S2 (kg hydrocarbons/ton rock)

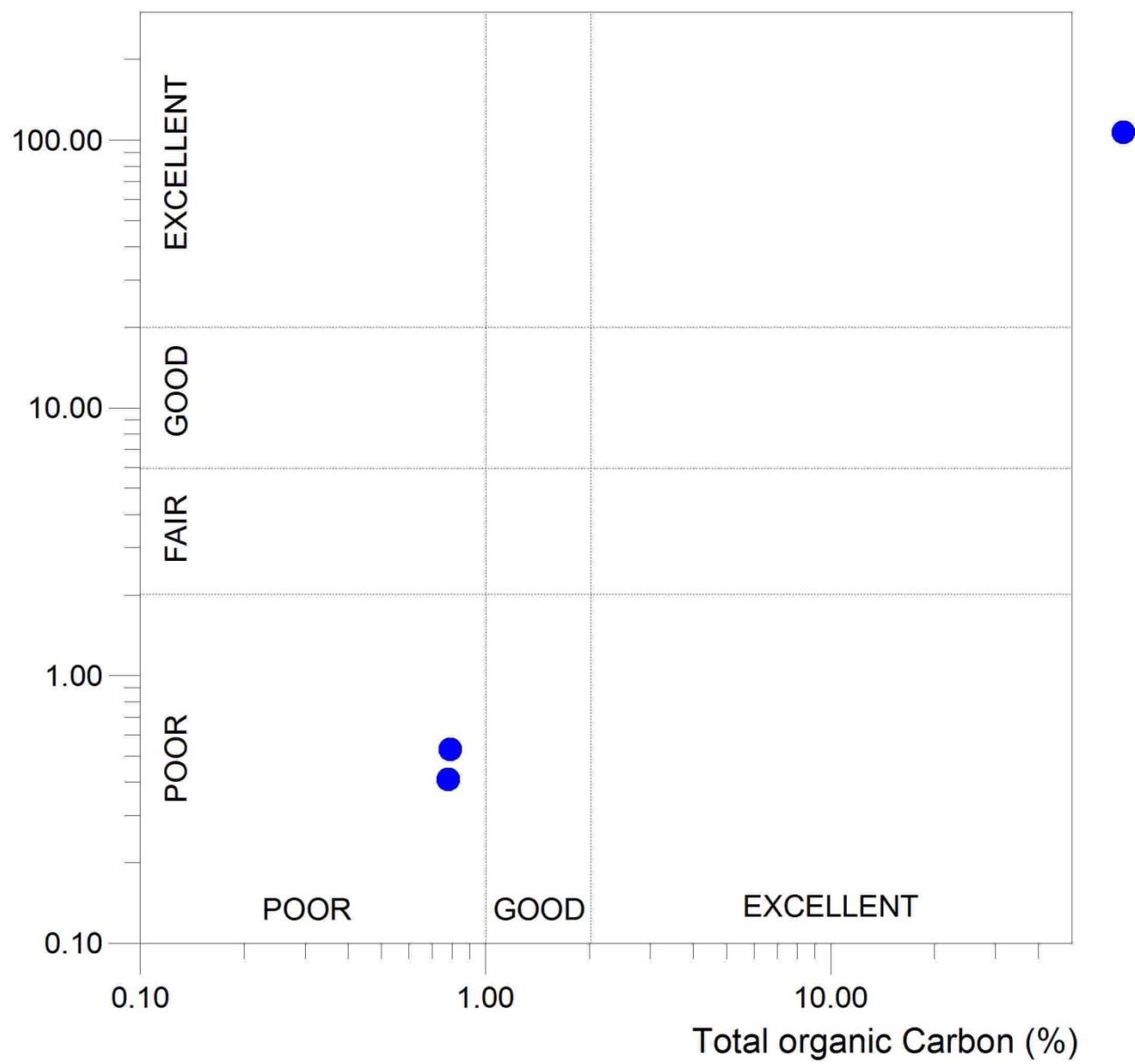


Fig. 2.8 TOC versus S2 for outcrop samples collected in 2006. Note that a coal sample from Phu Quoc Island falls outside the standard plot. Data are listed in table 2.3

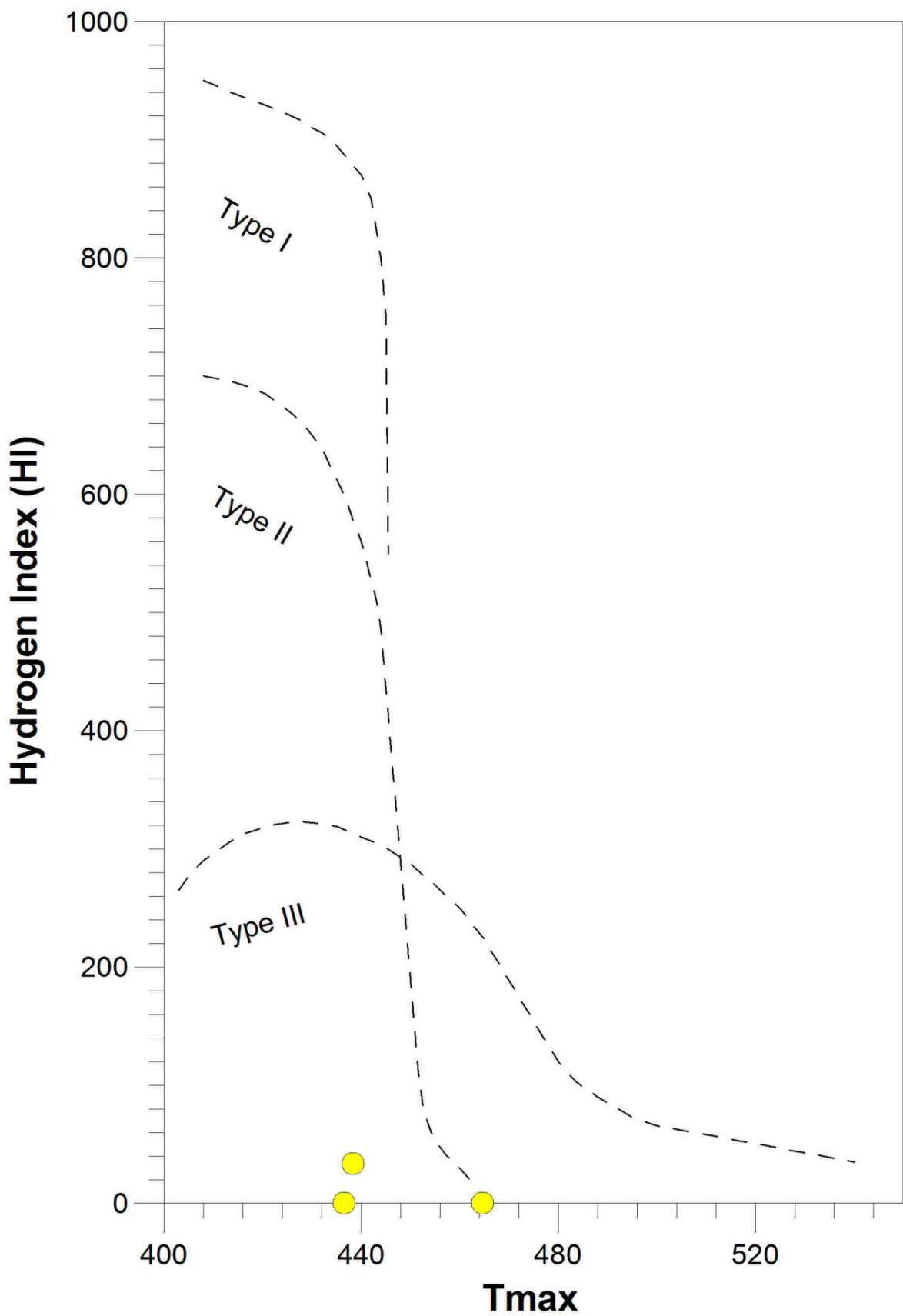


Fig. 2.9. Tmax versus HI for outcrop samples collected in 2012. Data are listed in table 2.5

S2 (kg hydrocarbons/ton rock)

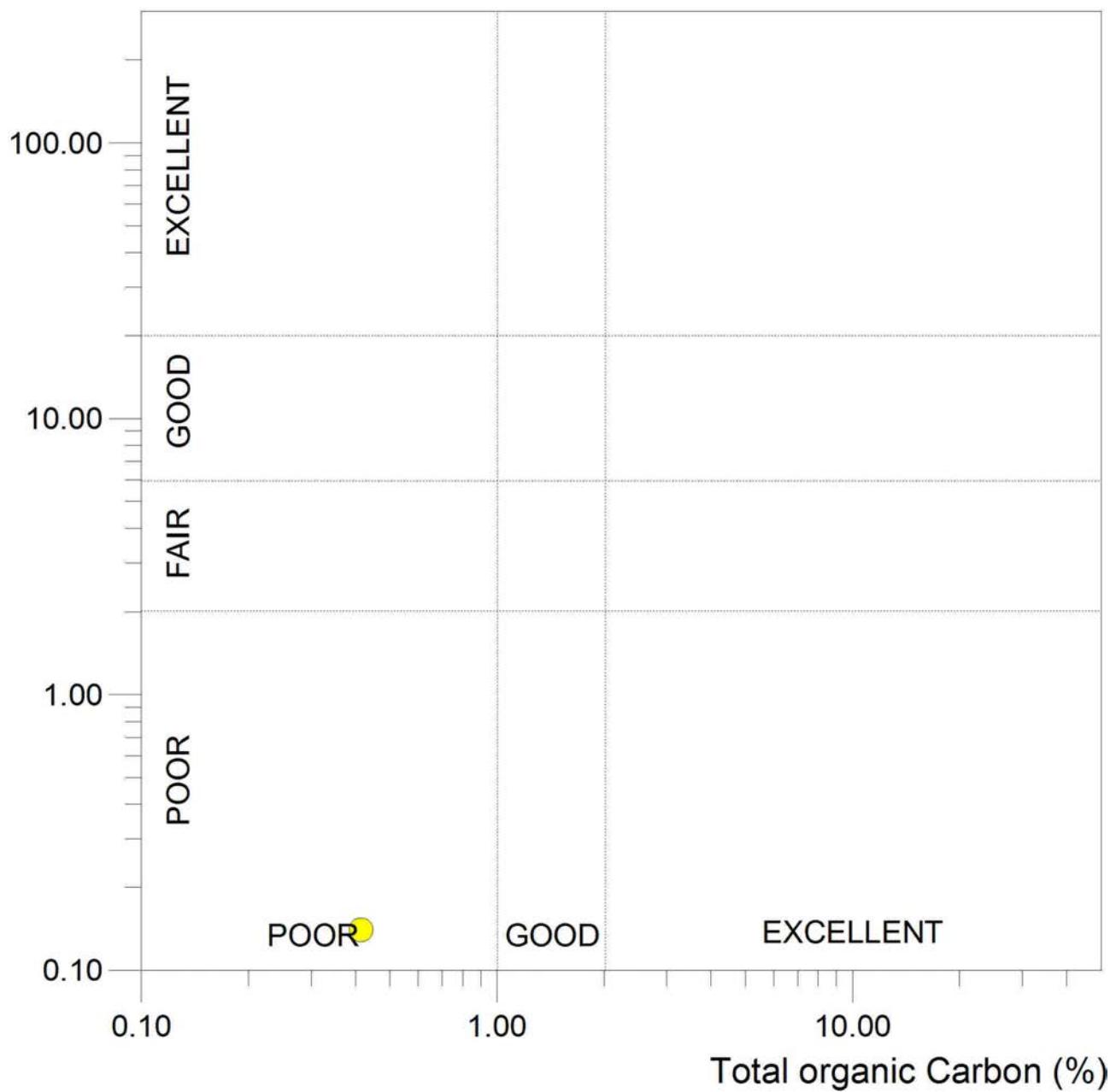


Fig. 2.10 TOC versus S2 for outcrop samples collected in 2012. Data are listed in table 2.3

### 3. Samples from Cambodia

Samples from Cambodia include a series outcrop samples collected during a fieldtrip 2012. Analysis data on additional samples from Cambodia are reported in Bojesen-Koefoed et al. (2007), a copy of which is included on the CD-ROM accompanying this report.

Outcrop samples (tables 3.1 – 3.12) analyzed are mostly very low in TOC and pyrolysis yield. Hence standard plots can only be prepared for samples from one locality.

Outcrop samples, Sanlong												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Sanlong	Cambodia	23248	538381	0,10	0,09	0,00	300	0,02	0	0	1	0,0017
Sanlong	Cambodia	23249	538382	0,24	0,23	0,00	303	0,01	0	0	1	0,0008

Table 3.1

Outcrop samples, Chun Luon												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Chun Luon	Cambodia	23250	538387	0,01	11,19	0,05	433	0	0	0	0	0
Chun Luon	Cambodia	23251	538388	0,00	0,63	0,00	531	0	0	0	0	0
Chun Luon	Cambodia	23252	538389	0,01	10,96	0,03	444	0	0	0	0	0

Table 3.2

Outcrop samples, Kombongtrah												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Kombongtrah	Cambodia	23253	538396	0,02	11,16	0,03	447	0	0	0	0	0

Table 3.3

Outcrop samples, Phnom Lok												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phnom Lok	Cambodia	23254	538708	0,01	0,08	0,00	425	0	0	0	0	0

Table 3.4

Outcrop samples, Phnom Kbal Remeas												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phnom Kbal Remeas	Cambodia	23255	538714	0,95	8,66	0,62	431	0	0	0	0	0
Phnom Kbal Remeas	Cambodia	23256	538715	0,31	7,89	0,62	429	0	0	0	0	0
Phnom Kbal Remeas	Cambodia	23257	538716	1,24	9,01	0,73	426	0	0	0	0	0

Table 3.5

**Outcrop samples, Vealrinh**

Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Vealrinh	Cambodia	23258	538738	0,05	0,07	0,22	451	0	0	0		0,00
Vealrinh	Cambodia	23259	538740	0,22	0,48	0,01	496	0,11	0	0	1	0,01
Vealrinh	Cambodia	23260	538741	0,72	0,86	0,01	440	0	0,24	33	0	0,02
Vealrinh	Cambodia	23261	538742	1,18	1,28	0,10	442	0	1,30	110	0	0,11
Vealrinh	Cambodia	23262	538743	0,23	0,28	0,01	448	0	0	0		0,00
Vealrinh	Cambodia	23263	538744	0,68	0,85	0,04	452	0	0,22	32	0	0,02
Vealrinh	Cambodia	23264	538746	0,04	0,09	0,01	462	0	0	0		0,00
Vealrinh	Cambodia	23265	538748	0,05	0,13	0,02	397	0	0	0		0,00

Table 3.6

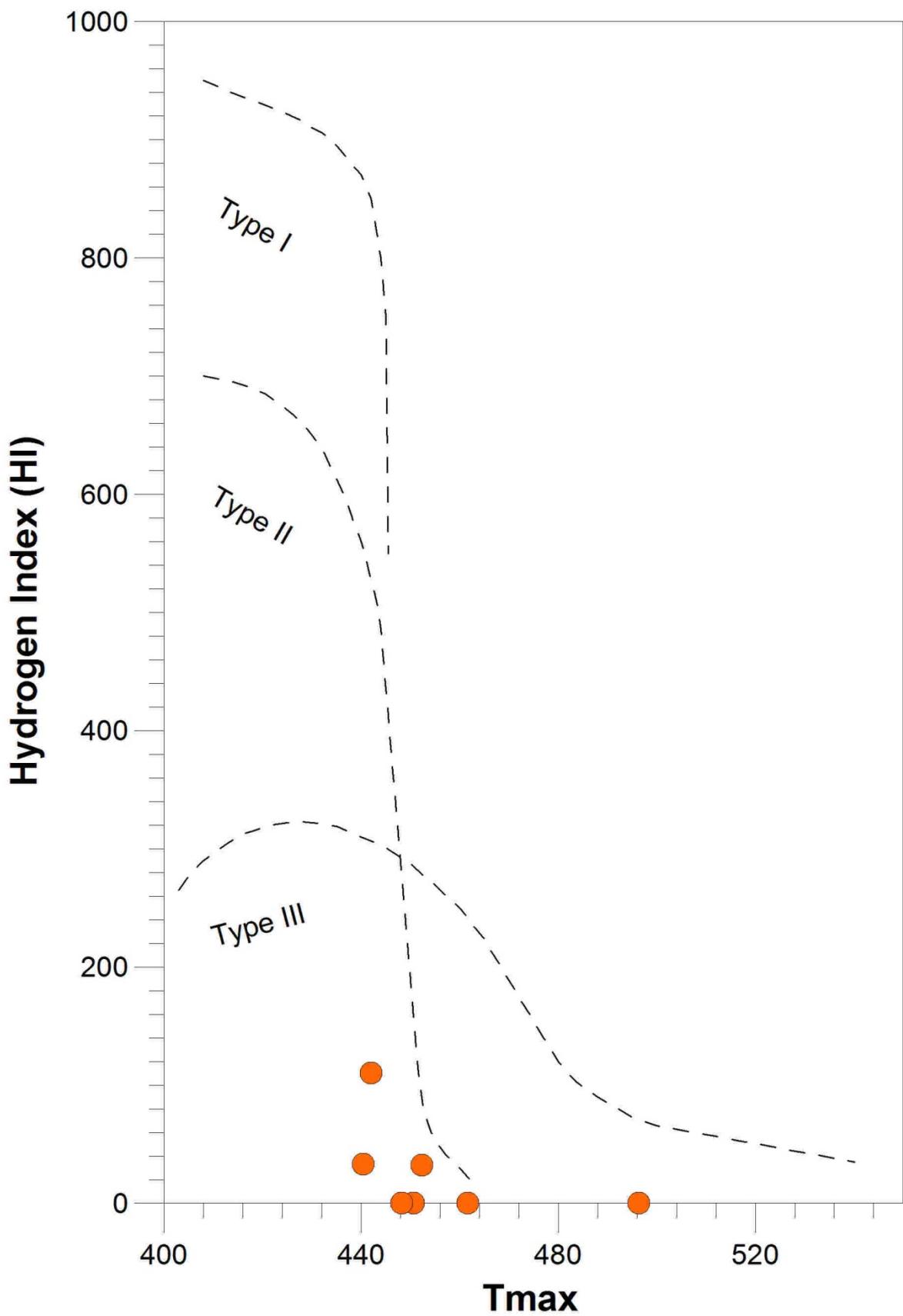


Fig. 3.1. Tmax versus HI for outcrop samples at Vielrinh in 2012. Data are listed in table 3.6

S2 (kg hydrocarbons/ton rock)

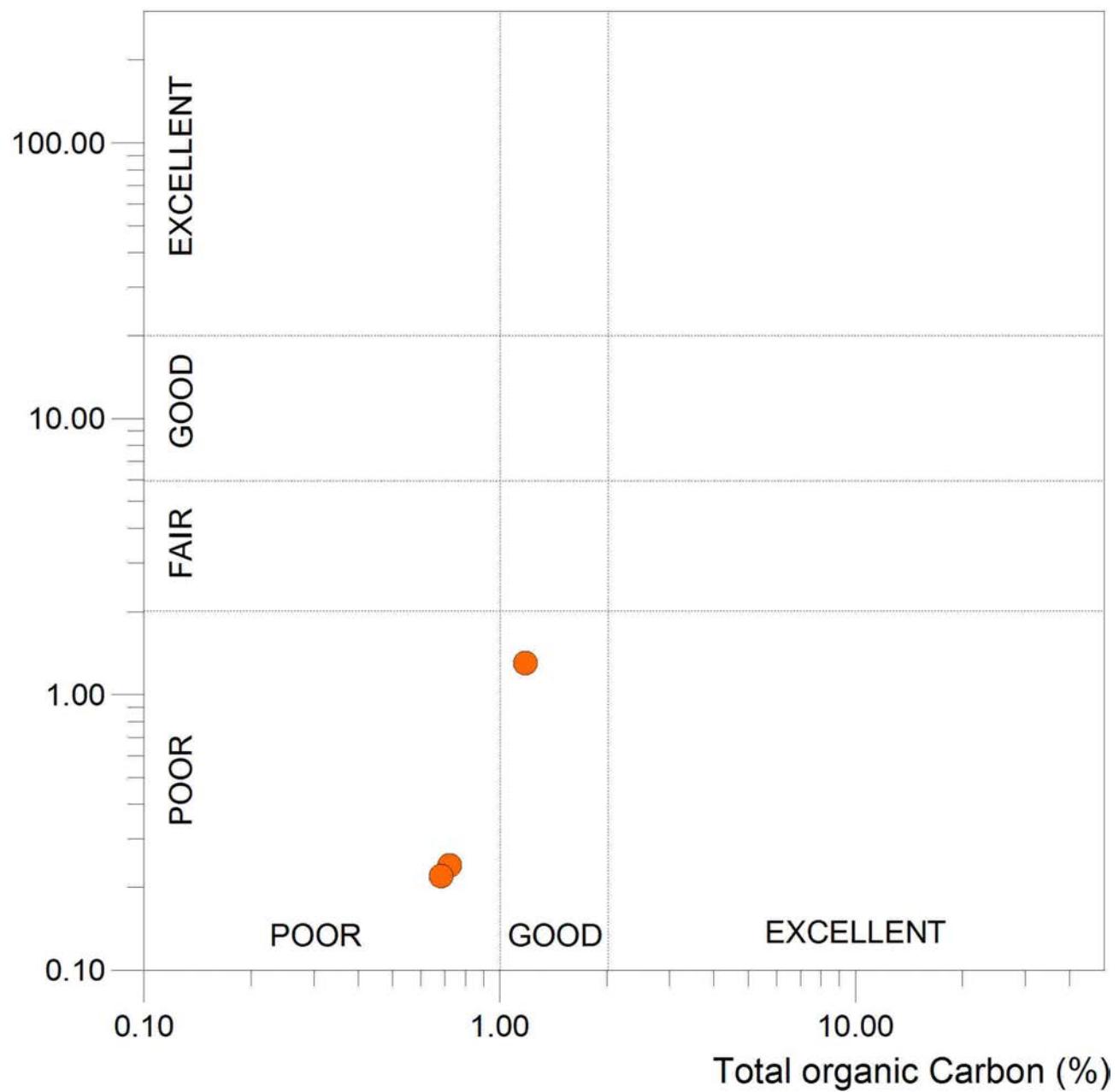


Fig. 3.2 TOC versus S2 for outcrop samples collected at Vielrinh in 2012. Data are listed in table 3.6

**Outcrop samples, Rang Pein**

Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Rang Pein	Cambodia	23266	538750	0,26	0,32	0,07	426	0	0	0	0	0

Table 3.7

**Outcrop samples, Prak Sambo**

Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Prak Sambo	Cambodia	23267	538752	0,25	0,62	0,05	419	0	0	0	0	0

Table 3.8

**Outcrop samples, Phnom Cheal**

Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phnom Cheal	Cambodia	23268	538755	0,30	0,45	0,01	420	0	0	0	0	0

Table 3.9

**Outcrop samples, Phnom Strong**

Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phnom Strong	Cambodia	23269	538759	0,23	0,84	0,34	422	0	0	0	0	0
Phnom Strong	Cambodia	23270	538760	0,19	0,53	0,28	425	0	0	0	0	0

Table 3.10

**Outcrop samples, Phnom Sorsear**

Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phnom Sorsear	Cambodia	23271	538817	0,08	11,18	0,04	444	0	0	0	0	0

Table 3.11

Outcrop samples, Phnom Bokor												
Locality	Country	Lab. #	Sample #	TOC (wt %)	TC (wt %)	TS (wt %)	Tmax (°C)	S1 (mg HC/g rock)	S2 (mg HC/g rock)	HI	PI	PC
Phnom Bokor	Cambodia	23272	538825	0,09	0,10	0,00	429	0	0	0	0	0,00
Phnom Bokor	Cambodia	23273	538826	0,07	0,12	0,00	462	0	0	0	0	0,00
Phnom Bokor	Cambodia	23274	538827	0,10	0,11	0,00	499	0,02	0	0	1	0,00
Phnom Bokor	Cambodia	23275	538828	0,00	0,05	0,02	268	0,02	0	0	1	0,00
Phnom Bokor	Cambodia	23276	538829	0,01	0,04	0,01	541	0,02	0	0	1	0,00
Phnom Bokor	Cambodia	23277	538830	0,07	0,04	0,00	397	0	0	0	0	0,00
Phnom Bokor	Cambodia	23278	538832	0,00	0,02	0,01	436	0	0	0	0	0,00
Phnom Bokor	Cambodia	23279	538835	0,03	0,05	0,00	488	0,01	0	0	1	0,00
Phnom Bokor	Cambodia	23280	538837	0,00	0,04	0,01	387	0	0	0	0	0,00
Phnom Bokor	Cambodia	23281	538843	0,04	0,06	0,00	549	0	0	0	0	0,00
Phnom Bokor	Cambodia	23282	538844	0,04	0,08	0,01	413	0	0	0	0	0,00
Phnom Bokor	Cambodia	23283	538845	0,00	0,35	0,01	411	0,02	0	0	1	0,00
Phnom Bokor	Cambodia	23284	538848	0,00	0,15	0,01	319	0,44	0	0	1	0,04
Phnom Bokor	Cambodia	23285	538849	0,00	0,05	0,00	372	0	0	0	0	0,00
Phnom Bokor	Cambodia	23286	538850	0,01	0,03	0,00	588	0,02	0	0	1	0,00
Phnom Bokor	Cambodia	23287	538851	0,00	0,03	0,00	526	0,02	0	0	1	0,00
Phnom Bokor	Cambodia	23288	538852	0,01	0,05	0,00	445	0	0	0	0	0,00
Phnom Bokor	Cambodia	23289	538853	0,00	0,02	0,00	518	0	0	0	0	0,00
Phnom Bokor	Cambodia	23290	538854	0,03	0,03	0,00	436	0,01	0	0	1	0,00
Phnom Bokor	Cambodia	23291	538855	0,00	0,04	0,00	529	0,10	0	0	1	0,01

Table 3.12

## **4. References**

Bojesen-Koefoed, J. A., Abatzis, I., Nielsen, L. H. & Petersen, H. I. 2007: CCOP/ENRECA field trip to southern Cambodia March 2007: organic geochemical analysis of field samples. GEUS rapport 2007/49

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