Car Nic. (Western margin of Car Nicobar) – Sept. 2003

	Age	Elevation
T_1	2750±110	2
T_2	5420±80	12

$U = \frac{2-0}{2750} \simeq 0.727$ mm/yr
≈ 1 mm/yr

$U = \frac{12+5}{5420} = 3.14$ mm/yr

Hut Bay (Little Andaman)

	Age	Elevation	Uplift
T_I	1042	1.798	$U = \frac{1.798-0}{1042} = 1.73$ mm/yr
T_{II}	3286	4.44	$U = \frac{4.44}{3286} = 1.35$ mm/yr.

Av. = 1.54 mm/yr.

Post-seismic displacements May-Oct, 2005

Campbell ~ 100 mm; uplift ~ 54 mm
PBLR ~ 66 mm; uplift ~ 40 mm
DLLC ~ 30 mm; uplift ~ 14 mm

Understanding the sedimentary deposits of large tsunamis close to their source is important because several large paleoseismic events have been recognized based in part on tsunami deposits. (eg Atwater et al. Orphan Tsunami Chilcuman References. (2005))

Modern examples of these large tsunamis will help us recognizing similar paleo tsunamis.

Dr. Vijayakumar

dates for pre-eq. coral
Add to fig caption.

performed

Avis Island Profile 4 (12° 54.986' N, 92° 55.942' E) - Aug. 2005

~~Terrace 1~~	Age	Elevation	Uplift rate
T2	1942 ±	7.229 wrong	$u = \frac{7.229}{1942} = 3.72$ mm/yr
T_1	967 ±	6.391	$u = \frac{6.391}{967} = 6.61$ mm/yr

Aves Island profile 4

T_1	967 ± 104	1.31 m	$u = \frac{1.31}{967} = 1.355$ mm/yr
T_2	1942 ± 114	2.647 m	$u = \frac{2.647}{1942} = 1.363$ mm/yr
AV/PD/LT/2	98 ± 13	0.25 m	$u = \frac{0.25}{98} = 2.557$ mm/yr

— Diatomy.

MAHABALIPURAM – SEPTEMBER 2005

Samples for size/Micropal analysis

Trench 1

suspected tsunami sand.

3. M5.	1.	MB/TR1/SZM/1	Trench 1 – top of sand layer – diatom of size analysis -
1. M3.	2.	MB/TR1/SZM/2	Trench 1 – Layer 4A – for size and forum diatom Suspect tsunami layer
5. M1.	3.	MB/TR1/SZM/3	Trench 1- Sand layer – bottom layer- 4A/size & Micropal
	Arch Excavation site – Saluvankuppan		
10. M10.	1.	MB/Ar/SZM/1	3.3 m BGL – south wall for size and micropal
2. M6.	2.	MB/Ar/SZM/2	West of temple – filling within granite
4. M8.	3	MB/Ar/SZM/3	2.2 m BGL- South wall
8. M7.	4	MB/Ar/SZM/4	Sandfill and bricks east of temple
11. M11 ~~M9~~.	5	MB/Ar/SZM/5	Southwall –wedge-bottom –2.2m BGL
7. M4.	6	MB/Ar/SZM/6	2.5 BGL – South wall size and …..
9. M9 ~~M11~~.	7	MB/Ar/SZM/7	2.2 BGL south wall wedge top
6. M2.	8	MB/Ar/SZM/8	Northwall –low most sand layer above low-most outerwall

the stratigraphic succession along the trench wall for comparison and correlation with features observed in other trenches dug in the area. The digital images of the fault zone and trench strata shall be stored in the Intel Pentium Notebook in the field itself. Further, these can be viewed in the field at a second trench location for comparison and correlation. The voluminous information on chronology and sedimentary characteristics shall be stored and retreived by the mobile data retreival unit and shall be of great help during discussions with scientists at different institutes and laboratories. Scanner shall help in amalgamation of diagrams and pictures of the field with text and thus achieve a better graphic representation of the facts. UPS shall be of help for uninterrupted performance.

Dates obtained
2/11/2005

Carbonaceous samples from Mahabalipuram (Saluvankuppan) September 1924, 2005

		Remarks
1.	MB/AR/BL	Collected on 21.09.05 Archeological site. 3.3 m from the ground level, southern wall
2.	MB/AR/UL	Collected on 21.09.05 Archaeological site 2.2 m from ground level
3.	MB/T1/BL	Collected on 22.09.05 Trench 1, excavated by us, ~2m from the surface, bear the suspected cultural level (brick platform) of `tsunami' sand (?) (layer 4)

(Samples1-3 , Rafter Radio Carbon, New Zealand)

4.	MB/Trench /1/Sed	located on 22.09.2005 Trench 1 layer 4 carbon sad –bulk sample

(Sample 4, BSIP-Lucknow) 1490±110

350 PERMANENT EQUIPMENT

(In Rupees)

Generic name of equipment and accessories with make and model	Name	Imported/ Indigenous	Estimated Cost (FEC)	Spare time available for use by others (in%)
1.GPS System		Imported	Rs.28,000/- (approx.)	30
2.Digital Camcorder, Sony DCR-TRV330E with spare battery and carry case	Sony Digital Camera Recorder		Rs.69,000 (approx.)	-do-
3.Notebook Inspiron 8100 Mobile Intel Pentium III/IV Processor,1.2Ghz,SXGA, (15+",TFT),LCD Display, SXGA,15+"TFT,VAS,I8100, 512KB L2Cache,Memory512MB, (2x256),PC133Mhz,32Mb DDR, FDD 1.44MB,3.5",TravelLite Module,Keyboard 87 Keys,US, Hard Drive 30GB, ATA-100, Microsoft Windows XP Professional OS,Fixed Optical Drive,Module,8x/8x/24x and DVD-ROM drive, Network Card, Modem Combo, Spare battery, Adapter110/220V, Leather carry case	Dell Notebook		Rs. 2.14 Lac (approx.)	
4. HP Laser Printer	HP1200		Rs. 20,000 (approx.)	-do-
5. Scanner HP ScanJet 6300C			Rs. 20,000 (approx.)	-do-
6. UPS 1000VA			Rs. 10,500	
Total			Rs. 3,61,500	

351 JUSTIFICATION FOR (350)

GPS is required for locating the exact position of the fault scarps and other seismogenic features in the field. The digital camcorder shall be used to copy the images of the fault zone and

Continued...

3/1/06

Samples having more bio materials (wood pieces)

(1) TS 11/33 at a depth of 33 m

(2) TS 18/51 at a depth of 51 m.

Kerala Samples

~~K/Q/PA/1 — TS 11/33 33m?~~

K/Q/PA/2 — TS 18/51 51 m?

Get the Section from Terry

Samples to be sent to New Zealand

18/3/2006.

(1) Sample 1 : GF/MP/D1 ✓

Date: 6/8/05
Site ref: AHW - Mohanpur -
Bore hole #: 1(B)
Sample No: 5
Depth: 5 m.

Only this 1 sample is sent. May/2006.

Silty clay with carb. matter & Shells

(2) Sample 2 : GF/MP/D2

Date: 6/8/05
Site Ref: AHW - Mohanpur
Bore hole #: 1(B)
Sample No. 5
Depth: 12 m.

Silty clay with carb. matter.

IOP Bhubaneshwar

(3) Sample 3 GF/MP/D3

Date 10/8/05
Site Ref: AHW - Mohanpur
Borehole # 1(B)
Sample no: 19 Depth 25-50 m

Silty sandy clay.

28/3/2006

Western side of [illegible] road
Vanagiri ~ 250 m from

N 11° 07.429'
E 79° 50.837

March 25-29, 2006

Varagiri

Kaveri Patanam

about ~~100~~ 850 m ~~80~~ m JCB site

West of

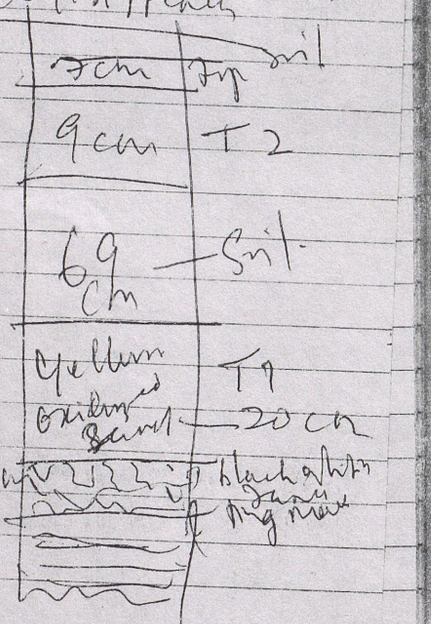
N 11° 07.429

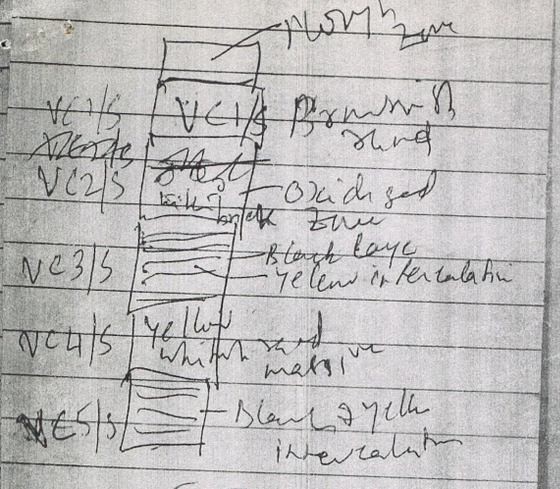
E 79° 50.837

trench.

At the western corner of the Varagiri trench

7cm	Top soil
9cm	T2
69 cm	Soil
Yellow oxidized sand	T1
	20 cm
12cm	black & white fine ring mass



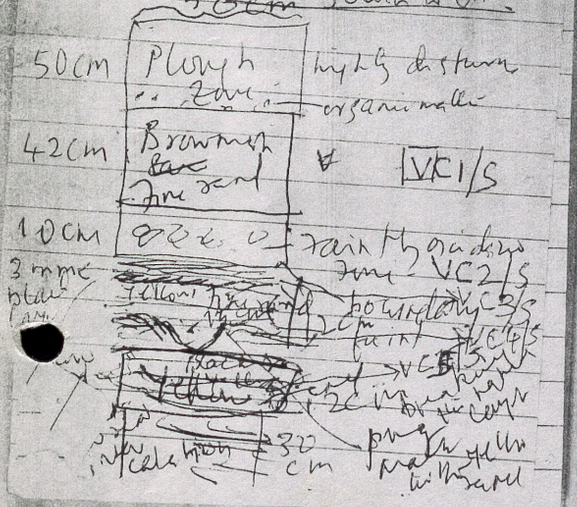


Key

Pen - 14 cm
Nigori sand - 26 cm
Showed 65 cm

28/3/06 Vanagiri C site

Vanagiri - western side of the road.
cultivated field South wall



CESS point
On the road

N 11°07.424'
E 79°50.844'

Pt Temple Stone
~20 m N of
CESS point
N 11°07.391' / 79°50.

Near Banyan tree

N 11°07.391'
E 79°50.846'

Near Banyan tree

Manfara Samples

April 5 – 10, 2006

Date: 07/03/06

Location: 4km NE of ~~Khario~~ Khatri village

Manfara trench

Direction of wall: N 65^0 E

GPS: 23^0 27.974'

70^0 22.804'

AMS samples

AMS-1 : Sample from sandblow

AMS -2: Sandblow sand

AMS- 3: Left side of main fault, shear guage

ESR Samples

ESR -1: Collected from right side fault gauge, comparatively compact gauge

ESR-2: collected from left of the fault gauge, friable material

ESR-3: collected from Shear zone, left of the fault

ESR-4: collected from shear zone of right of the fault

ESR-5: carbon~~i~~ material collected from reserve fault plain

TL samples

TL-1: Quaternary Deposit ~~6985 ± 566 Yr~~ 690 ± 69 Yr.

TL-2: Upper wedge fill mix sand 5125 ± 840 Yr.

TL-3: Mesozic sand

TL-4: Lower wedge fill mix sand 1732 ± 430 Yr.

TL-5 (Khatri) 6180 ± 1342 Yr

carbon sample

C-1 – Carbon material from Wagad S.St Layer

Wagad SSt layer.

Date: 09/03/06

Location: Budharmora trench

Direction of wall: N-S

GPS: 23^0 20.611'

70^0 11.563'

AMS samples

C-1 (AMS): material from calcretic zone

C-2a (AMS): material from south end of layer-2

C-2b (AMS):material from middle of layer-2

C-2 : collected form layer-2

C-3: calcritic material

TL Samples:

TL-1: Dune sand sample from the 200 meter east of the trench ~ 6983±589 yr.

Samples for grain size analysis

SZ-1: Dune sand sample from the 200 meter east of the trench ✓

SZ-2: upper layer of the trench, recent deposit

SZ-3: sandblow sand from the bottom of the trench

November 2006

OSL dates for Suresh, Wadia Inst.

TL-1 (Budharmor) = 6983 ± 589 yr

TL-1 (Kharoi) = 690 + 69 yr

TL-2 (Kharoi) = 5125 ± 840 yr

TL-4 (Kharoi) = 1732 ± 430 yr !!

TL-5 (Kharoi) = 6180 ± 1324 yr.

Manpur

27/12/06

1 OP. AMS

VAN-2/L1/C.

27/12/06

WADIA WITH OSL + TL samples

1. VM-2/L1/OSL
2. M/S/OSL
3. ~~VM/~~ VM-3/L1/OSL
4. VAN-2/ polling sample
5. VM-1/L1/P – Polling sample
6. VANJ/B/L1 – polling sample
7. M/P/TL – polling samples
8. VANJ/P/1

Chapman Conference on
Active Tectonics and Seismic Potential of Alaska
Alyeska Resort, Girdwood, Alaska, USA 11-14 May 2006

Registration Form – Deadline: 19 April 2006

Please return this form by 19 April 2006 via email to chapman-help@agu.org to fax +1-202-777-7385 or mail to the address noted below. If you register by 19 April, you will receive a conference T-shirts at no additional charge!!!
Please complete the form below by entering your responses(s) at the prompts. Use "X" to indicate a selection.

Name: C.P. Rajendran **Badge Name:** C.P. Rajendran

Organization/Company: Centre for Earth Science Studies

Address: PB No.7250, Akkulam, Trivandrum, Kerala 695 031, INDIA

(use semi-colons or comas to separate lines of the address)

City: Trivandrum **State/Province:** Kerala **Country:** INDIA

Phone: +91-471-2445803 **Fax:** +91-471-2442280

Email: cp_r@vsnl.com [ ] I am looking for a roommate. [ ] Male [ ] Female

T-shirt Size: XL **Flight Arrival Information:** 10th May 2006, 18:21hrs (GMT)

Registration Fees

There is no one-day registration fee. Participant registration fees cover admission to all scientific sessions, the opening reception, the banquet dinner, the field trip, daily morning and afternoon breaks as well as the conference program book. Cancellation must be in writing and received by 26 April 2006; a $40 processing fee will be deducted from the amount paid. Refunds will not be processed after 26 April 2006. To qualify for the Low Income Country fee, you must currently live in and have proof of residency in a country classified by the World Bank as `Low Income or Lower Middle Income'. See the list of qualified countries at: http://www.agu.org/meetings/Berkner_countries.html

[ ] Regular - $350.00
[X] Student or Low Income Country - $175
[ ] Guest Banquet Ticket - $55.00
[ ] Guest Opening Reception Ticket - $25.00

Payment Information

Payment in U.S. dollars must accompany this form.

Total amount enclosed: $ _____

[ ] American Express [ ] Visa [X] Master Card [ ] Check (Number_____)

Cardholder's Name: C.P. Rajendran
Card Account Number: 5176533510422006 Expiration: 03/09

Make checks payable to the AGU. Please mail check along with the completed registration form to **Active Tectonics and Seismic Potential of Alaska Chapman Conference,** AGU, 2000 Florida Avenue, NW, Washington, DC 2009, USA.

Please indicate any special needs or restrictions, such as disabilities or dietary restrictions:

Andaman-Nicobar 17/4/07
Mar-Apr/2007

Samples given by Terry

for XRD, Size + Micro.

1. HUT/A/1 — XRD, Size
2. BUR/1/D/3 Size, XRD
3. BUR/1/1 — XRD + Size
4. CHI/A/1 - Size, XRD
5. CHI/A/1 - Micro
6. HUT/B/3 - Micro
7. HUT/B/3 - Size, XRD
8. BUR-1/B/1 - XRD, Size
9. BUR-1/B/1 - Micro.

17/4/07 Attention: Terry

Samples fm Bhy - March 2007

1. S1/TA/Grouge - XRD

2. SZ/TA/KH/SZ (Sediment) - Size

3. SZ/TA/KH Sediment - Size.

Samples collected from Andaman-Nicobar
March – April, 2007

Burmanalla-Rangachang

1. BUR/A/1 – Clay-silt top layer – for XRD
2. BUR/B/1 – Sand (sea surge?) – for foram, diatom and XRD.
3. BUR/C/2 – peat – dating BSIP & IOP.
4. BUR/D/3 – Coralline sand.
5. BUR-2/B/1

Chowldari

~~6. CHO~~
6. CHO-1/B/1 – peat – BSIP
7. CHO-1/B/2T – Shells (Turritella) – dating → IOP
8. CHO-1/B/3/G – Sorted shells → IOP.

Campbell Bay

9. PEA-1/B/1 – Peat from Peakodi beach, Nicobar.
10. LAX/B/1 – Shells – Montipora – dating

Hut Bay

11. HUT/B/1 – piece of peat – Hut Bay – Sent to Rafter – New Zealand.
12. HUT/B/2 – ~~Peat – bulk sample~~ Shells from peat.
13. HUT/B/3 – Peaty sand → also, foram, diatom, XRD.
14. HUT/C/1
15. HUT/C/2

Chidiatapu

16. CHI/A/1 – top level sed. from Chidiatapu. ~~Chemical~~ XRD, foram, diatom.

Samples sent to Sneeu

June 4, 2007

1. N/T3/D/4/cp 24°12°47°N
69° 11° 45° E
Vighakot - Carb. sed.

2. Bharuch - GD
Depth 0.5 m
10/1/04

3. Mahi - 1
Depth 15 cm

4. Vg/T4/D/2/98
bone.

5. Vg/T5/D/1/98

6. MB/Ar/Br/T2
lowermost phase below
Cretaceous formation

7. MB/T1/BR/T2/Treach 1

Below Layer 4
T2 date - bricks from
lower layer

8. P1/D/E1/2

Assam (1950) Tezu - Root.

9. BUR-1/C/2 peat.

10. PEA-1/B/1 - Peat

Date, time, sample name, nature of material, sample depth, location, elevation above msl, expected age, reason for that, whether pretreatment has been done contamination - etc

13/10/02 Samples sent to Sreenivasulu

1. CHO-1/B/2/T Shells

2- HUT/C/1

3. HUT/B/2

4- Lav/B/1

5. HUT/B/3

6. HUT/C/2

7. PENT/B/1

8- BUX-1/C/2

9. HUT/C/2

10. CHO-1/B/3/4.

TL Samples from Vanagiri (August, 2008)

1. T9 (T10) / Chola (Trench 9?)	2 m from surface. T9/Ch/1 sample from urn. 2223 ± 157
2. V/8/N wall / brick. (Trench 8)	embedded in mud V/8/N/br/2 under tsunami sand sheet.
3. VAN 9 - Chola (Trench 9) 1846 ± 45	2 m from surface - sample from urn. bottommost layer. VAN/9/Ch/3
4. V8/N wall/Brick. Trench 8	embedded V/8/N/br/4 339 ± 50
5. V/8/N wall / TL-3 (Trench 8)	15 cm from top V/8/N/5
6. V/8/ (Trench 8)	upper layer - V/8/6 1182 ± 161
7. VAN-9-Chola (Trench 9)	bottom of layer 1 1.75 m from surface. VAN/9/Ch/7
8. T8/3/4 (Trench 8)	Top soil; 1 m thick compact unit T8/3/4/8 993 ± 73
9. - Pit 6 (Trench 6)	from Trench 6 / 40 cm from surface. T6/9 1392 ± 63 yr.

Oct-7, 2008

Organics samples handed over to Rafeev BMS

from Vanagiri

1. V8/OR

2. V6/OR.

1/12/08 N25° 12.969; E060° 59.978

① B-1 - Shells under the bottom sand - boulder lake.

BSIP Makran

② F-1 Shell fragments from bottom clay - Free zone

N25° 25.411'
E060° 35.887'

2002 November 22	Friday	1924 Agrahayanam 1
1178 വൃശ്ചികം 6		1423 റംസാൻ 17

PHONES TO MAKE	IMPORTANT WORKS
③ P-4 BC 57960	N25° 16.375' E060° 43.966' Shells from cliff top - Profile 4. 6933 yrs.
2002 NOVEMBER 22 FRIDAY	APPOINTMENTS
④ PB-1	④ Shells from Pasahandar cliff top - PB-1

There are sadder hearts than yours, go and comfort them, and that will comfort you. -Anon

N25° 04.806'
E061° 21.121'

(5) BA-2 . Shells from bottom layer Baluchi-Tran

N 25° 24.736'
E 060° 38.034'

2002 November 23 1178 വൃശ്ചികം 7	Saturday	1924 Agrahayanam 2 1423 റംസാൻ 18

PHONES TO MAKE	IMPORTANT WORKS
(6) INCO-1 N 25° 16.636' E 060° 41.287'	Shells from the cliff top behind INCO.

2002 NOVEMBER	APPOINTMENTS
23 SATURDAY	N 25° 23.35' E 060° 37.52' (7) ~~STO3~~ STO-3 | A Shells from Terrace 2 Prophet P3

God is a circle whose centre is everywhere, but circumference nowhere. -Empedocles

Nothing rich of P3

N 25° 10.381'
E 061° 05.870'

(8) Profile 2. (WP-7)

from the well 7 m behind on the cliff top

P-2/M

from the well (W1)

Profile-2

2002 November 24 | Sunday | 1924 Agrahayanam 3
1178 വൃശ്ചികം 8 | | 1423 റംസാൻ 19

PHONES TO MAKE	IMPORTANT WORKS
(9) P-3/M ~~36.118~~ N25°23.135 N25°16.731 060°37.52	~~N25°05.434~~ Profile-3 Chatihar Post raised beach.
2002 NOVEMBER **24** SUNDAY	APPOINTMENTS N25°14.364 060°51.526 (10) INCO-2 beach rock from cliff - lower side behind INCO

Wise men argue, fools decide them. -Anon

N25° 12.958
E 060° 59.878

(11) ~~BO~~ BL-1/M

uplifted Shells from Boulder horizon

2002 November 25 1178 വൃശ്ചികം 9	Monday	1924 Agrahayanam 4 1423 റംസാൻ 20

PHONES TO MAKE	IMPORTANT WORKS
(12) STO-3/B/M N25° 05.477' E 061° 18.444'	Profile 3 (STO3)

2002 NOVEMBER	APPOINTMENTS
25 MONDAY	Terrace 3

Hypocrisy is the homage which vice pays to virtue.

-La Rochie foucauld

Peat Samples from Rutland Island

RUT-1 → Peat from Rutland Island (Andaman.)
RUT-2 → Peaty Sediment.

~150 meters east of Campaign-mode GPS site.

Sent to BSIP for C^{14} dating.

January 25, 2014

Nautiyal (BSIP) received them on Feb 6, 2014.



34 : 1-280

Palynology

CESS NOTES

laevigate — psilate or without any ornamentation.

Punctate — with pits.

Ascostromata — a disc shaped vegetative part of fungus

nonostiolate — without any opening.
ostiolate — with opening
dimidiate — dissimilar surfaces.

pseudoparenchymatous — false thin walled cells.

setose — with hair or slight projections

Hyphae — hair like projections.

~~Ostio~~. Scrobiculate — a type of reticulation.

~~8~~ Exine is divided ~~+~~ into 2 parts –

The outer part is known as exine

The inner part is known as nexine.

Pilate – ~~sud~~ pin-head like ornamentation ~~with~~

 → zonisulcus – sulcus ~~is~~ throughout the margin.

Archeopyle – opening.

Intrastructured – structure present in the inner side of the exine.

 → slalongate – pore transversely elongate

 lolongate. longitudinal.

tenuimarginate – with margin

CESS

NOTES

foreoreticulate — reticulations formed by pits.

muri — (reticulation - ht from the surface)

lumina — cavity inside reticulations.

tegillate — ~~co~~ roof connecting the ~~org~~ ornamentation

conied — △ △

trizoni mango colporate — # 3 apertures (colporate ( )) uniformly distributed on both the surfaces.

homobrochate — reticulation formed by ~~a~~ single bacula, and of same size.



crassiarticulate — reticulate — thick.

mammillate — 

Intrabaculate — baculate within the exine.

CESS Foraminifera NOTES

Aboral – Opp. to oral side or end.

Acc. apertures – Test openings that do not lead directly into primary chambers but extend beneath or through acc. chambers.

Accessorii – Chambers in irregular clusters.

Agglutinated – Foreign particles bound together by cement.

Alveolus – minute blind cavity in shell wall.

Alveolar – numerous honeycomb-like small cavities.

Anterior – Direction toward aperture.

Aperture – opening or openings from chamber of test to ext.

CESS

NOTES

Arborescent :- Branching. tree like

Axis - Imaginary line around which spiral or cyclical shell is coil. - transverse to plane of coiling.

Biconvex Having both sides convex or more or less inflated.

Cancellate Having honeycomb structure.

Convolute Evolute, enrolled referring to test with all whorls visible.
Corkscrewing Having tubelike plant spirally coiled test.

Costa - raised ridge or rib.
Costate Having raised ridges or costae.

CESS

NOTES

External fissure :- linear depression on outer surface of test where wall bends downward into septum coincides in position with septal suture.

Extra umbilical aperture. Opening in final chamber of test not connecting with umbilicus or periphery.

Extra umbilical - umbilical aperture

Opening in final chamber of test that extends along its forward margin from umbilicus towards periphery, thus reaching extra umbilical point (outside umbilicus). Eg. Globorotalia.

Flange Plate like marginal extension along chamber or bordering aperture as highly developed aperture lip (Haunkenina)

CESS **NOTES**

Foramen Opening between Chambers located at base of septa (eg: Fusulinidae) may represent previous aperture or be formed secondarily.

Fossettes Grooves paralleling periphery (eg: on the surface of Elphidium spp)

Fusiform :- Spindle shaped, tapering at each end.

Hispid :- Covered with fine short hair like spines.

Hyaline Glassy clear, transparent.

CESS

NOTES

Dimorphism - Occurrence of in single species of 2 distinct forms; megalospheric & microspheric tests.

Distal Direction away from proloculus in direction of growth.

Embryonic apparatus Gr. of chambers at center of some megalospheric tests, larger in size + different in shape & arrangement from other chambers; nucleoconch.

Equatorial aperture:- Symm. opening of planispiral test, commonly interiomarginal but may be areal or peripheral

Evolute Tending to uncoil. Chambers nonembracing.

CESS

NOTES

Imperforate: - without pores, sometimes used for porcelaneous tests. and in describing ornamentation (eg; pillars, keels, carinal band) & normally perforate forms.

Inframarginal sulcus Deep indentation & aperatural face of test.

Intercarinal located between chambers.

Interiomarginal aperture Basal opening in test at margin of final chamber along final suture; in coiled forms may umbilical, extraumbilical & equatorial in position.

Interseptal - located betw. septa.

Involute - Strongly overlapping; in rolled forms. later whorls completely enclosing earlier ones.

CESS

NOTES

Multilocular Many-chambered test of unicellular organisms.

Oblique section Slice through test cut in direction neither ||el to axis of coiling nor normal to it.

Peristome - Raised rim around aperture of test.

Phialine Having everted rim on apertural neck as on neck of vial or bottle.

Planispiral Coiled in single plane.

Proloculus Initial chamber of foraminiferal test.

Rectilinear Growing in a straight line.

CESS **NOTES**

Quinqueloculine Having five externally visible chambers as a result of growth in varying planes about elongate axis

Plicate Having folds, ribs or ridges.

reticulate like network, referring to ornamental ridges at surface of test or inner network

Retral processes Backward-pointing extensions of chamber cavity and enclosed protoplasm, located beneath external ridges on chamber margins (eg: Elphidium).

Rugose Rough. Surface Rough irregular ornamentation. May form ridges.

CESS

NOTES

Septum Partition between chambers.

Sessile - Attached, sedentary.

Sigmoid - S-Shaped.

Siphon - Internal tube extending inward from aperture -

Spinose Having fine elongate solid spines

Stolon Narrowed extension of body commonly tube like projections connecting chambers in orbitoids.

Striate Marked by parallel grooves or lines.

Suture Line of union between two chambers or between two whorls (Spiral suture)

CESS

NOTES

Tooth - Projection in aperture of test, may be simple or complex, single or multiple.

Tooth plate Internal, apertural modification consisting of a centrally located plate that extends from aperture through chamber to previous septal foramen (eg. Bolivinidae)

Trochoid Trochospiral, umbilicoid umbiliform; chambers coiled spirally evolute on one side, involute on other.

Trochospiral:- Trochoid, umbiliform spirally coiled chambers, evolute on one side of test, involute on opp. side.

Tuberculate Covered with tubercles or small rounded processes.

~~SB2/P6~~

① RAP/SB-2/P6 - Shravasti - Rapti section near pole 6. 30 cm from the surface.

② RAP/SB-2/P9
Shravasti - Rapti section near Pole 9 - within the clasts & the sandblow near Pole 9.

③ RAP/SB-2/P10 Shravasti-Rapti section western most sandblow, material within the clast. 1006 ± 20 BP
10988 - 10424

(7) RAP/GC/P7 (*5)

Carb-matter obtained from the grayish clay layer occuring around 2m from the surface at Pole 7.

modern carb.

(8) SIM-1 ~~SIM~~/L1/1 sample (*1)

from ~~bottom part of~~ the trench SIMRA-1 (Bihar) within ~~silty clay~~ ~~below~~ the sandblow SB-1.

1201 ± 20 BP. AD 775-869

(9) SIM-1 ~~SIM~~/L1/2 (*2)

sample obtained from 1.82 m from the surface (bottom of the trench) + 68 cm below the SB-1 (older sand is in)

577 ± 15 BP. AD 1315-1352

(4) RAP/SB-2/B/P10 (*3)

Shravasti-Rapti section. sample collected from sand layer beneath the westernmost sandblow.

1006 ± 20

AD 988-1042

(5) RAP/P1 (*4)

Collected from a spot ~1 m from the surface under Pole 1 at the Rapti section

Modern age.

(6) RAP/W1/P7 (BSIP) 2030 ± 80

Collected wood piece come from 2.5 m from the surface ~3 m east of Pole 8 (between Poles 8 & 7) within cross bedded sand under an oldest sandblow containing clay clasts

SIM-2/L1 - stem obtained (BSIP)
from trench Simra 2 + ~45 cm
from surface on southern
wall from within the
lower sandblow within the
crater. AD 1660±90

SIM-2/L2. Leaves
obtained from Simra-2
trench ~~at~~ from within
the grayish clay at
the bottom of trench below
the sandblow crater - southern
wall - 1.25 m from the surface.

SIM-2/A1 - sample obtained
from 100 cm from the surface
at trench Simra-2 within sandblow.

SIM-2/A2:
sample obtained from
70 cm from ~~SM~~ SIMRA ~~trench~~ 2
trench within the sandblow.

Samples for Size Analysis.

		Loc	Nature/Remarks
1)	SZ(A)/Hut/OT	HutBay	Sand from ~~old~~ Suspected old tsunami deposits.
2)	SZ/Hut/NT.	Hut Bay	Sand from new. Tsunami deposits.
3)	SZ(B)/Hut/OT.	Hut Bay	Sand from ~~o se~~ old tsumaini dep from sea side.
4)			

Samples for Dating – Hut

		Loc.	
(14)	T3/~~Har~~/Hut/ (10P)		Calcareous from river Sect near. Harmandir Bay possibly an older terrace.
(15)	T2/Hut/D/P5 (10P)	Hut Bay.	Calcareous from Terr-2, near Prof-5

MINERALOGY AND PETROLOGY OF THE CORDIERITE BEARING METAPELITES OF SOUTH KERALA, INDIA WITH PARTICULAR REFERENCE TO THE OCCURRENCES IN TRIVANDRUM DISTRICT

Synopsis

Mineralogy and Petrology of cordierite bearing metapelites of South Kerala, India with particular reference to the occurrences in Trivandrum District have been studied. Cordierite also occurs in significant amounts in charnockitic association in Pathanamthitta District. Detailed geological mapping in and around Trivandrum district followed by documentation of major cordierite bearing quarries were carried out. Macrostructural studies in the area have established four phases of tectonism. Three metamorphic events have been identified based on the relative timing between growth of minerals and deformations. The first metamorphic phase covered the first two tectonic phases, the second metamorphism coincided with the third phase of tectonism and third metamorphic phase commenced before the fourth phase of tectonic activity. Powder and single crystal XRD studies have revealed that the cordierites are perfectly ordered orthorhombic varieties having a space group C_{ccm}. The cordierites are characterised as perdistortional and subdistortional varieties based on distortion index for charnockite and metapelitic associations respectively. The sector trilling in cordierite indicates a transformation of hexagonal to orthorhombic varieties through Al, Si ordering thereby ensuring a slow cooling history of the terrain. The metastable hexagonal cordierite is due to rapid crystallization from fluid in the high temperature /relative low-pressure environment of the granulites. The thermobarometry based on Electron Probe Micro Analysis has revealed that the temperatures recorded from the cordierite sillimanite gneiss ranged from 760°C to 920°C at P 4.3 to 6.2 kbar while cordierite charnockite recorded a temperature between 680°C to 770°C at P 5.2 to 5.5 kbar. The cordierite bearing metapelites are re-equilibrated along the retrograde portion of the regional PT path and lost their signature partly with respect to their high temperature-pressure equivalents. The re-equilibration of the rocks occurred under high H_2O activity. The IR spectroscopy studies have revealed that the cordierite H_2O content is more in metapelites when compared to charnockitic associations in the area. This study presents a clockwise PTt path for the cordierite bearing rocks of the study area.

Samples for Dating (~~Contd~~)

(13) Mahabalipuram (Archaeological Excavation site) (saluvankuppam)

	Loct	Nat/ Remarks
1) MB/CP-5/D	M.B Puram.	Charcoal Sample. 2.5 m from Surface
2) MB/CP-D/B1	"	Charcoal Sample from lower brick layer.
3) MB/CP-7/Sh	"	Shell samples from excavation site.

Size Analysis. Sample.

	Loc.	Remarks
(1) MB/CP-4/S	M. B Puram.	~~Sample~~ Tsunami Sand from M.B. Puram excavation site.
2) MB/CP-3/S	MB. puram.	Sediment Sample from 1.80m from Surface.
(3) MB/SIZE (CP-6-Pottery) (CP-1-Shell) (CP-2-Brick)	M.B Purm.	Miscellaneous Samples of brick Shell, & Pottery

UNIVERSITY OF KERALA

Department of Geology
Kariavattom 695 581

August 22, 2005

Dear Sir:

An open defence of the thesis entitled "Mineralogy and Petrology of the cordierite bearing metapelites of South Kerala with particular reference to the occurrences in Trivandrum District" submitted by Sri. E. Shaji for the award of Ph.D. degree is scheduled to be conducted in the Department of Geology, University of Kerala , Kariavattom Campus at 11.00 A.M. on August 30, 2005.

The Chairman of the Board of Adjudicators for holding the open defence is Dr. S.M. Ramasami, Bharathidasan University, Tiruchirappally.

I request you to kindly participate in the open defence.

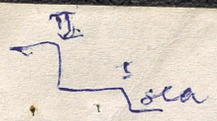
Yours Sincerely,

22/08/2005

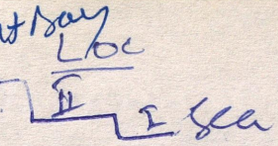
Prof. R. Krishnanath
Convener, Open Defence

Encl: Copy of the Synopsis

Dr. Kusala Rajendran
&
Dr. C. P. Rajendran



Samples for Dating — Hut Bay Loc — Nature/Remarks



Sample 1) T2(B) || HUT | D | P1 — Hut Bay — Calcareous (Terrace 2)

2) T2(A) | HUT | D | P1 × — Hut Bay — Calcareous (Terrace 2) (Terrace 2 is older)

3) T2(B) | HUT | D | P3 — Hut Bay — Calcareous (Terrace 1)

4) T1 | HUT | D | P1 × — Hut Bay — Calcareous. (Terrace-1) (Terrace 1 is younger close to sea)

5) T2(B) | HUT | D | P4 — Hut Bay. — Calcareous (Terrace 2)

10P

6) WS | HUT | OT — Hut Bay — Wood Sample from the suspected old Tsunami deposit.

7) CS | HUT | OT — Hut Bay — Calcareous Sample from the suspected old tsunami deposits

8) GS | HUT | OT — Hut Bay — Gastropods from suspected old tsmi dep.

9) T2(A) | HUT | D | P3 — Hut Bay — Calcareous (Terrace 2)

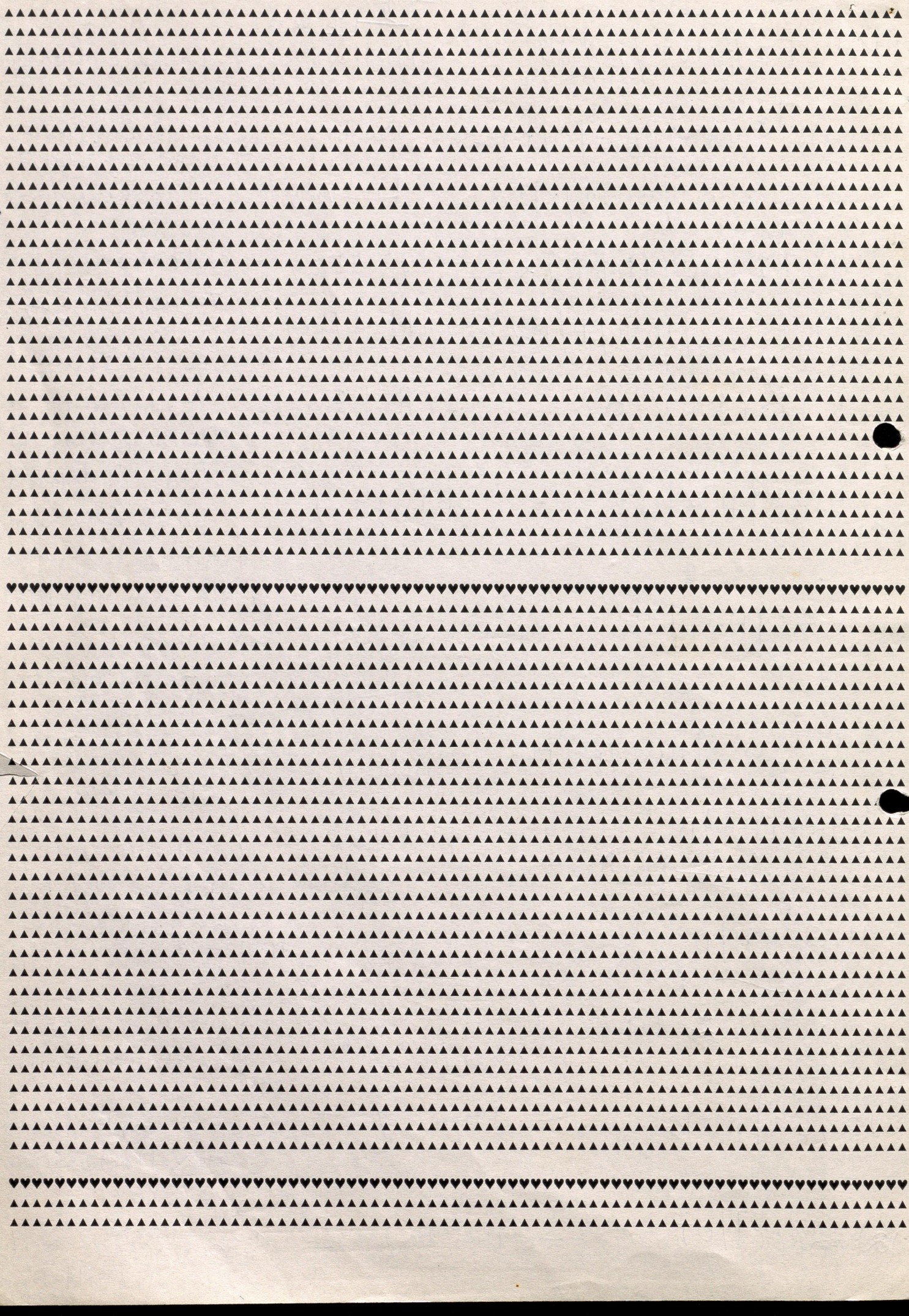
10) GF(A) | FB | D. ~~(10P)~~ (SSIP) — Flat Bay — Carbanaceous Soil from flat bay near Port Blair.

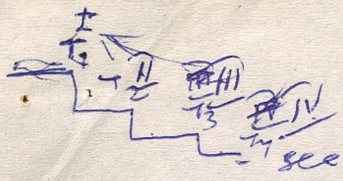
11) GF(B) | FB | D ~~(10P)~~ (SSIP) — Flat Bay — from 13 – 13.95 m (Geofoundtn) " "

13) T1 | HUT | D | P2 — Hut-bay (Calcareoous from Terrace 1) near profile-2 — from 6 – 6.45 m (Geofoundation)

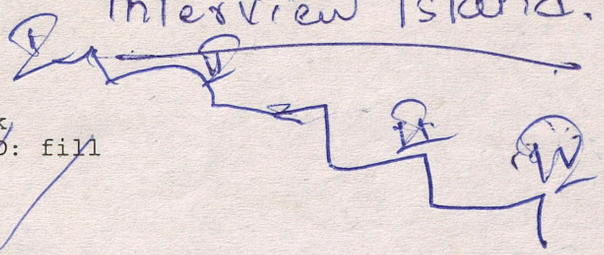
General. 12) GF | MB | G. — Mini Bay. — Core Sample from 4m; Hard sedimentary rock.

12) CB | HUT | OT — Hut Bay — Carbonaceous Soil from suspected old Tsunami





Interview Island.



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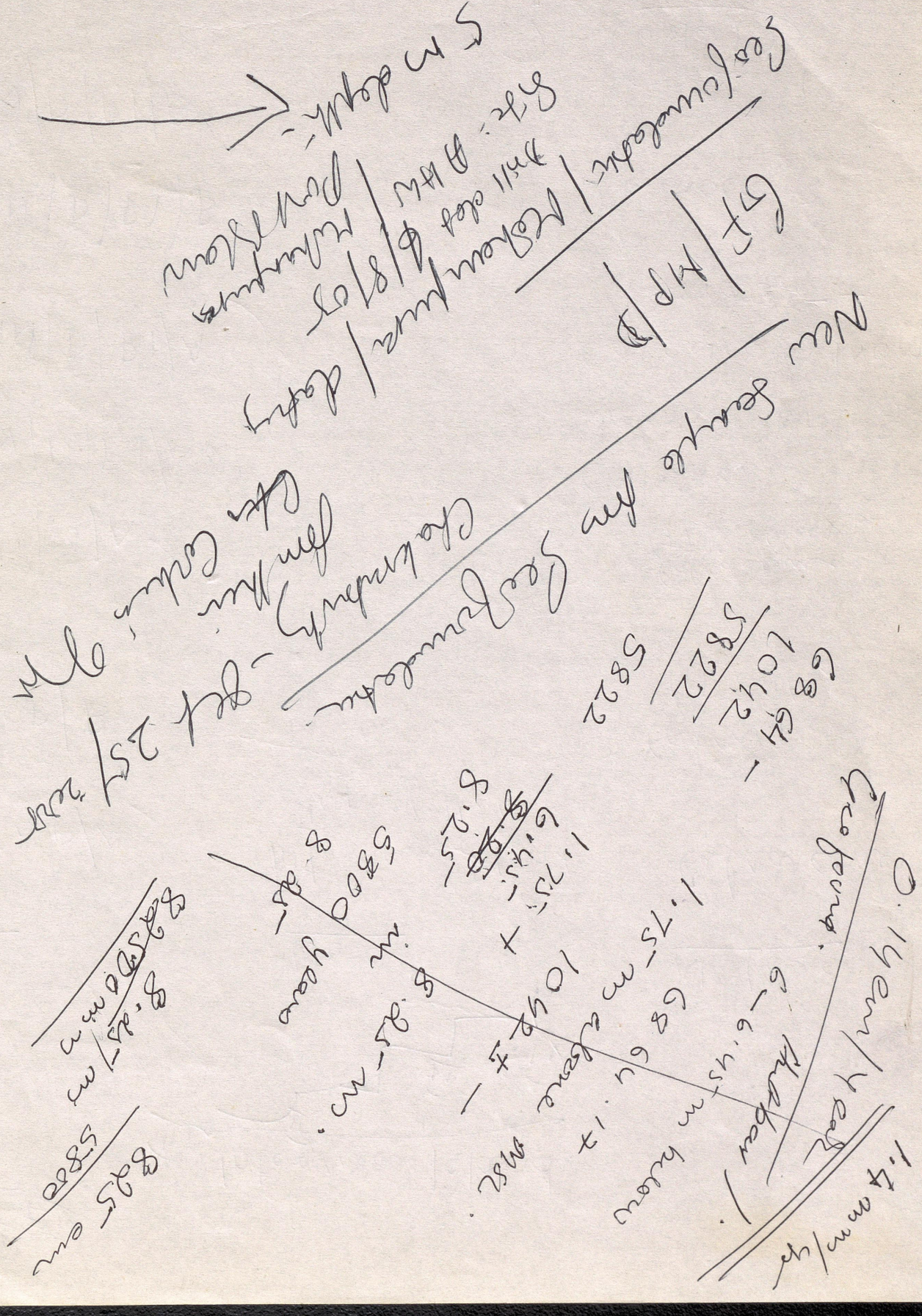
-savelevel-

No	Loc	Nature.
1) IN/TOP/A ✓	Interview Island Top of Hill	Calcareous.
2) IN/TOP/B (TOP)	"	Calcareous (Duplicate)
3) ~~IN/T1~~ T1/IN/D/P1/A ✓	duplicate "	Calcareous (T1 is oldest)
4) T3/IN/D/P1/A ✓	"	Calcareous from terrace level 3.
5) T2/IN/D/P1/A ✓	"	Calcareous from terrace-2
6) T3/IN/D/P1/B	"	" terrace-3.
7) T1/IN/D/P1/B.	"	" terrace-1 (oldest) ?
8) T1/IN/D/P1/C	"	terrace-1
9) T2/IN/D/P1/B.	"	terrace-2. (older)
10) T3/IN/D/P1/C	"	terrace-3 (old)

lot of new information. Collaboration with a group that is already engaged in similar studies in another subduction zone will render technical support in data gathering and interpretation.



~~Interv~~

Interview Island (Contd)

No	LOC	Nature
(11) IN/ST/D	Int	Sample from Stream bed.
(12) (10P)		

MARK LIST

(Ph.D Qualifying Examination)

Date : July 04, 2005

Venue : Centre for Earth Science Studies, Trivandrum

Subject : Paper-II : Seismology and geodynamics process of subduction zones

Max. Mark : 100

Name of the candidate	Marks awarded (out of 100)
ANIL EARNEST	

Examiner:

Dr. Ajay Kumar Varma
Scientist
Centre for Earth Science Studies
Trivandrum 695 031

Signature

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Interview Island

		LOC	
12 ~~11~~	IN/St/D (10P)	Intr Island.	Coral Sample from a stream sect in interview Island, Possibly 2nd terr from Sea
13 ~~12~~	T3/IN/D/P1/D (10P)	"	Coral Sample from 3rd terrace.
13 ~~14~~			

Port Blair (Dating)

	Loc	Nature/Remarks
⑦ RG/wood/1 (BSIP)	Ranga Changa near Port Blair	wood Sample from Strean bank Sect -Ranga changa.
~~⑧ PA/Peat/1.~~		

PANCHVADI.

	Loc	Nature.
① PA/Peat/1. (BSIP) 1490±140 yr B.P.	Panchvadi. road side near the Sea.	~~wood~~ peat Sample. from Stream Sect.

Andaman
Little Andaman
August 2005

Samples for Dating - Port Blais

		Loc	Nat
① RG/Peat/SB	BSIP	Ranga Changa near Port Blais	Peat layer over Sand blow
② RG/Peat/1	BSIP	"	"
③ RG/Peat/2	BSIP	"	Wood, charcoal ~~from~~ from Loc
④ RG/Peaty Sand/3.	BSIP	"	Peaty Sand from. Ranga Changa.
⑤ RG/Peaty Sand/4	IOP	"	Peaty Sand ~~sic~~ shell fragments below wood from. Loc
⑥ RG/Shell/B	IOP	"	Shell for dating obtained from beach rock at Ranga Changa which showed a sand blow structure. Shells were obt below this feature

Samp for Size analysis.

	Loc	Nature
① TS/RG/1	Ranga Changa. Port Blair	Tsunami Samp from Surf from. Gudiya Badu near Burma Nalla (Port B)
② TS/RG/2.	"	

Tsu Deposit from a trench. near Burma Nalla at a depth of 150 cm.

Interview Island

		LOC	
12 ~~11~~	IN/St/D ~~/~~ (10P)	Intr Island.	Coral Sample from a stream sect in interview Island, Possibly 2nd terr from Sea
13 ~~12~~	~~D~~ T3/IN/D/P1/D (10P)	"	Coral Sample from 3rd terrace.
13 ~~14~~			

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Size Analysis - Avis. Island

① AV|Sz|1|L1 " "

② AV|Sz|2|L1 " "

Sample Collectd from depth of 28 cm. from trench 1 at level 1.

" dep. 10 cm.

③ AV|Sz|3|L1 " dep 86 cm.

" .

④ AV|Sz|4|L1 " dep 15 cm

⑤ AV|Sz|5|L1 " 110 cm. "

" " . "

g])j)JcD\KoFlfUJcFL)JcC<$V>p9'JcC<$g])j)JcDPGp_/5YJcFL)JcC<$UAt''JcC<$g])j)
JcDABr=ab^JcFL)JcC<$ScA^'JcC<$g])j)JcD8?!#'q`JcFL)JcC<$JcC<$JcGECJcC<$JcC<$
JcGECJcC<$JcC<$JcGECJcC<$JcC<$JcGECJcC<$JcC<$JcGECJcC<$JcC<$JcGECJcC<$JcC<$
JcGECJcC<$JcC<$JcGECJcC<$JcC<$JcGECJcC<$JcC<$JcGECJcC<$JcC<$JcGECJcC<$JcC<$
JcGECJcC<$JcC<$JcGEC~> Z
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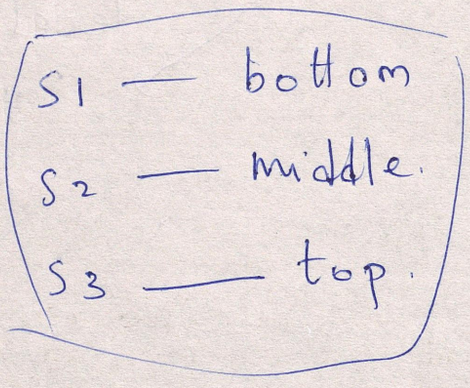
Sill 1

Sill-2



Dating :- Diglipur – ~~Moffar~~ Maggar Nalla.

Sample No.	Loc.	Nat/Rem.
1) MN|TR1|D|B (trench 2004)	"	Charcoal from bottom of trench. above the Yellow layer in trench 1
② MN|Sill 1|S3 * ✓ (order feature on the bank)	"	Sample charcoal taken from top of liquified layer.
③ MN|Sill 1|S1 * ✓	"	" " " bottom. "
④ MN|Sill 1|S2.	"	" middle "
⑤ MN|Sill 2|S1 ✓ *	"	" ~~top~~ bottom. "
⑥ MN|Sill 2|S2.	"	——→ Middle. "
⑦ MN|Sill 2|S3 ✓	"	——→ " top "

13° 43' 00"

– Size Analysis. ~~Nag~~ Magar Nalla

① MN/SZ/SB	"	Sample for size analysis from Sand blow.
② MN/TR1/YL	"	from yellow layer in trench 1
③ MN/TR1/GL	"	Sample from Size Analysis from below grey layer in trench 1
4) MN/TR1/YL1	"	8. " Just below yellow layer, may be a sand blow?
⑤ MN/TR1/SD	"	" from Sanddyke (2004)
⑥ MN/TR1/PSB	"	" " from previous Sand blow in trench 1

AVIS Island — Dating

No	Loc	Nat/Rem.
1) AV|PD|LT|1	Avis Island.	Coral Samp from present day low tide level.
2) AV|T2|A	"	Samp from 10–15 m from Surf, 2nd most distant from Sea, Possibly terrace 2.
(3) AV|T2|B	"	Shells of Gastropods. from terrace 2, 10–15 cm from Surface.
(4) AV|T1|A	" ✓	Shells from terrace 1 (level closest to sea)
(5) AV|T2|C. ✓	"	Shells from terrace 2 10–15 m from Surface
(6) AV|T1|PB.	" ✓	Calcareous fragments. from the bottom of the trench + cut at Terrace 1
(7) AV|T2|D ✓	"	Coral sample from 10–20cm depth from terr-2.
(8) AV|PD|LT|2 ✓	"	Coral Samp from present day low tide level.
(9) AV|T2|E	"	Coral samp from terr-2. 10–15 cm from Surface.
(10) ~~AV|SS|AV~~ 1		Terr 1

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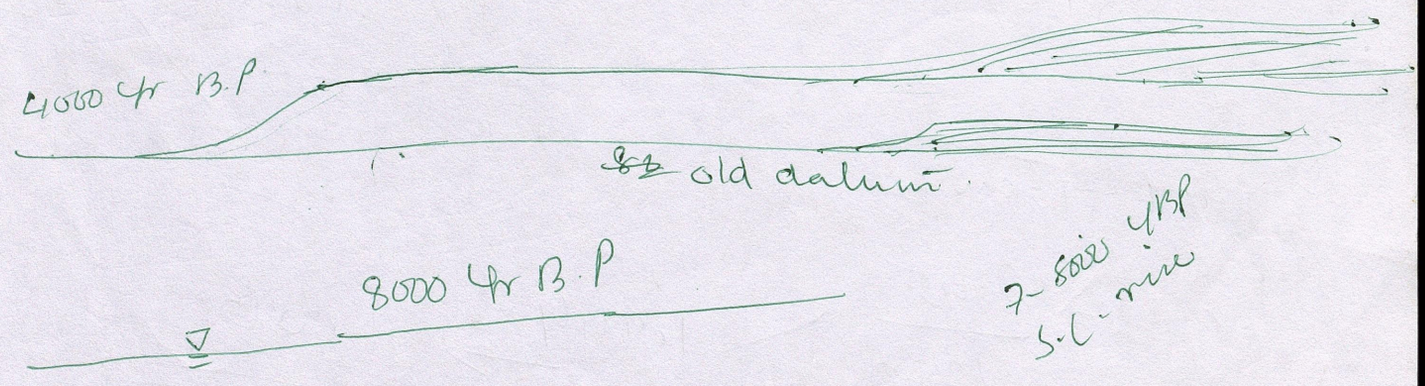
District of Headquarters			Name	Anil Earnest		Month of January-Febraay 05			Purpose of		Field work around Andaman and			
			Designation	Research Assistant		Voucher No.			Tour		Nicobar Islands			
			Pay	Rs. 8000										
			Project	PLAN (216)		Payments for								
Date and Hour		Place			**Sanction No. 933/05 dt. 04.01.05**									
Dep	Arrival.	From	To	Mode	Dist.	Fare	Inc.	Mileage Allowance			Rent	DA	Actual	Remarks
09/01/2005	09/01/2005	CESS	Air Port,TVM	Taxi	25									
01:00 PM	2.00 Pm		Via Vattiyoorkavu											
09/01/2005	09/01/2005	Air Port	Air Port	Air	800									
2.50 Pm	3.50 Pm	TVM	Chennai	Halt at Chennai							450	230		
10/01/2005	10/01/2005	Chennai	Port Blair	Air	1200									
8.30 Am	9.30 Am	Air Port												
10/01/2005	10/01/2005	Fieldwork around Port Blair		Jeep										
9.30 am	6.30 pm			Halt at Port Blair							400	185		
11/01/2005	11/01/2005	Fieldwork around Port Blair		Jeep										
8.30 am	6.30 pm			Halt at Port Blair							400	123.333		
12/01/2005	12/01/2005	Fieldwork around Port Blair		Jeep										
07.00 am	07.00 pm			Halt at Port Blair							400	123.333		
13/1/05	13/1/05	Fieldwork around Port Blair		Jeep										
8.00 pm	08.00 am			Halt at Port Blair							400	123.333		
14/1/05	14/1/05	Fieldwork around Port Blair		Jeep										
7.00 am	7.00 pm			Halt at Port Blair							400	123.333		
15/1/05	15/1/05	Port Blair	Hut Bay	Ship	200	30								
8.00 am	12.30 pm			Halt at Hut Bay								150		
16/1/05	16/1/05	Fieldwork around Hut Bay		Jeep										
12:00 AM	4.30 pm													
16/1/05	16/1/05	Hut Bay	Port Blair	Ship	200	30								
5.00 pm	9.30 pm			Halt at Port Blair							400	185		
17//1/05	17/1/05	Fieldwork around Port Blair		Jeep										
7.00 am	7.00 pm			Halt at Port Blair							400	123.333		
Total						**60**					**3250**	**1366.67**		

Sample ID	Location	Type	Status	C-14 Age
C/K/T2/D2	Kathane	Carb Sediment	To Count as on 8/11/04	
C/B/T1/4	Baruchh	Carb Sediment	Being counted as on 8/11/04	
C/B/T1/3	Baruchh	Carb Sediment	Very low Organic carbon	
C/B/T1/2	Baruchh	Carb Sediment	Being counted as on 8/11/04	106±77
C/U/T1/D1	Uthalia	Carb Sediment	Done	2530±80
C/T/T1/4	Surat	Carb Sediment	low carbon	
MB/T1/D1	Motibaru	Carb Sediment	To Count as on 8/11/04	
CN/TC/1	Car Nicobar	Calc Sediment	Done	5420±80
CN/SA/1	Car Nicobar	Calc Sediment	Done	35910±1040
K/Q/PA/1	Paravur	Charcoal		

Cal age: 20-143 yr B.P.
C | U | T1 | D1

δ13C corrections for radiocarbon ages measured as 14C/13C ratios (Reimer et al., 2004

Cathode	IP#	Sample Name	Uncorr. BP	error BP	δ13C	δ13C err
3	352	IN/TOP/B	24598	279.8	2	1
4	334	T(2)B/HUT/D/P3	4259	99.5	2	1
7	330	T3/Har/HUT	1420	76.4	2	1
9	316	AV/PD/LT/1	200	77.1	2	1
11	314	AV/T1/A	483	107.9	2	1
12	326	AV/T1/PB	544	103.6	2	1
13	349	T3/IN/D/P1/C	18881	212.2	2	1
16	350	T1/HUT/D/P2	6441	116.9	2	1
17	351	AV/T2/A	1205	93.5	2	1
28	353	T2/HUT/D/P1	3238	132.6	2	1
29	354	AV/PD/LT/2	-325	112.7	2	1
30	375	AV/T2/E	896	90.4	2	1
32	376	AV/T2/D	941	125.7	2	1
3	318	RG/Shell/D	936	76	2	1
4	320	IN/St/D	6554	84.2	2	1
5	322	T3/IN/D/P1/D	16426	122.3	2	1
7	332	T2/IN/D/P1/B	20731	168.3	2	1
8	328	T2(A)/HUT/D/P1	1481	60.2	2	1
9	344	T1/IN/D/P1/B	22244	173.8	2	1
11	347	T1/IN/D/P1/C	11195	288.4	2	1
12	337	AV/T2/E	2027	83.2	2	1
13	338	AV/T2/D	1349	41.6	2	1
16	341	AV/T2/B	1519	113.6	2	1
17	346	AV/T2/C	1255	88.3	2	1
18	342	T2(A)/HUT/D/P3	2700	46.1	2	1
36	323	T(2)B/HUT/D/P4	6352	135	2	1
37	329	T2/HUT/D/P5	1872	61.7	2	1



Avio

① $\frac{0.75+0}{49}$ $\frac{0.75}{427}$

② $\frac{1.5}{294} = 5.10$ $\frac{1.5}{668} = 2.24$

③ $\frac{1.31}{332} = \cancel{4.518}$ 3.945 $\frac{1.31}{727} = \cancel{2.06}$ $= 1.80$

④ $\frac{(1.75-15cm)}{948} = \cancel{1.845}$ 1.687 $\frac{1.75-0.15}{1349} = \cancel{1.297}$ 1.186

⑤ $\frac{2-0.15}{665} = 3.00$ 2.781 $\frac{2-0.15}{1047} = 1.910$ 1.766

⑥ $\frac{2.4-0.15}{656} = \cancel{3.658}$ 3.429 $\frac{2.4}{1170} = \cancel{2.051}$ $= 1.923$

2.25

⑦ $\frac{2.647}{621} = 4.186$ $\frac{2.6}{840} = 3.095$

Av = 2.045

6

⑧ 2.6 − 15cm

dip

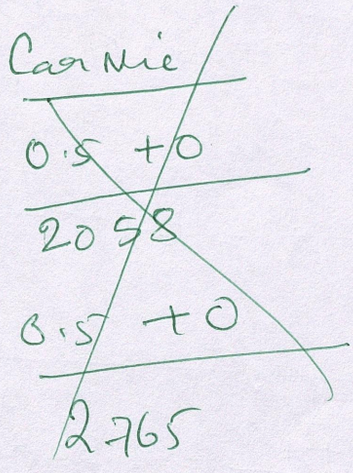
$= \frac{2.45}{1260}$ 1.944 → 1.66

$\frac{2.45}{1770}$ 1.384

Av = 1.76

)

Corr. BP (years)	error (yrs)
25021 ✓	280
4682	100
1843	77
623	78
906	108
967	104
19304	212
6864	117
1628	94
3661	133
98	113
1319	91
1364	126
1359	76
6977	85
16849	123
21154	168
1904	61
22667	174
11618	289
2450	84
1772	42
1942	114
1678	89
3123	47
6775	135
2295	62



Car Nic

$\frac{13+3}{5545} = 2.\cancel{70}$ mm/yr

2.88

$\frac{13+3}{5995} = \cancel{2.502}$

2.668

Av = ~~2.607~~ 2.774 mm/yr

Uplift rates

$\frac{7+6.0}{7623} = 1.705$ $u = z - z_0 \rightarrow S_2$ 1.74 mm/yr

$\frac{7+6.0}{7293} = 1.782$ t.

6977. 7293 7623.

INTERVIEW

Younger

① $\frac{50 + 130}{30880} = 5.82$

② $\frac{50 + 130}{25021} = 7.193$

$\boxed{Av = 6.42}$

③ $\frac{26 + 125}{22890} = 6.596$

$\frac{18m + 7.0 + 6}{7293} = \cancel{3.18}$ = 4.25

$\frac{18m + 7.0 + 6}{7623} = \cancel{3.18}$ 4.06

4.1 mm/yr

④ $\frac{18 + 120}{22709} = 6.076$ $\frac{18+120}{23635} = 5.83$ Av = 5.95 mm

⑤ $\frac{13 + 120}{19332} = 6.879$ $\frac{13+120}{19885} = 6.688$ Av = 6.8835

⑥ $\frac{18+120}{21990} = 6.275$ $\frac{18+120}{23212} = 5.945$ = 6.10

~~Av 1.609~~
~~Av = 1.543~~

HUT

① $\frac{2.8+1}{2834} = 1.340$ $\frac{2.8+1}{3360} = 1.13$ Av = 1.23

② $\frac{2.8+1}{3236} = 1.174$ $\frac{2.8+1}{3915} = 0.970$ Av 1.07

③ $\frac{2+1}{1290} = 2.325$ $\frac{2+1}{1597} = 1.87$ Av 2.097 2.101

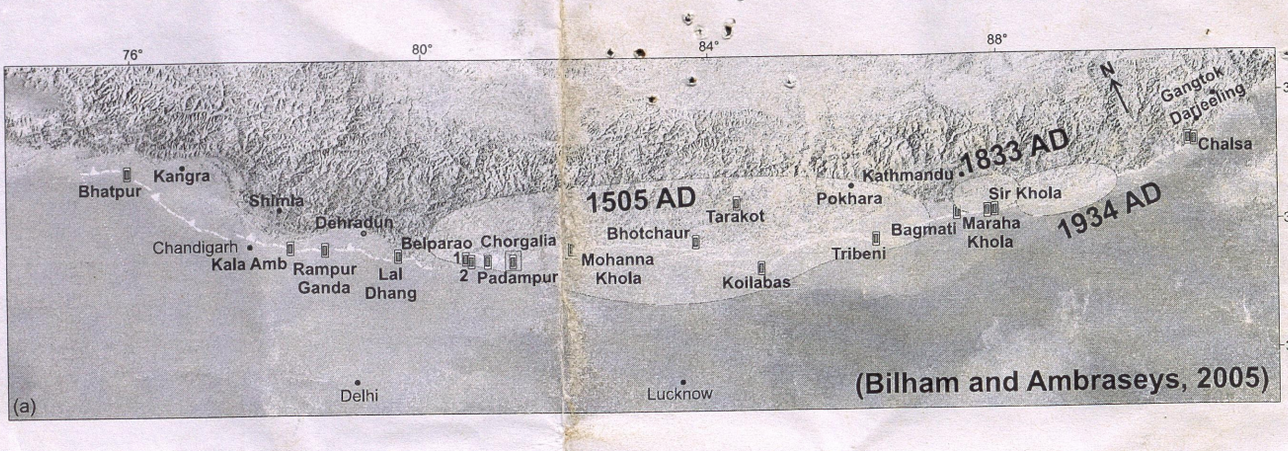
④ $\frac{2.8+1}{2749} = 1.382$ $\frac{2.8+1}{3052} = 1.245$ Av 1.313

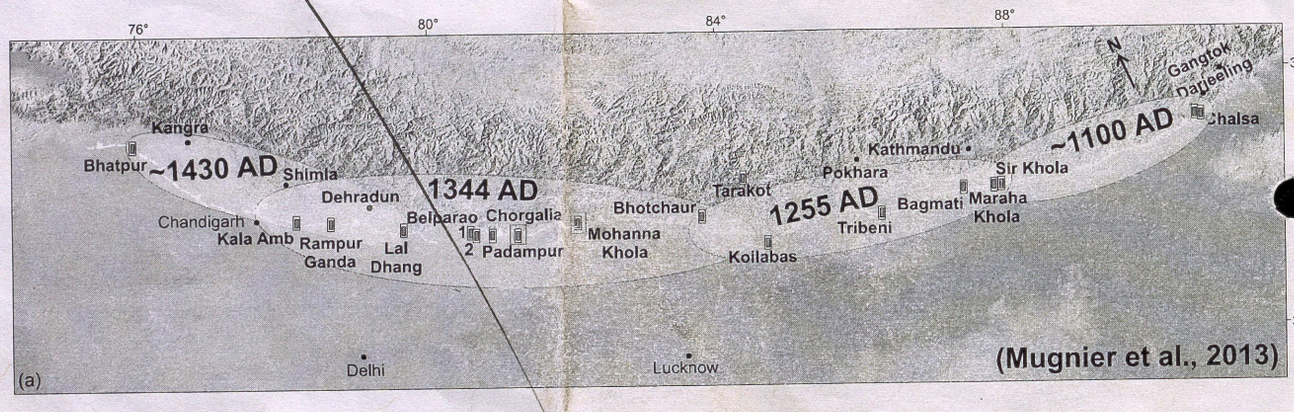
⑤ $\frac{1.5+0}{466} = 3.218$ $\frac{1.5}{776} = 1.932$ Av = 2.5

⑥ $\frac{4.5+6}{6977} = 1.50$ $\frac{4.5+6}{75.44} = 1.39$ Av = 1.44 ~~Av = 1.642~~

Radiocarbon results from Kelshi samples

S.No	Sample Id	LAB Id	Nature of the Sample	Depth	Radiocarbon results
1.	M1	**K -1**	Peat - Section I	2.10 mtr	1449-1634 AD
2.	M2 a	**K - 2**	Peat - Section I	1.65 mtr	1410-1456 AD
3.	M2 b	**K - 3**	Charcoal - Section I	1.30 mtr	1439-1628 AD
4.	M3 a	**K - 4**	Charcoal - Section I	80 cm	1474-1641 AD
5.	M3 b	**K - 5**	Charcoal - Section I	50 cm	1446-1632 AD
6.	M4	**K - 6**	Charcoal - Section III	20 cm	1458-1635 AD
7.	M4 shell	**KL**	Shell sample – Section III	20 cm	1508-1681 AD


76°
80°
84°
88°
34°
32°
30°
N
Gangtok
Darjeeling
Chalsa
Kangra
Bhatpur
Shimla
Dehradun
Chandigarh
Kala Amb
Rampur
Ganda
Lal
Dhang
Belparao 1
2
Chorgalia
Padampur
1505 AD
Tarakot
Bhotchaur
Mohanna
Khola
Koilabas
Kathmandu
Pokhara
Tribeni
Bagmati
Maraha
Khola
Sir Khola
1833 AD
1934 AD
Delhi
Lucknow
(a)
(Bilham and Ambraseys, 2005)


76°
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Kangra
Bhatpur
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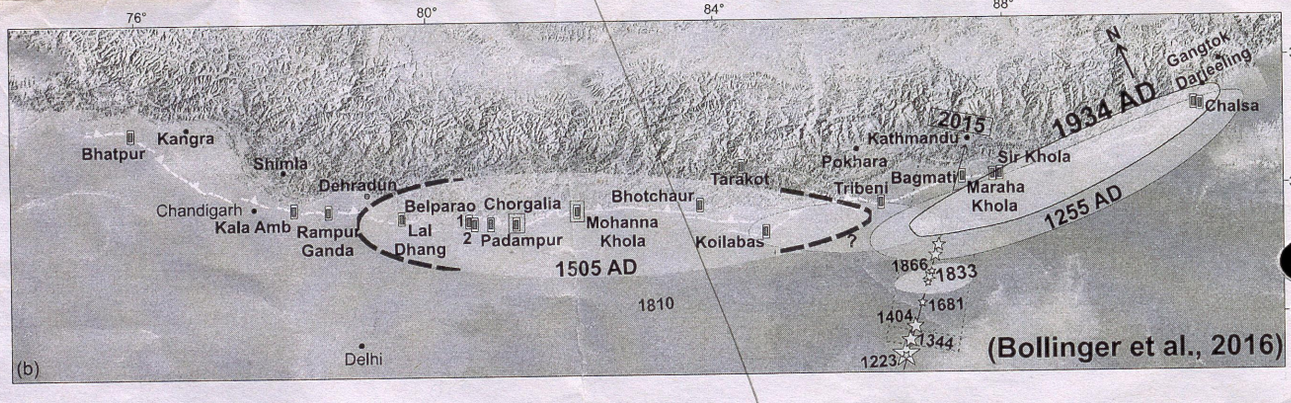
Dehradun
Chandigarh
Kala Amb
Rampur
Ganda
Lal
Dhang
Belparao 1
2
Chorgalia
Padampur
1344 AD
Bhotchaur
Tarakot
Mohanna
Khola
Koilabas
1255 AD
Kathmandu
Pokhara
Tribeni
Bagmati
Maraha
Khola
Sir Khola
~1100 AD
Delhi
Lucknow
(a)
(Mugnier et al., 2013)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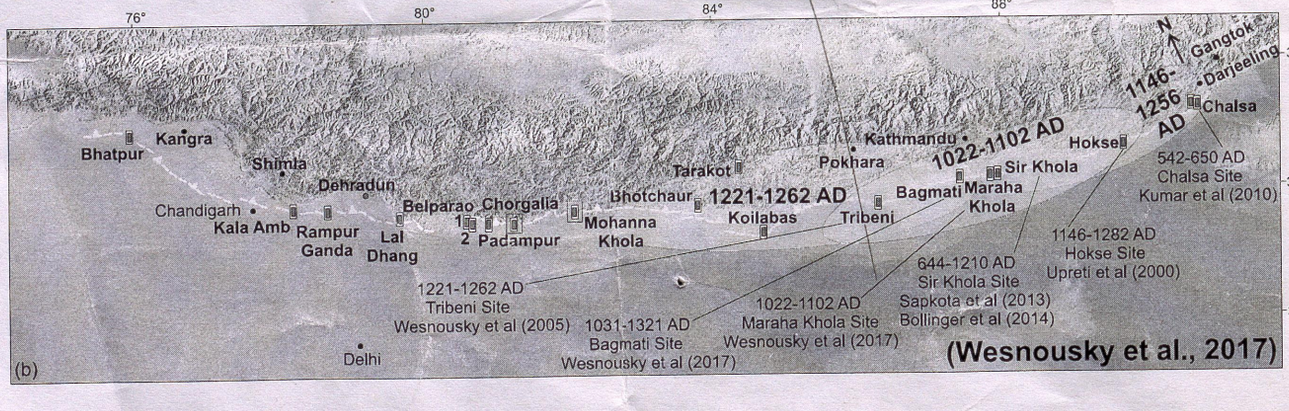
Chandigarh
Kala Amb
Rampur
Ganda
Lal
Dhang
Belparao 1
2
Chorgalia
Padampur
Bhotchaur
Tarakot
Mohanna
Khola
Koilabas
1505 AD
1810
Kathmandu
2015
Pokhara
Tribeni
Bagmati
Maraha
Khola
Sir Khola
1934 AD
1255 AD
1866
1833
1681
1404
1344
1223
Delhi
(b)
(Bollinger et al., 2016)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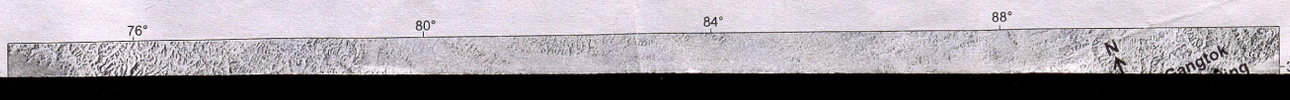
Shimla
Dehradun
Chandigarh
Kala Amb
Rampur
Ganda
Lal
Dhang
Belparao 1
2
Chorgalia
Padampur
Bhotchaur
Tarakot
Mohanna
Khola
1221-1262 AD
Koilabas
Kathmandu
Pokhara
Tribeni
Bagmati
Maraha
Khola
Sir Khola
1022-1102 AD
Hokse
1146-1256 AD
542-650 AD
Chalsa Site
Kumar et al (2010)
1146-1282 AD
Hokse Site
Upreti et al (2000)
644-1210 AD
Sir Khola Site
Sapkota et al (2013)
Bollinger et al (2014)
1022-1102 AD
Maraha Khola Site
Wesnousky et al (2017)
1031-1321 AD
Bagmati Site
Wesnousky et al (2017)
1221-1262 AD
Tribeni Site
Wesnousky et al (2005)
Delhi
(b)
(Wesnousky et al., 2017)


76°
80°
84°
88°
34°
N
Gangtok

~~Mahe~~ - Maharashtra - Mahim

	Loc	Nat/Loc
(1) MA/BR/1	Mahi, Maharashtra.	Sample of beach rock
(2) MA/BR/2	"	

26°03'N; 91°25'E

Assam -

	Loc	
KU/SL/D ~~KU/D/B1~~	Kukurmara Assam - from sand blow feature	→ Duarah's sample sample as interlayered parallel to stratification
KU/S2/D	Kukurmara Assam - from sand blow feature	→ Sample distributed within site of collection. Both samples ~~from~~ are from same location

1950

Site 1

~~2~~

2	①	B1/D/E1/1	1m Twig	1500 ± 230 Ft	AD 390 – AD 780 (1365)	4th AP 1560–1170
	②	B1/D/E1/2	1m Sediment	1970 ± 710	BC 800 – AD 800 (1960)	2750–1170
3 –	③	B1/D/E1/3	Trunk	5190 ± 110	BC 3960 – 3700 (5780)	5910–5650
1	④	B1/D/E1/4	24cm Peat	80 ± 200	AD 1640 – 0 (0)	310–0

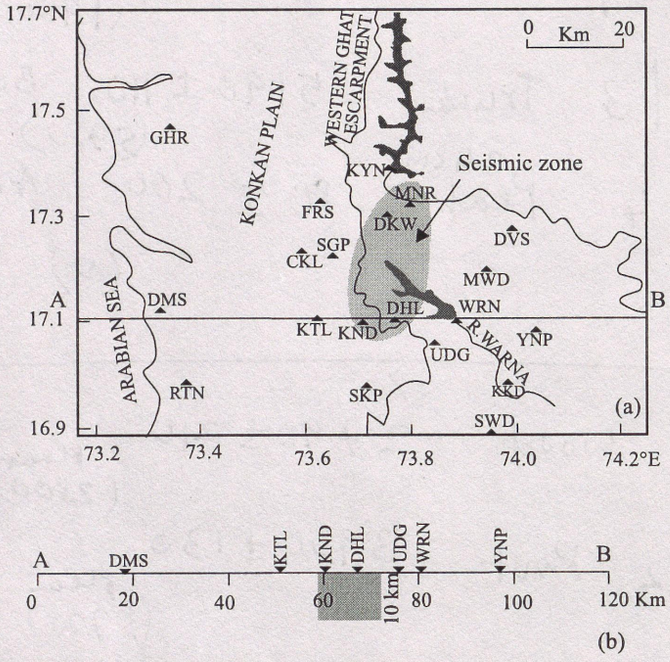
---

①	P1/D/E1/1	Wood	2790 ± 210	Mean (2800)	BC 1130 – ~~AC~~ 601 ~~3080 – 2551~~ 3080 – 2551
②	P1/D/E1/2	Root	3900 ± 130	Mean (3720)	~~2410~~ BC 2460 – 1080 BC 4410 – 3030
~~③~~	~~P1/D/E1/3~~	~~Sediment~~			
③	P1/D/E1/4	Sedi	80 ± 90		~~270~~ ~~310 – 0~~ AD 1680 – 0 (0) 310 – 0

[0] [0]

[1365 1960] [2800]

[5780] [3720]



Figures 1a and b

Assam, Temple - Kamakhya TL dating -

The sample of the lower brick wall is a fired brick (red brick). From the debris the dated sample is not brick, because bricks will give its original date of firing. We dated the burnt pottery used in the temple rituals collected from the debris. The dating is done only for quartz.

The bricks and pottery were crushed in a hand-vice. The crushed materials were treated with HCl. Quartz grains of the size range 90-125 micrometre were etched with 40% HF for 40 minute at 20°C. Natural TL(N) as well as $N+\beta_i$ were measured with Riso TL/OSL (model TL DA-15) reader at a heating rate $5°Cs^{-1}$. The $N+\beta_i$ glow curves were recorded after waiting for 50 hour to ensure that no unstable luminescence signal interfered the readings. The annual dose rates are not determined till now, but as the area is a gneissic terrain having continuity with the Chidrang, the dose rate determined by Dr. M.P. Chougaonkar, BARC for your Dilma samples were considered for the necessary correction. The annual dose rates were measured by gross alpha counting method using pairs technique. This is the reason I was asking you about your TL-dates for Chidrang earlier. I think you are probably not receiving the dates from Gartia. The annual dose rate table for your samples is given below.Th and U values are in ppm and K values in per centage. However, the Kamakhya samples are now at BARC. The dating activities are found to be difficult to managed. As such I am planning to do it locally in the Nuclear Lab of Cotton College in Guwahati and K in the University using AAS.

Table 1 : Details of annual dose evaluation.

Sample	Concentration (ppm)			Dose rate(mGy/a)	Average dose rate(mGy/a)
	Th	U	K%		
Dilma/2/TL-1	21.94	6.40	1.284	4.46	4.27 ± 0.60
Dilma/1/TL-2	11.95	3.49	2.019	3.59	
Dilma/1/TL-3	20.20	5.90	1.942	4.75	

Km/S2/BRT
Km/S3/Br.

Assam TL dates

Sample No:	Lab ID	Av.Dose rate	~~Palcodose~~ Equivalent dose	Estimated ages
S2(Kamakhya 2nd layer)	Luminescence Dating Laboratory	4.27 ± 0.60mGy/yr	4.993 ± 0.009Gy	1194 ± 120yr
S3(Kamakhya Bottom brick)	Manipur University Imphal, India	4.27 ± 0.60mGy/yr	6.145 ± 0.038Gy	1464 ± 150yr

The bore hole data at Darranga, Tulsibari and Tamulpur have been taken from the Geological Survey of India publication with the following reference : Geological Survey of India (1977), Miscellaneous Publication No.32 ; Contributions to Geomorphology and Geohydrology of the Brahmaputra Valley. The bore hole data of Guwahati has been provided by Mr. D.K. Barman, Geologist, Directorate of Geology and Mining, Government of Assam, Kahilipara, Guwahati.

Kholabandha was a small district covering the lower reach of the Chaulkhowa which was later merged with the Old Kamrup district. The Chaulkhowa river basin is now a part of the Barpeta district, which is curved out of the Old Kamrup district. K.L. Baruah's Early History of Kamarupa described the Old Kamrup district.

1074 - B.P.
1314 - 682 -
926 -

1464 + 150 1479
1464 - 150 1314

521 - 686

Table 1a: Data on thermoluminiscense dating and estimated ages.

Sample No.	Lab ID	Material dated	Dose rate (Gy/ka)	Equivalent dose (Gy)	Estimated age (ka)
		~~brick~~ pottery	4.27 ± 0.60		1194 ± 120
		brick	4.27 ± 0.60		1464 ± 150

Table 1b. AMS age data for organic samples from sites at Dilma

Sample No.	Lab ID	Material dated	14C age Yr.BP.	Calendar ~~age~~ ~~year~~ age B.P. (2σ range)	Calendar year (2σ range)
D2-1897-1	BS-1900	Charcoal	2170 ±140	2486-2481	B.C.535-530
D2-1897-2	BS-1901	Charcoal	1250 ± 80	1305-971	A.D.645-980
D1-1897-1	NZA 14919	Charcoal	2501 ± 75	2761-2347	B.C. 810-400

~~Bricks and pottery~~

~~crushed material were bricks & pottery~~

Procedures used in this analysis were similar to those described by Aitken (1985; 1991). For TL dating experiments ~~From the we used lower level, we used bricks fired bricks,~~ from the lower level, ~~which gives the original date of firing and from the debris level burnt pottery was used. The crushed bricks and pottery were treated with HCl. deposited in 20% HCl. to remove two~~

Each Quartz grains (90-125 μm) were extracted ~~for re to~~ from by sieving and etched with ~~40~~% HF for 40 min. at 20°C. Natural thermo-luminescence (N) as well as NTβ, were measured with Riso TL/OSL (model TL DA-15) reader ~~at~~ (Manipur University, Imphal, India) at a heating rate

Stuiver, M. and Reimer, R.J. 1993. Extended ^{14}C data base and revised CALIB 3.0 ^{14}C age calibration programme. Radio Carbon 35, 215-230.

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Table 1a: Data on thermoluminiscense dating and estimated ages.

Sample No.	Lab ID	Material dated	Dose rate (GY/Ka)	Equivalent dose (GY)	Estimated age (Ka)
			4.27 ± 0.60		1194 ± 120 1464 ± 150

Table 1b. Age data for organic samples from sites at Dilma

Sample No.	Lab ID	Material dated	Dose rate (GY/Ka)	Equivalent dose (GY)	Estimated age (Ka)
D2-1-1897-1	BS-1900	Charcoal	2170 ±140	2486-2481	B.C.535-530
D2-1-1897-2	BS-1901	Charcoal	1250 ± 80	1305-971	A.D.645-980
D1-1-1897-1	NZA 14919	Charcoal	2501 ± 75	2761-2347	B.C. 810-400

^{14}C age yr B.P.

Calendar B.P. age (2σ range)

Calendar year (2σ range)

1 AMS data provided by Rafter Radiocarbon Lab., New Zealand

2 ~~Conventional ages β-counting~~ ages determined by

3 ~~Calendar ages estimated following β-counting~~ at BS/P, Lucknow Indian Stuiver et al. (1993)

5 Cs^{-1}. ~~The N + β, grow curves were recorded after waiting for 50 hour to ensure that no unstable luminescence signal interferred the readings.~~ The dose rate of ~~sample~~ bulk samples were determined by ~~neutron~~ laboratory ~~measurements~~ (Bhabha Atomic Research Centre, Mumbai, India) assays by neutron activation analysis of U, alpha-~~counting~~ particle counting for U, Th and X-ray spectrometry for K.

~~The~~ Dose rate is measured in the basis of ~~Zn~~ Zn^{3} (As) alpha counting Th and U ~~are~~ were determined by gross alpha counting technique, using parts circuit (e.g. Aitken, 1985). And the potassium content is using ~~inductively~~ inductively coupled plasma-atomic emission spectroscopy (ICP-AES)

Thank Shri M. Chongaonkar (Environment Division, Bhabha Atomic Research Centre) Mumbai, India for his help in dose analysis.

There is epigraphical
evidence for sea surge
~~On~~ between 1148 and 1203 A.D.
at Tanjore Area.

Table 4 A. Ages of the coral terraces at Interview Island, Little Andaman and Car Nicobar

Interview Island					
S.No.	***Sample ID***	***Lab. No.***	***Elevation (m)***	***C14 years B.P.***	***Remarks***
1	IN/TOP/A	R290 33/2	50	30880±300	Coral fragment from the highest point of the island (Fig.8A).
	IN/TOP/B	IP352		25021±280	Duplicate (Calcareous)
2	T5/IN/D/P1/A	R290 33/3	26	22890±120	Coral fragment from the fifth terrace on the island ~160m from the sea (Fig.8A).
3	T4/IN/D/P1/A	R290 33/4	18	19894±100	Coral fragment from the fourth terrace of the island~100m from the sea (Fig.8A)
4	T3/IN/D/P1/A	IP322	13	16849±123	Coral fragment from the third terrace of the island ~70 m from the sea(Fig.8A)
	T3/IN/D/P1/C	IP349		19304±212	Terr. 3
5	T2/IN/D/P1/A	IP320	7	6977±85	Coral fragment from the second terrace ~40m from the sea(Fig.8A)
	T2/IN/D/P1/B	IP332		21154±168	Terr. 2
6	T1/IN/D/P1/B	IP344		22667±174	~~Terrace 2 (Old)~~ ~~Terr. 2~~
	T1/IN/D/P1/C	IP347		11618±289	old → Terr. B
Hut Bay (Little Andaman)					
1	HB/L2/CP	--	4	3286±100	Coral fragment obtained ~100m from the sea(Fig.8B)
	T2(B)/HUT/D/P3	IP334		4682± 100	Terrace 1

	T2/HUT/D/P1	IP353		3661± 133	
	T2(A)/HUT/D/P1	IP328		1904± 61	
	T2(A)/HUT/D/P3	IP342		3123± 47	
	T2(B)/HUT/D/P4	IP323		6775± 135	
	T2/HUT/D/P5	IP329		2295±62	
2	HB/L1/CP	--	1.5	1042±90	Coral fragment obtained ~10m from the sea (Fig.8B)
	T1/HUT/D/P2	IP350		6864±117	
3	T3/HAR/HUT	IP330		1843±77	Harmandar Bay
Car Nicobar					
1	CN/TC/1	BS2258	12	5420±80	Coral fragment from the cliff ~5m from the sea(Fig.8C)
2					
3					

Avis Island

1	AV/PD/LT/1	IP316	623±78	
	AV/PD/LT/2	IP354	98± 113	
2	AV/T1/A	IP314	906± 108	
	AV/T1/PB	IP326	967± 104	
3	AV/T2/A	IP351	1628± 94	
	AV/T2/E	IP375	1319± 91	
	AV/T2/D	IP376	1364± 126	
	AV/T2/E	IP337	2450± 84	
	AV/T2/D	IP338	1172± 42	
	AV/T2/B	IP341	1942± 114	
	AV/T2/C	IP346	1678± 89	

22-10-07-

6-10-07

15 days.

Table 4 B. Radiocarbon dates from various locations in the Andaman and Nicobar Islands.

S.No.	*Location*	*Sample ID*	*Lab. No.*	*C14 years B.P.*	*Remarks*
1	Panchavadi (Middle Andaman)	PA/Peat/1	BS2505	1490±140	Roots of old mangrove traces preserved in the elevated coastal sections
2	Rangachanga (near Port Blair)	RG/Peat/2	BS2511	4320±130	Peat from stream bank (Fig.10A)
3	Rangachanga (near Port Blair)	RG/Shell/D	IP318	1359± 76	Shell from stream bank
4	Rangachanga (near Port Blair)	RG/Wood/1	BS2530	740±100	Wood sample from stream bank (Fig.10A)
5	Magar Nalla (near Diglipur)	MN/Sill1/S3	BS2521	1050±100	Peat taken from the top of the liquefied layer (Fig.7)
6	Hut Bay (Little Andaman)	GS/HUT/OT	R29033/8	753±35	Gastropod shells from sand deposits from the older terrace (Fig.10B)
7	Hut Bay (Little Andaman)	CS/HUT/OT	R29033/7	5623±35	Coral fragment from the suspected tsunami deposit

*Measurements for C14 dating of the coral samples were done at the Rafter Radiocarbon Laboratory, New Zealand, Birbal Sahni Institute of Palaeobotany, Lucknow,India and Institute of Physics, Bhubaneswar, India. Ages of calcareous samples are estimated assuming ΔR (difference in reservoir age of local region compared to model ocean) to be zero. Half-life for C14 taken as 5570±30 yr B.P. at the Birbal Sahni Institute of

Palaeobotany, 5568 at the Institute of Physics and 5730 yr B.P. at Rafter Radiocarbon Laboratory, New Zealand.

1 m = 100 cm.

3.2 mm/yr.

IUGS International Union of Geological Sciences

EC European Commission

100

30880 = 50+50

30880 : 100 mt 1000

Int. Island.

T1 → pennultimate

T2 → 7.271 m . age 6977. $U = \frac{7.271 + 5m}{6977} = 0.0017m = 1.75 mm/yr$

T3 12.899 m 16849 $U = \frac{12.899 + 120m}{16849} = 7.88 m/yr$

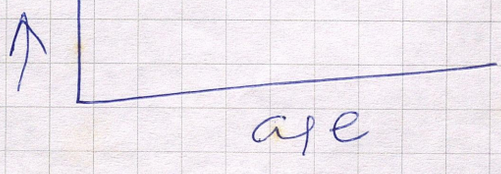
T4 17.793 m 19894 $U = \frac{17.793 + 120}{19894} = 6.9 m/yr.$

T5 ~~22890~~ 25.82 22890. $U = \frac{25.82 + 115}{22890} = 6.15 m/yr$

Terrace	Elh (z)	age	sl level (SL)	uplift
T2	7.271	6977	−5 m.	12.271
T3	12.899	16849	−120	132.89
T4	17.793	19894	−120	137.793
T5	25.82	22890	−115	140.82

~~50~~ 80

Uplift = z − SL



BS No	Sample No	Radiocarbon Age	Calibrated result	
			1 Sigma	2 sigma
1530	VG/T5/D/1/98	7730 ± 90	BC 6603-6453	BC 6751-6383
1531	VG/T3/D/1/98	1840 ± 120	AD 66-341	BC 59 – AD 440
1532	VG/T1/D/1/98	5870 ± 260	BC 5055-4457	BC 5314-4165
~~1534~~	~~VG/T3/D/2/98~~	~~390 ± 100~~	~~AD1433 – 1644~~	~~AD 1398-1954~~
1518	VG/T5/D/1/98	3570 ± 100	BC 2032 - 1748	BC 2190 –1673
1484	V/T/D/2/CP	1443 ± 95	AD 545-AD 669	AD 421-AD 778
~~S-2251~~	~~V/T3/D/Sh/CPR1~~	~~Sample insufficient for dating~~		
~~1559~~	~~V/T3/D/Sh/4/CPR2~~	~~360 ± 130~~		~~520-291~~
1560	V/T3/D/Sh/4/CPR3	1340 ± 140		1350-1091 A.D.
~~1649~~	~~No.2/O/D/99~~	~~1180 ± 120~~		~~1260-960 A.D.~~
~~1632~~	~~No.3/O/D/99~~	~~160 ± 90~~		~~290-0 A.D.~~
~~1640~~	~~No.4/O/D/99~~	~~440 ± 90~~		~~540-380 A.D.~~
~~1644~~	VG/T5/D/2/98	2900 ± 90	Sediment	3210-2890 A.D.
121569	V/T3/D/3/CP	1110 ± 50	Charcoal	855-1020 AD
121572	V/T2/D/1/CP	390 ± 50	Charcoal	1430-1645 AD
121573	V/T1/D/E4/CP	1070±50	Charcoal	885 – 1035 AD
121574	V/T1/D/E/CP	1150 ± 50	Charcoal	780 -1000 AD
121575	V/T1/D/W/CP	1090 ± 50	Charcoal	875 – 1025 AD

BS 1531 VG/T3/D/1/98 Sediment 1840±120 59–440

BS-1532 VG/T1/D/1/98 Sediment 5870±260 ~~5055-6143~~ 5314–4165 BC.

BS-1530 VG/T5/D/1/98 Sediment 7730±90 6751–6383 BC

~~BS-1518~~

BS-1534 VG/T5/D/1/98 Sediment 390±100 1398–1954 A.D

BS-1518 VG/T5/D/1/98 Shell 3570±100 2190–1673 B.C.

~~BS-1484 V/~~

Ahmedabad and Baroda. In fact, from the historic accounts it becomes clear that impact of the earthquake on the areas north of Allah Bund (e.g. around the town of Hyderabad in Pakistan, located ~200 km north from the Bund) as was much more severe. In a specific reference to the earthquake-related changes near Hyderabad at the bank of the Fulle River, Frere (1907) reported a much-lowered water level in and around the river, three days prior to the earthquake, which remained that way till the day of the earthquake.

. Widespread liquefaction phenomena accompanying the earthquake were also reported (MacMurdo, 1821). The jets of black muddy water thrown out of the fissures reportedly carried wrought irons and nails, presumably the remnants of ships preserved in the underlying sediments. The liquefaction was reported from places as far as Porbunder (250 km south of Allah Bund). Although there were no reports of any foreshocks, imperceptible microseismicity may have been occurred before the earthquake (Frere, 1870). However, a large number of aftershocks were felt by the people; at least one shock was felt everyday until the end of November of 1819. The 1819 earthquake seems to be the only large-magnitude event that has occurred in the vicinity at least up until 16th century. This is borne out by the fact that in Ahmedabad, the turret of 16th century Mosque fell down due to the impact, indirectly proving that no big earthquakes of similar magnitude occurred in this region 400 years prior to the 1819 earthquake

The Allah Bund and its elevation

The accounts of the 1819 earthquake, however, contain a great deal of discussions on the height of the Allah Bund that was raised during the 1819 event. Burnes, who surveyed the area in 1827 and 1828, provided the first eyewitness account of the surficial deformation produced by the earthquake (Burnes, 1835). He was the first one to quantify the elevation and length of the Allah Bund. The height of the Allah Bund according to him is about 3 m from the level of the river, with a gradual slope toward the north for about 25 km. Along with the uplift, Sindri, a small mud fort located 10 km south of the Allah Bund toward Luckpat, subsided during the earthquake. The depth of the Sindri Lake, according to Burnes was ~1 m. The length according to him was extended much in east-west direction for about 80-96 km. Since then, several workers have dealt with the elevation and subsidence of the Runn. In 1844, Baker surveyed the Allah Bund, and leveling was carried out across the bund. According to this survey (Baker, 1847), the greatest height of the bund above the level of the Sindri Lake was 7.7 m, which contradicts the earlier observation. The slope on the northern sides was about 1.5 m per 1.5 km and on the southern side the bund was much steeper and amounts to 18 m per 1.5 km. Baker's section indicates depth of 3 m near the Sindri Lake. One probable reason for this discrepancy regarding the elevation of the Allah Bund may be the changing water level in the lake, which might have been used as a reference datum.

Wynne (1872), however, argued that the Allah Bund was not in fact an uplifted tract but rather '*merely had the appearance of such when viewed from the south....*'. Oldham (1926), who synthesized the existing data, however, assumed that the surface at Sindri was not more than 1.5 m above the future lake and expected uplift on the north

BS No	Sample No	Radiocarbon Age	Material	Calibrated result 2 sigma
B5 1530	VG/T5/D/1/98	7730 ± 90	Greenish clay with shells	BC 6751-6383
B5 1531	VG/T3/D/1/98	1840 ± 120	Sediment	BC 59 – AD 440
B5 1532	VG/T1/D/1/98	5870 ± 260	Shells	BC 5314-4165
B5 1518	VG/T5/D/1/98	3570 ± 100	Shells	BC 2190 –1673
B5 1484	V/T2/D/2/CP	1443 ± 95	Charcoal	AD 421-AD 778
B5 1560	V/T3/D/Sh/4/CPR3	1340 ± 140	Shells	A.D. 1350-1091 AD
B5 1644	VG/TO1/D/10/98	2900 ± 90	Sediment	A.D. 3210-2890 AD
Beta 121569	V/T3/D/3/CP	1110 ± 50	Charcoal	AD 855-1020 AD
Beta 121572	V/T2/D/1/CP	390 ± 50	Charcoal	AD 1430-1645 AD
Beta 121573	C/T1/D/E4/CP	1070±50	Charcoal	AD 885 – 1035 AD
Beta 121574	V/T1/D/E/CP	1150 ± 50	Charcoal	AD 780 -1000 AD
Beta 121575	V/T1/D/W/CP	1090 ± 50	Charcoal	AD 875 – 1025 AD
~~B51531~~	~~VG/T3/D/1/98~~	~~1840 ± 120~~	~~Sediment~~	~~AD 59-440 A.D.~~
B5 1532	VG/T1/D/1/98	5870 ± 260	Sediment	B.C. 5314-4165 BC
B5 1530	VG/T5/D/1/98	7730 ± 90	Sediment	B.C. 6751-6383 BC
B5 1534	VG/T5/D/1/98	390 ± 100	Sediment	A.D. 1398-1954 AD
B5 1518	VG/T5/D/1/98	3570 ± 100	Shell	B.C. 2190-1673 BC

VG/T5/D/2/98

BS 1530 VG/T5/D/1/98

~~VG/T3~~

BS 1518 VG/T5

BS 1530 VG/T5

BS 1534 VG/T5

BS 1518 VG/T5

BS 1531 VG/T3/D/1/SV

~~Beta~~

~~BS~~

BS 1484 V/T2/D/2/CP

~~Beta~~

Beta 121569 V/T2/D/1/CP

V/T3/D3/CP

~~V/T2/D/1/CP~~

VG/T5/D/2/98

VG/T1/D/1/98

height of 2 or 3 yards for the distance of 2 to 3 kos (5-7.5 miles) commencing about 2 kos above Sindree: the spot is called Ullah Bund (God's embankment), but the monsoon has worn a water-way through it an irregular narrow channel; the material being of clay, sand and gravel, this would soon be deepened and widened by any flow of water; the earth was also raised at a place called Sunda. The usual tide only reaches this Sunda, the spring tide now goes over it by a cubit. The earthquake of 1819 raised the ground as to leave the tide there waist high, but in 1901 (AD 1844) (the Hindu lunar calendar Jeth Sumvut 1901 is actually June 1845), a series of shocks occurred, that raised the earth still more, so as to leave a cubit (foot and a half) as the greatest depth of water ever found there: these shocks also extended the breadth of the Allah Bund to the extent of 3 kos: before they occurred the usual tide went over the Sunda by about half a foot, but now not at all. At spring tides, however, a boat drawing a cubit of water can with some labour be taken over the Sunda". From this description, two points become clearer. [One] First, a slight coseismic [modification] elevation of surface level (0.5-1 m) occurred south of Sindri during the June 16,1819 event, which is also attested by Burnes (1835), and [two] second, further rise in level occurred near Sunda during the June 19, 1844 event. The significance of these changes in the overall seismotectonics of this region will be discussed later.

MORPHOLOGY OF THE ALLAH BUND REGION: THE FIELD STUDIES

The morphology of the Great Rann of Kutch is dominated by several features (Fig. 1b). Among those elements, the Bet Zone (BZ) occupies a slightly elevated area in the north that is comprised of a network of dry river channels with intervening depressions. The Bet Zone represents the vestiges of an ancient delta. The Southern part of this zone merges with the Allah Bund Zone (ABZ). In the north, the BZ joins with the sand ridges of the Sind Province of Pakistan. A linear zone of depression from the Kori Creek up to Patcham in the east extends along the southern fringe of the Allah Bund Zone, which is partially under tidal influence (Fig. 3). During the tidal influx, the seawater transgresses up to Patcham ~90 km inland. On the southern border of the depression (Fig. 3), Banni land forms a slightly elevated area (3-10 m above the level of Rann) with grasslands covering about 3000 sq. km. The sediment characteristics of the alluvium are analogous to that of the Bet Zone.During stormy seasons, the tidal water from the Rann surges onto the Banni land. A shallow depression free from seawater incursion occurs on the eastern side of the Rann, which is called as Great Barren Zone. This region is separated from the zone of the linear depression by a structural high (Fig. 2).

The southern edge of the Allah Bund which is defined by a roughly east-west trending elevated tract can be divided into two curvilinear lobes, abutted against the salt encrusted surface for a distance of 95 km (Figs. 1b and 3). The central part of the scarp shows deflection from N 315° to N 290°. The 15-20-km-wide deformed zone is sandwiched between desert dunes in the north and the salt-encrusted Rann in the south. The western and eastern ends of the scarp are bounded by the Indus delta. Patcham Island respectively. Relatively high content of micaceous fine sand distinguishes the deposits in the BZ from the dark brown Rann deposits (Figs. 4a and b). The BZ probably represents

Fig. 1b shows many shaded areas. Please explain.

Please explain how rivers can flow on topographic highs. Are the channels bounded by natural levees made of overbank deposits?

Allah Bund has been defined as Southern Allah Bund Zone. What is it? Should it also be shown on a map?

Age Data

Kutch

Av. 845 – 1020

BS No	Sample No	Radiocarbon Age	Material	Calibrated result 2 sigma
Beta 121573 ✓	V/T1/D/E4/CP	1070±50	Charcoal	AD 885 – 1035
Beta 121574 ✓	V/T1/D/E/CP	1150 ± 50	Charcoal	AD 780 -1000
Beta 121575 ✓	V/T1/D/W/CP	1090 ± 50	Charcoal	AD 875 – 1025
BS 1484 ✓	V/T2/D/2/CP	1443 ± 95	Charcoal AD 416 – 777	AD 421-AD 778
Beta 121572 ✓	V/T2/D/1/CP	390 ± 50	Charcoal	AD 1430-1645
BS 1560 ✓	V/T3/D/Sh/4/CPR3	1340 ± 140	Shells A.D. 425-992	AD 1350-1091 ✓
Beta 121569 ✓	V/T3/D/3/CP	1110 ± 50	Charcoal	AD 855-1020
BS 1532 ✓	VG/T1/D/1/98	5870 ± 260	Shells B.C 5363-4167 Sediment	BC 5314-4165 ✓
BS 1531 ✓	VG/T3/D/1/98	1840 ± 120	Sediment B.C. 91-AD 431 dominated by carb. matter	BC 59 – AD 440 ✓
BS 1518 ✓	VG/T5/D/1/98 A	3570 ± 100	Shells BC 2198 – 1642	BC 2190 –1673
~~BS 1530 ✓~~	~~VG/T5/D/1/98~~ B	~~7730 ± 90~~	~~Greenish clay with shells~~ Sediment	~~BC 6751-6383~~ 6749 – 6420
BS 1534 ✓	VG/T5/D/1/98	390 ± 100	Sediment B AD 1329-1950	AD 1398-1954
BS 1644 ✓	VG/T5/D/2/98 (VG/TO1/D/10/98)	2900 ± 90	Sediment (greenish clay).	~~AD 3210-2890~~ BC 1385 – 834

Eliminate

~~BS 1559 V/T3/D/Sh/4/CPR2 360 ± 130 520-291~~

~~AD 1313-1950~~

Greenish clay & ~~Add~~ shells, and carb. matter

BC-5051 - 4176

5870 ± 260
1840 ± 120
3570 ± 100
7730 ± 90
2900 ± 90

μ_{ave} = 4285 ± 42

Figure 6. A silt mound on the crest of Allah Bund. View from east. Degraded mounds can be seen in the background that are distributed in an area measuring 500 m2, with varying height, 1-3 m.

Figure 7 A Sketch of multiple liquefaction features from a trench (T4; See Fig. 1 for location) at Vighakot. Note the sheared margin of the feature on the right side. Radiocarbon dates obtained from the trenches are also shown.

Figure 8 Stratigraphy of trenches at locations T3 and T5 (see Fig.1 for locations). T3 is located near the zone of uplift and T5 is near the zone of subsidence. Two occupation levels have been identified in this trench. Top occupation level is dated at 390±50 yr B.P. inferred to be maximum age of the most recent settlement, until the 1819 earthquake period.

Figure 9 A schematic diagram showing style of deformation on two parallel thrust faults in the Allah Bund region and Sunda respectively. Fault propagation fold developed on a preexisting normal listric fault due to tectonic inversion.

Andaman Interview Is.

In-2 382 ± 25

	AD	BP
1σ	1451 – 1497 (0.76)	453 – 499 (0.76)
	1474 ± 23	476 ± 23
	1470 ± 25	480 ± 25
2σ	1445 – 1522 (0.72)	428 – 505 (0.72)
	1484 ± 39	466 ± 39
	1480 ± 40	470 ± 40

Medieval

From: "Jaime Magliocca" <magliocca@unavco.org>
Subject: GAMIT Support
Date: Thu, October 14, 2010 12:39 am
To: vanessa@ceas.iisc.ernet.in
Cc: "'Katie Shapiro'" <KatieS@bouldertravel.com>

Dear Vanessa,

Congratulations! You have been selected to receive the following support from UNAVCO for the GAMIT Short Course, November 16-19, 2010 in Miami, FL.

Available Support:

I currently have an itinerary for you and the price is $1317.00USD. I'd like to book this as soon as possible. Please provide me with your name as it is stated on your passport and your date of birth.

Bengaluru India to Miami Nov 15-19

15NOV Bangaluru to Paris 215A 835A

15NOV Paris to Miami 1050A 235P

20NOV Miami to Atlanta 130P 330P

20NOV Atlanta to Paris 605P 825AM

21NOV Paris to Bangaluru 1045A 1230A

Hotel Accommodations:

Your hotel accommodations will be covered and you will be paired up with someone from the same sex (unless you specified on your application that you will not need accommodations). I will add you to my rooming list and email you your confirmation number and roommate name. Please do not call the hotel for reservations.

The hotel is:

Courtyard Miami Coconut Grove

2649 South Bayshore Drive

Miami, FL 33133

Breakfast is provided at the hotel, lunches and breaks will be provided by UNAVCO. Dinner and all incidentals (shuttles, parking and rental car) will not be covered.

790 ± 140

1130 ± 60

1050 ± 140

1130 ± 90

1210 ± 90

Weighted mean $= 1110 \pm 40$

A	σ
790	140
1130	60
1050	140
1130	90
1210	90

$w_i = 1/\sigma_i^2$

$$A_{AVG} = \frac{\sum w_i A_i}{\sum w_i}$$

$$\sigma_{AVG} = \frac{1}{\sqrt{\sum w_i}}$$

SIM-host ?

SIM-2/SB2

SIM-2/SB3

SIM-3A (Top sand)

SIM-3A/LS (Liquified sand)

SIM-3A/MC (Middle Clay

SIM-3A/BS (Bottom Sand)

RAP-LS

RAP-6

RAP-2

RAP-4

RAP-1

RAP-5

RAP-3

Wood → RAP/W1/P7

Large quantities of samples

Rapti. Shravasti Sand

SIM-2

SIM-1

SIM-3A

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Chandra Mohan
Dr. ~~Chandra~~
Nautiyal

1. BUR-1/C/2 · 480 ± ~~70~~ (~~545~~-497)
2. PEA-1/B/1 · 420 ± 120 (541-313)
3. CHO-1/B/1 3280 ± 180
4. BUR-2/B/1 · 3500 ± 130
5. LAX/B/1 . 3190 ± 120 (3287-3268)
one sigma

draft of Rs 19642/-

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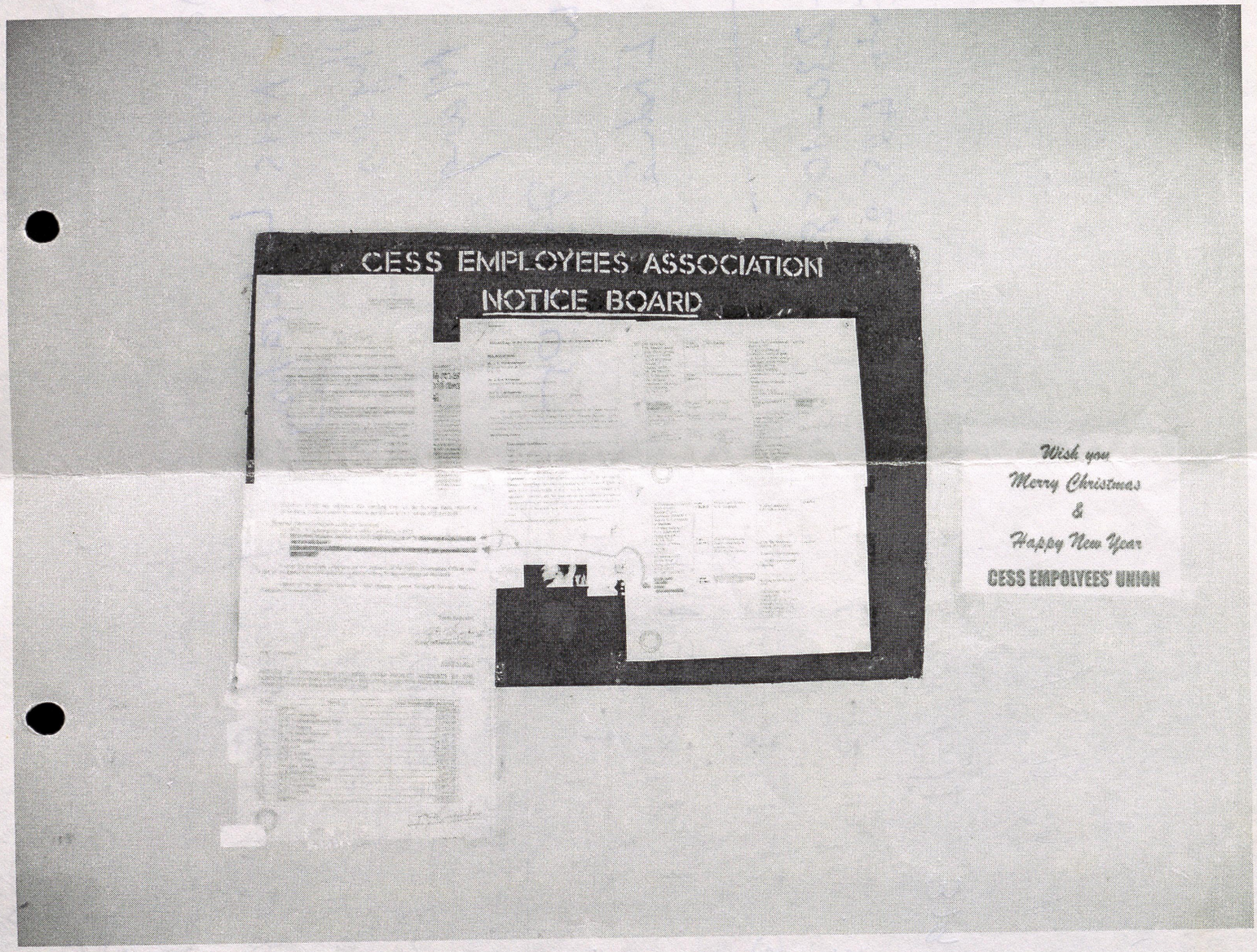
1. PEA-1/B/1	6. LAX/B/1
2. HUT/B/2	7. BUR-1/C/2
3. HUT/C/1	8. HUT/C/2
4. CHO-1/B/2/T	9. HUT/B/3
5. CHO-1/B/3/G	

A basic assumption is that carbon sample is uncontaminated, and that it has been a closed system with respect to isotopic carbon since death of the organism. Shells, ~~tufa~~ and soil carbonate are generally unreliable for dating, because they do not form a closed system(s) ~~and~~ Shells exchange carbon with groundwater, and might ~~give~~ not give true age.

"Calibrated ages" are those which have used existing tree-ring records to the calendar years associated with the radiocarbon age (Stuiver, M., Long, A. and Kra, R. 1993. Calibration 1993: Radiocarbon, V. 35).


CESS EMPLOYEES ASSOCIATION
NOTICE BOARD
Wish you
Merry Christmas
&
Happy New Year
CESS EMPOLYEES' UNION

$$\sigma_{av} = \left[\frac{1}{(60)^2} + \frac{1}{(100)^2}\right]^{-0.5}$$

$\sigma_1 = 60$
$\sigma_2 = 100$

$$= \left(0.000277 + 0.0001\right)^{-0.5}$$

$\frac{1}{3600} + \frac{1}{10000}$

$$= (0.000377)^{-0.5}$$

$$\sigma_{av} = \frac{1}{\sqrt{0.000377}}$$

$\mu_1 = 970$
$\mu_2 = 1020$

$$= \frac{1}{0.01941}$$

$$= 51$$

$$\mu_{av} = \sqrt{(51)^2 * \left(\frac{970^2}{60^2} + \frac{1070^2}{100^2}\right)}$$

$$= \sqrt{2601 \times \left(\frac{940900}{3600} + \frac{1144900}{10000}\right)}$$

$$= \sqrt{977585} \left(261.36 + 114.49\right)$$

983

$$\frac{59752900}{8100} + \frac{8410000}{8100}$$

7376.9 1038.27

$$= \sqrt{1764 \times (509.71 + 235.11 + 1253.16 + 7376.9 + 1038.27)}$$

$$= \sqrt{1764 \times 10413.04}$$

$$= \sqrt{18368796.96}$$

$$= \sqrt{18368602.56}$$

$$= \underline{\underline{4285}}$$

$$(\text{Max} \pm \sigma_{av}) = \underline{\underline{4285 \pm 42}}$$

μ	σ
5870	± 260
1840	± 120
3570	± 100
7730	± 90
2900	± 90

$$\sigma_{av} = \left[\frac{1}{260^2} + \frac{1}{120^2} + \frac{1}{100^2} + \frac{1}{90^2} + \frac{1}{90^2}\right]^{-0.5}$$

$$= \frac{1}{67600} + \frac{1}{14400} + \frac{1}{10000} + \frac{1}{8100} + \frac{1}{8100}$$

$$= 0.00014792 + 0.00006944 + 0.0001 + 0.00012345 + 0.00012345$$

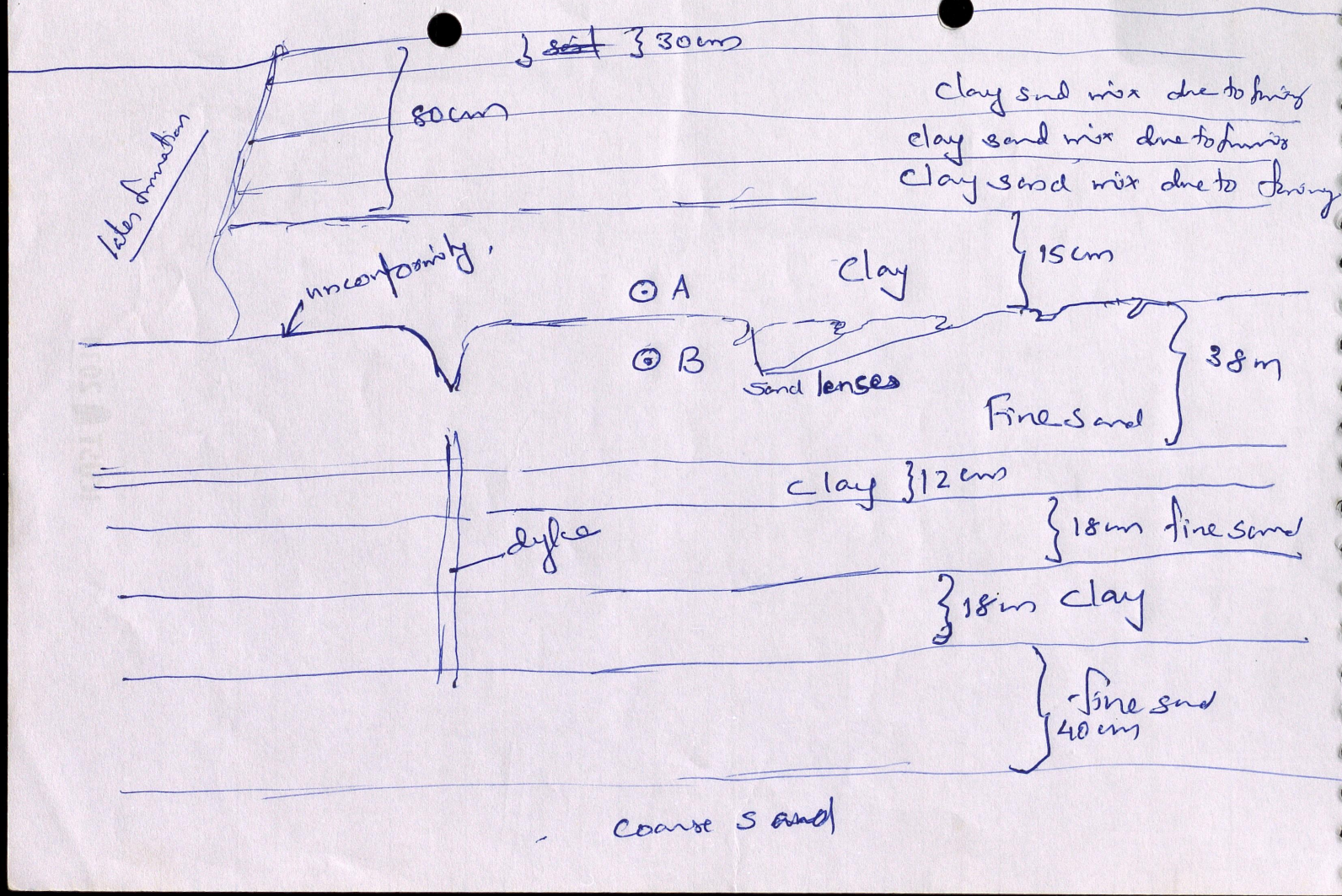
$$\sigma_{av} = (0.0005642 76)^{-0.5}$$

$$= \frac{1}{\sqrt{0.0005642 76}} = \frac{1}{0.02375} = 42$$

$$\mu_{av} = \sqrt{(42)^2 \times \frac{5870^2}{260^2} + \frac{1840^2}{120^2} + \frac{3540^2}{100^2} + \frac{7730^2}{90^2} + \frac{2900^2}{90^2}}$$

$$= \sqrt{1764 \times \frac{34456900}{67600} + \frac{3385600}{14400} + \frac{12531600}{10000} +}$$

509.71 235.11 1253.16


30cm
80cm
clay sand mix due to flowing
clay sand mix due to flowing
clay sand mix due to flowing
lateral formation
unconformity
A
B
clay
15cm
sand lenses
Fine sand
38m
clay 12cm
dyke
18cm fine sand
18m clay
fine sand
40cm
coarse sand

Date

BSIP samples

1. C/K/T2/D2 Kalhana. Sediment

2. C/B/T1/4 (Baruchh-4) Bharuchh. Sediment

3. C/B/T1/3 (Baruchh-3) Bharuchh. Sediment

4. C/B/T1/2 (Baruchh-2 depth 50cm) Bharuchh. Sediment

5. C/U/T1/D1 Uthalia (Kolhat) Sediment

6. C/T/T1/4 Tapi (Surat) depth 2.73 m. Lignite matter.

7. MB/T1/D1 Motibaru Sediment.

8. CN/TC/1 Car Nicobar — top of the cliff. 5420 ± 80 yr BP. Cal. wood

9. CN/SA/L Car Nicobar — lower level Sawai Calcareous rock

10. K/Q/PA/1 Paravur, Kerala. Earth. Wood.

35,000
30,000
95,000

Hans

Sample ID	R Number	NZA	$\delta^{13}C$	Radiocarbon Age	$\delta^{14}C$	$\Delta^{14}C$	Percent Modern
MN/Sill1/S1	29033/1	23359	-26.6	-295 ± 30 BP	27.2 ± 3.8 ‰	30.5 ± 3.8 ‰	103.05 ± 0.38
IN/TOP/A Highest point Interview	29033/2	23360	-1.9	30880 ± 300 BP	-977.7 ± 0.8 ‰	-978.7 ± 0.8 ‰	2.13 ± 0.08
T1/IN/D/P1/A Terrace 1 (Older) Interview	29033/3 ✓	23361	-1.4	22890 ± 120 BP	-939.7 ± 0.9 ‰	-942.5 ± 0.9 ‰	5.75 ± 0.09
T3/IN/D/P1/A Terrace 3 Interview	29033/4 ✓	23362	-1.9	19894 ± 100 BP	-912.5 ± 1.1 ‰	-916.5 ± 1 ‰	8.35 ± 0.1
T2/IN/D/P1/A Terrace 2 Interview	29033/5 ✓	23363	-0.3	29130 ± 250 BP	-972.2 ± 0.9 ‰	-973.6 ± 0.8 ‰	2.64 ± 0.08
CS/HUT/OT Hutt Bay - Surface.	29033/7	23365	-1.4	5623 ± 35 BP	-482.6 ± 2.3 ‰	-506.7 ± 2.2 ‰	49.33 ± 0.22
GS/HUT/OT Shells from Old Surface	29033/8	23366	2.2	753 ± 35 BP	-44.3 ± 4.1 ‰	-95.5 ± 3.8 ‰	90.45 ± 0.38
KU/S1/D - Kukutmute Assam Ligue.	29033/12	23367	-27.1	132 ± 30 BP	-27 ± 3.6 ‰	-22.8 ± 3.6 ‰	97.72 ± 0.36
Calibration for NZA 23365							
2 sigma interval is 4534 BC to 4359 BC	6483 BP to 6308 BP (97.8% of area)						
1 sigma interval is 4490 BC to 4445 BC	6439 BP to 6394 BP (38.9% of area)						
plus 4416 BC to 4400 BC	6365 BP to 6349 BP (11.8% of area)						
Calibration for NZA 23366							
2 sigma interval is 1218 AD to 1289 AD	732 BP to 661 BP (95.0% of area)						
1 sigma interval is 1257 AD to 1280 AD	693 BP to 670 BP (48.3% of area)						
Calibration for NZA 23367							
2 sigma interval is 1670 AD to 1949 AD	280 BP to 1 BP (99.1% of area)						
1 sigma interval is 1680 AD to 1706 AD	270 BP to 244 BP (12.2% of area)						
plus 1719 AD to 1743 AD	231 BP to 207 BP (10.8% of area)						
plus 1751 AD to 1762 AD	199 BP to 188 BP (4.0% of area)						
plus 1803 AD to 1885 AD	147 BP to 65 BP (37.8% of area)						
plus 1912 AD to 1937 AD	38 BP to 13 BP (12.1% of area)						

Hutt Bay

Andaman

Dates from Allah Bund

Paleo-Liquefaction -

Radiocarbon Age 1110 ± 50

Calibration data set: intcal04.14c

Reimer et al. 2004

1110 ± 50 yr B.P.

One Sigma Ranges: [start:end] relative area

[cal BP 961: cal BP 1062] 1.

Two Sigma Ranges: [start:end] relative area

[cal BP 931: cal BP 1141] 0.984974

[cal BP 1160: cal BP 1169] 0.015026

Cal yr. B.P. 931 – 1141

Radiocarbon Age 1340 ± 140

Calibration data set: intcal04.14c

Reimer et al. 2004

1340 ± 140

One Sigma Ranges: [start:end] relative area

[cal BP 1082: cal BP 1114] 0.087378

[cal BP 1120: cal BP 1372] 0.912622

Two Sigma Ranges: [start:end] relative area

[cal BP 967: cal BP 1522] 1.

Cal yr. 967 – 1522 B.P.

Radiocarbon Age 390 ± 70

Calibration data set: intcal04.14c

Reimer et al. 2004

One Sigma Ranges: [start:end] relative area

[cal BP 330: cal BP 359] 0.241888

[cal BP 369: cal BP 372] 0.012666

[cal BP 429: cal BP 507] 0.745447

Two Sigma Ranges: [start:end] relative area

[cal BP 315: cal BP 413] 0.414249

[cal BP 419: cal BP 515] 0.585751

419 – 515

CALIB RADIOCARBON CALIBRATION PROGRAM*
Copyright 1986-2005 M Stuiver and PJ Reimer

*To be used in conjunction with:
Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.

R/wood
wood
Radiocarbon Age 740±100
Calibration data set: shcal04.14c
McCormac et al. 2004
One Sigma Ranges: [start:end] relative area
[560 BP:612 BP] 0.369046
[622 BP:690 BP] 0.502359
[699 BP:721 BP] 0.128596
Two Sigma Ranges: [start:end] relative area
[515 BP:798 BP] 1.

515 + 798 / 2 656 ± 141

D/lique
Interview
Radiocarbon Age 1050±100
Calibration data set: shcal04.14c
McCormac et al. 2004
One Sigma Ranges: [start:end] relative area
[792 BP:982 BP] 0.954878
[1035 BP:1047 BP] 0.045122
Two Sigma Ranges: [start:end] relative area
[724 BP:1096 BP] 0.973275 ✓
[1102 BP:1140 BP] 0.022563
[1161 BP:1168 BP] 0.004162

724 + 1096 / 2 910 ± 186

plant
Pblair
Radiocarbon Age 5903±35
Calibration data set: shcal04.14c
McCormac et al. 2004
One Sigma Ranges: [start:end] relative area
[6573 BP:6579 BP] 0.031312
[6633 BP:6733 BP] 0.968688
Two Sigma Ranges: [start:end] relative area
[6536 BP:6751 BP] 0.987183 ✓
[6764 BP:6776 BP] 0.012817

6536 + 6751 / 2 6643 ± 107

shell
Pblair
Radiocarbon Age 6283±25
Delta R = 0±0
Calibration data set: Marine/No. Hem
Reimer et al. 2004
One Sigma Ranges: [start:end] relative area
[6691 BP:6776 BP] 1.
Two Sigma Ranges: [start:end] relative area
[6655 BP:6824 BP] 1.

6655 + 6824 / 2 6739

6739 ± 85

Ranges marked with a * are suspect due to impingment on the end of the calibration data set

PJ Reimer, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell,
CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich,
TP Guilderson, KA Hughen, B Kromer, FG McCormac, S Manning, C Bronk Ramsey,
RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor,
J van der Plicht, and CE Weyhenmeyer (2004), Radiocarbon 46:1029-1058.

KA Hughen, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell,
CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich,
TP Guilderson, B Kromer, FG McCormac, S Manning, C Bronk Ramsey, PJ Reimer,
RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor,
J van der Plicht, and CE Weyhenmeyer (2004), Radiocarbon 46:1059-1086.

FG McCormac, AG Hogg, PG Blackwell, CE Buck, TFG Higham, and PJ Reimer (2004)
SHCal04 Southern Hemisphere Calibration 0 - 11.0 cal kyr BP

(X)

CALIB RADIOCARBON CALIBRATION PROGRAM*
Copyright 1986-2005 M Stuiver and PJ Reimer

*To be used in conjunction with:
Stuiver, M., and Reimer, P.J., 1993, Radiocarbon, 35, 215-230.

Sample ID: GF(A)/FB/D
Radiocarbon Age 5900Â±120
Delta R = 11Â±35
Calibration data set: marine04.14c
Hughen et al. 2004

One Sigma Ranges: [start:end] : [6176 BP:6444 BP]

Sample ID: CB/HUT/OT
Radiocarbon Age 8220Â±160
Delta R = 11Â±35
Calibration data set: marine04.14c
Hughen et al. 2004

One Sigma Ranges: [start:end] : [8540 BP:8959 BP]

Sample ID: MB/T1/L4
Radiocarbon Age 1490Â±110
Delta R = 11Â±35
Calibration data set: marine04.14c
Hughen et al. 2004
One Sigma Ranges: [start:end] : [917 BP:1159 BP]

DR (ER notation) is the difference between the local reservoir age + that of the global mean age.

Reference
KA Hughen, MGL Baillie, E Bard, A Bayliss, JW Beck, C Bertrand, PG Blackwell,
CE Buck, G Burr, KB Cutler, PE Damon, RL Edwards, RG Fairbanks, M Friedrich,
TP Guilderson, B Kromer, FG McCormac, S Manning, C Bronk Ramsey, PJ Reimer,
RW Reimer, S Remmele, JR Southon, M Stuiver, S Talamo, FW Taylor,
J van der Plicht, and CE Weyhenmeyer (2004), Radiocarbon 46:1059-1086.

Chauldhari Port Blair - Shell date

Marine Shell from Port Blair
Radiocarbon Age 3280±190
Delta R = 12±34
Calibration data set: marine09.14c
Reimer et al. 2009
One Sigma Ranges: [start:end] relative area
[cal BC 1375: cal BC 916] 1.
Two Sigma Ranges: [start:end] relative area
[cal BC 1632: cal BC 726] 1.

One Sigma Ranges: [start:end] relative area
[cal BP 2865: cal BP 3324] 1.
Two Sigma Ranges: [start:end] relative area
[cal BP 2675: cal BP 3581] 1.

Cal yr BP ?

2675 - 3581

2680 - 3580 rounded off

3130 ± 450 Cal yr BP

01/03/06

NOTE

Enclosed please find the reports of our Plan projects, 204 and 216 along with list of publications.

C.P. Rajendran
PI, PLAN (204) & (216)

Kusala Rajendran
Co-Inv, PLAN (204) & (216)

Through

The Head
GSD

To

The Director
CESS

Marine Shell from Port Blair
Radiocarbon Age 3280±190
Delta R = 12±34
Calibration data set: marine09.14c
Reimer et al. 2009
One Sigma Ranges: [start:end] relative area
[cal BC 1375: cal BC 916] 1.
Two Sigma Ranges: [start:end] relative area
[cal BC 1632: cal BC 726] 1.

One Sigma Ranges: [start:end] relative area
[cal BP 2865: cal BP 3324] 1.
Two Sigma Ranges: [start:end] relative area
[cal BP 2675: cal BP 3581] 1.