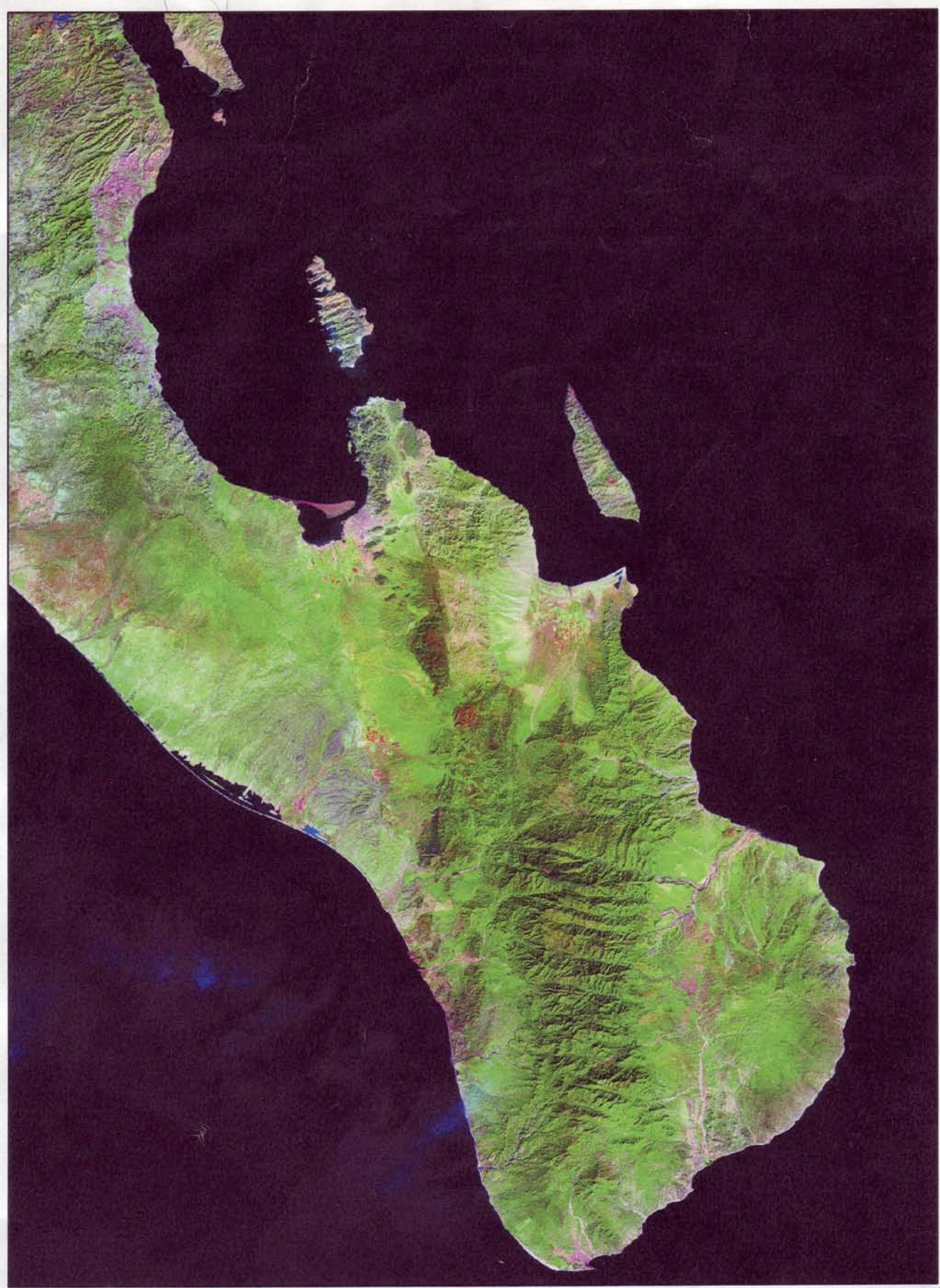


12/05



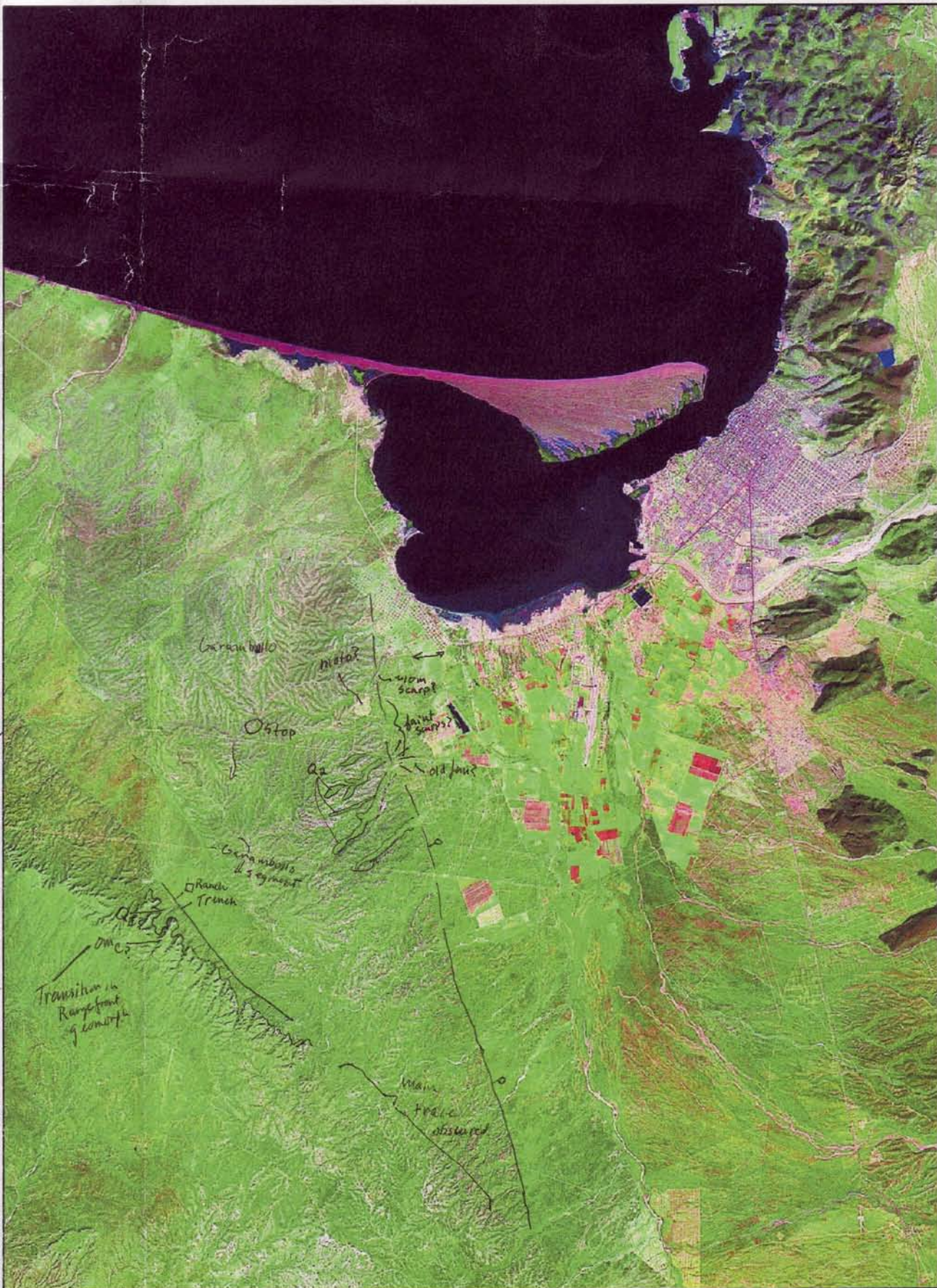
"Escalón
Norte"



0 12.5 25 50 Kilometers

12/16/05

Sierra
las
Cruces



Flow
Structural
boundary?

Sierra Staabla

0 2 4 8 Kilometers

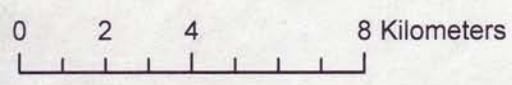
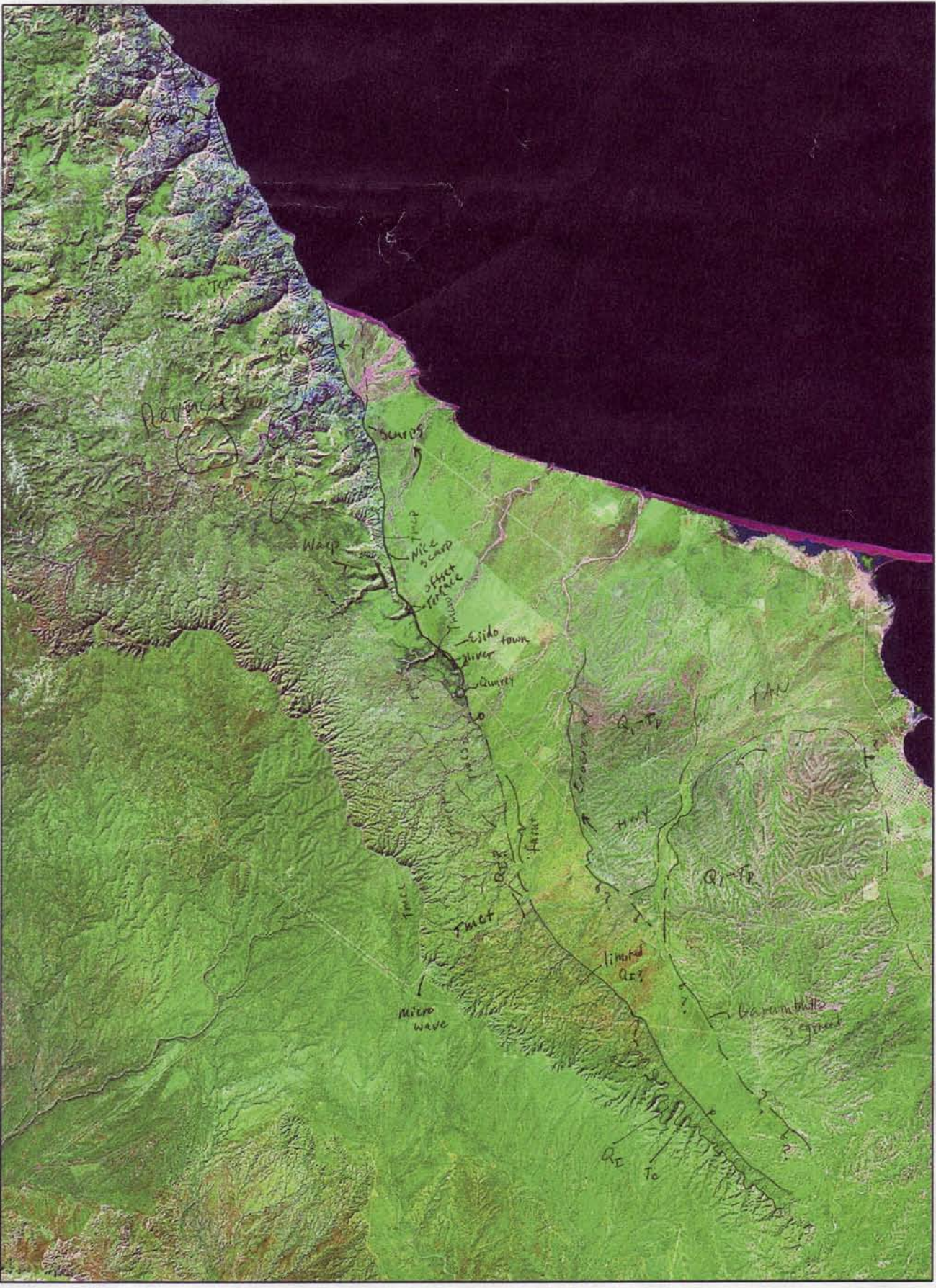
Centenario Fault

12/17/05

Bonefil Segment
~~Bonefield~~
~~Boneford~~

White Weald tuff
Sp. e. pine tuff
(Woodhead to S. segment)

Tm cc - gravel, crs. ss
Comandit
Fm. Ct - tuff, massive w ss
Cs₂ - coarse-fine ss
Cr - collian

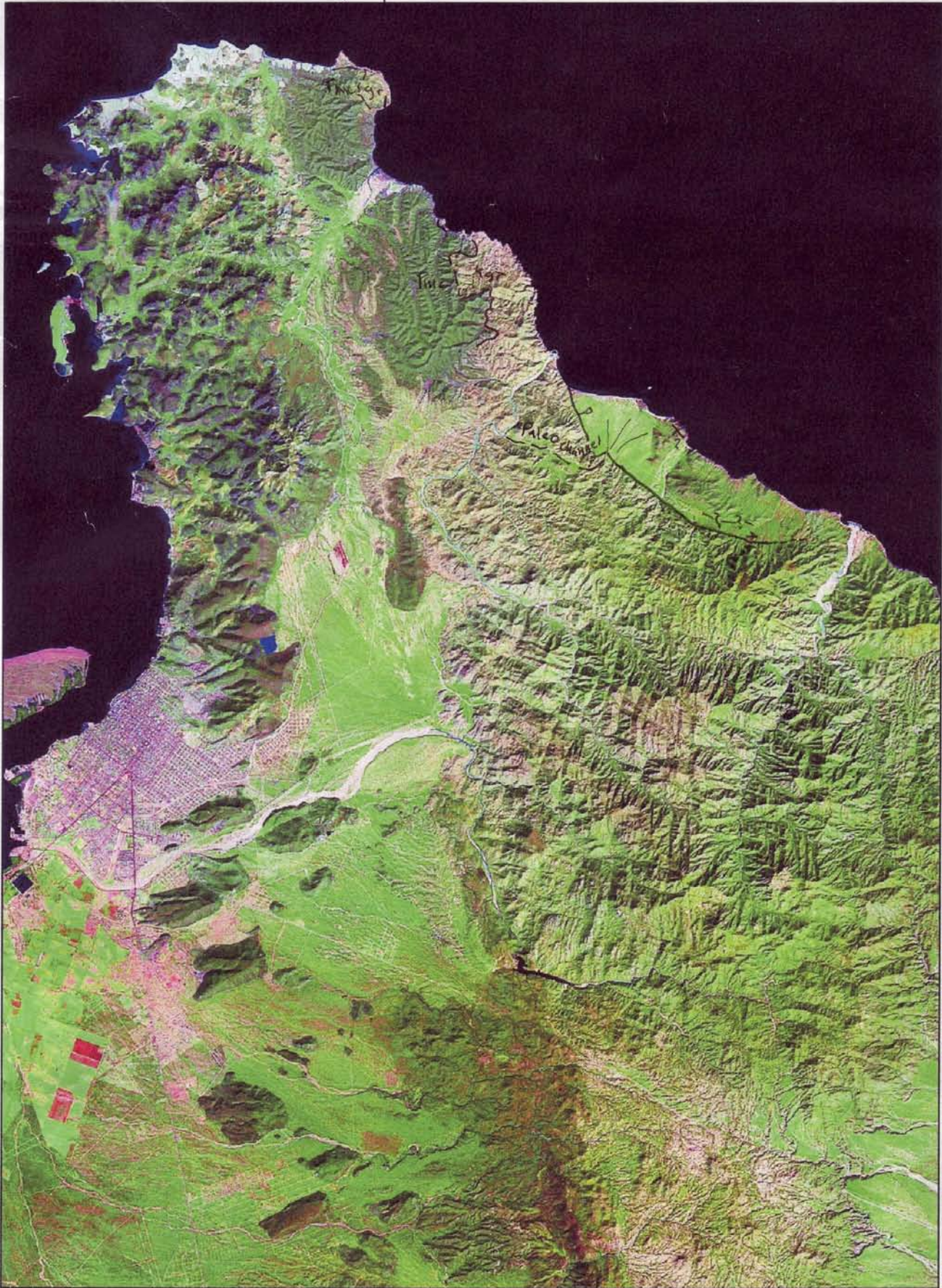


Cl Content

1 - Nice Platform

12/18/05

Pta. Palguero
↓



Punta
← coyote

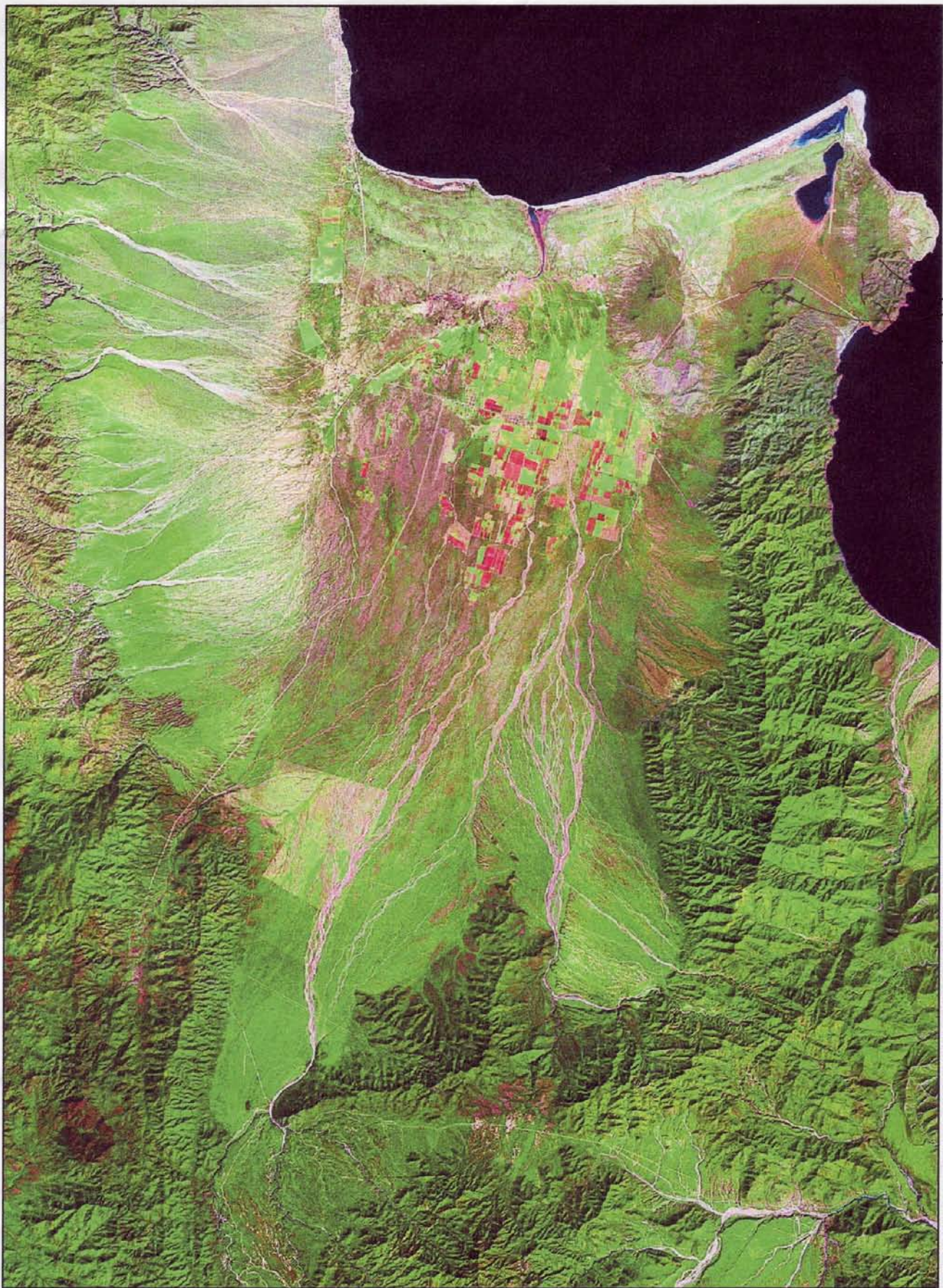
El Coyote
←

Bahía
← el Rosario

Las Cruces
←

← San Il.?

0 2 4 8 Kilometers



granite
"Gigling
Martin"
possible
scarp

0 2 4 8 Kilometers

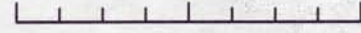
12/17/05

difficult access

to gorges water



0 2 4 8 Kilometers



12/15/05

bridge
Los Barriles

Buenos Aires ↘

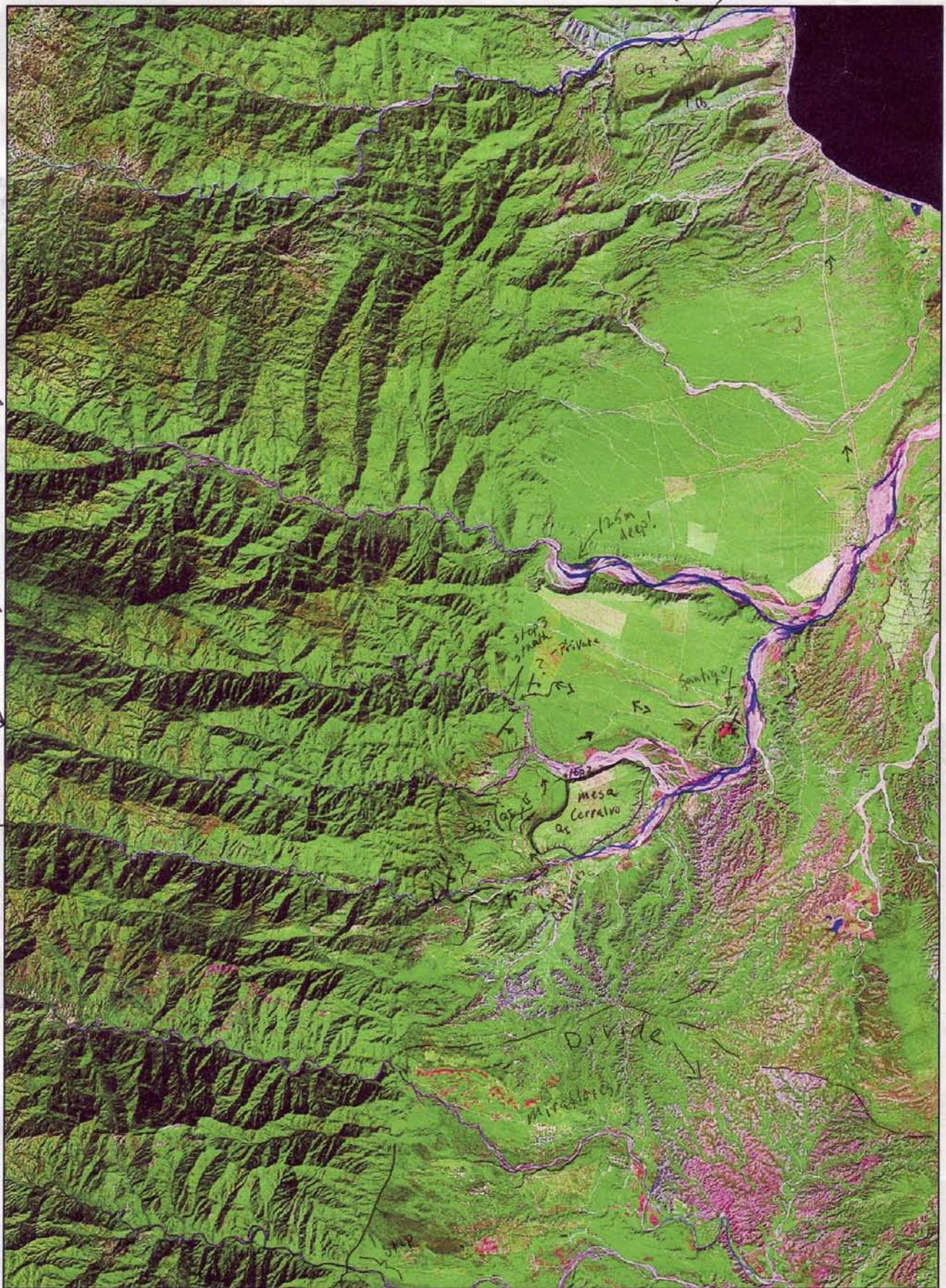
Jornes?
San
Dionisio ↘

Flor de mayo
or
La Zorra ↘

San Jorge
or
Sta Rita ↘

~~Atenas~~
El Chorro

Portezuelo ↘



← ? trace

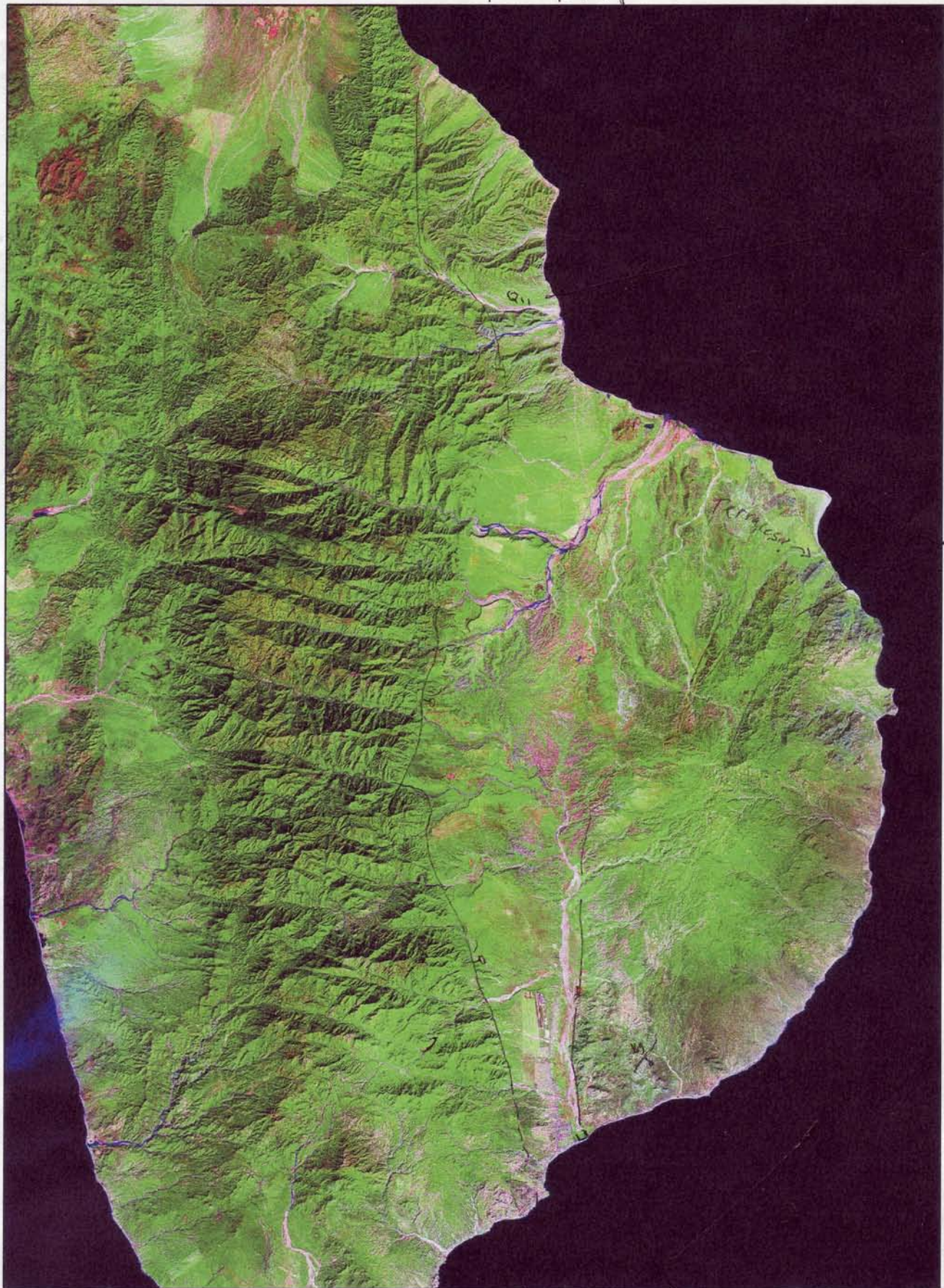
0 2 4 8 Kilometers

12/15/05



0 2 4 8 Kilometers

Faults roughly from G. Martinez 12/05



San Bartolo R.

Trinidad faults

Sierra la Trinidad

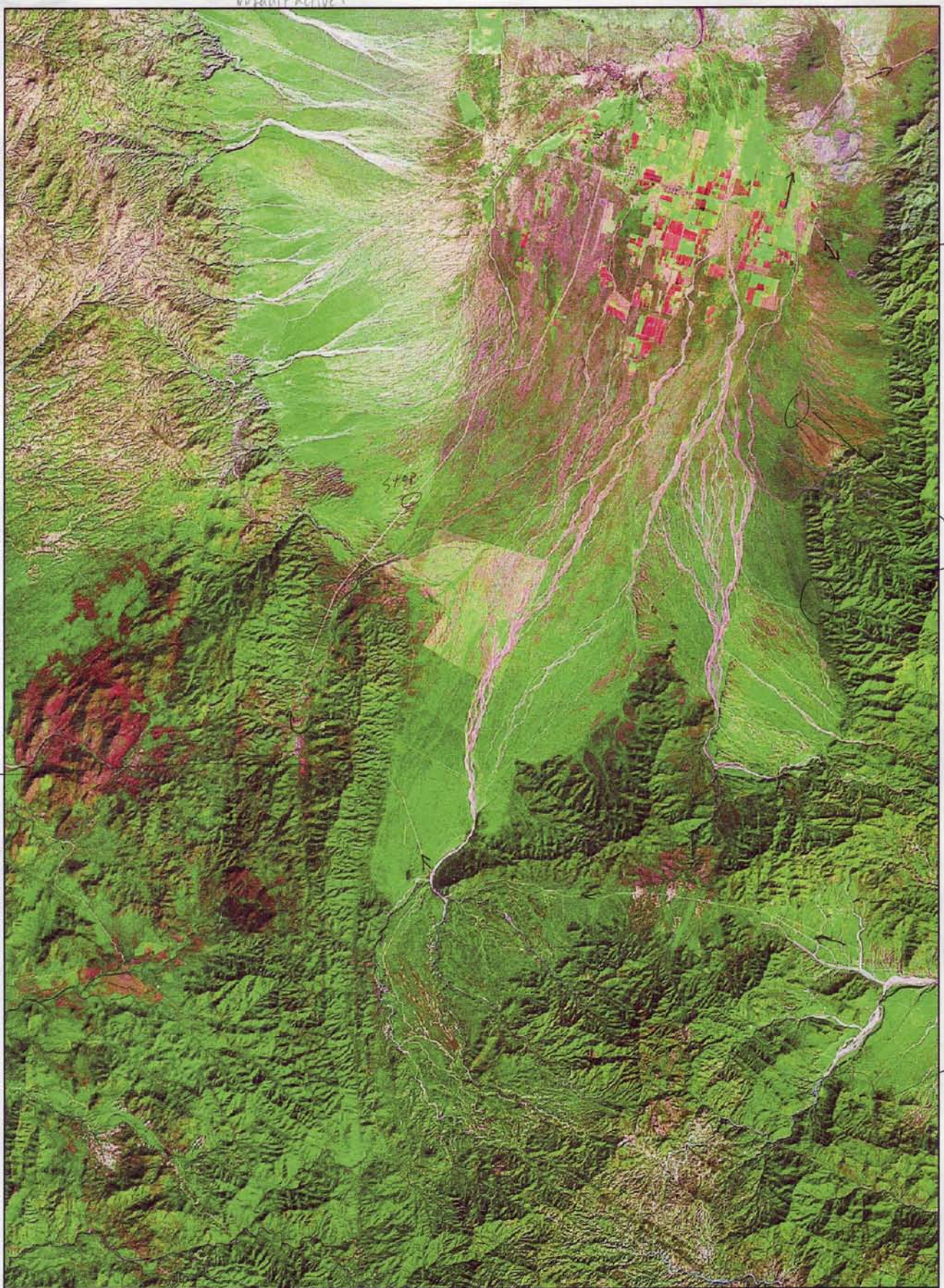
0 5 10
20 Kilometers

San Jose de Laba fault

arroyo de San Jose fault

Sierra la Laguna

on top surface
being eroded?
No fault active?

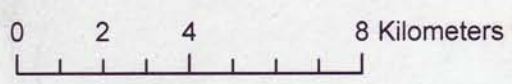


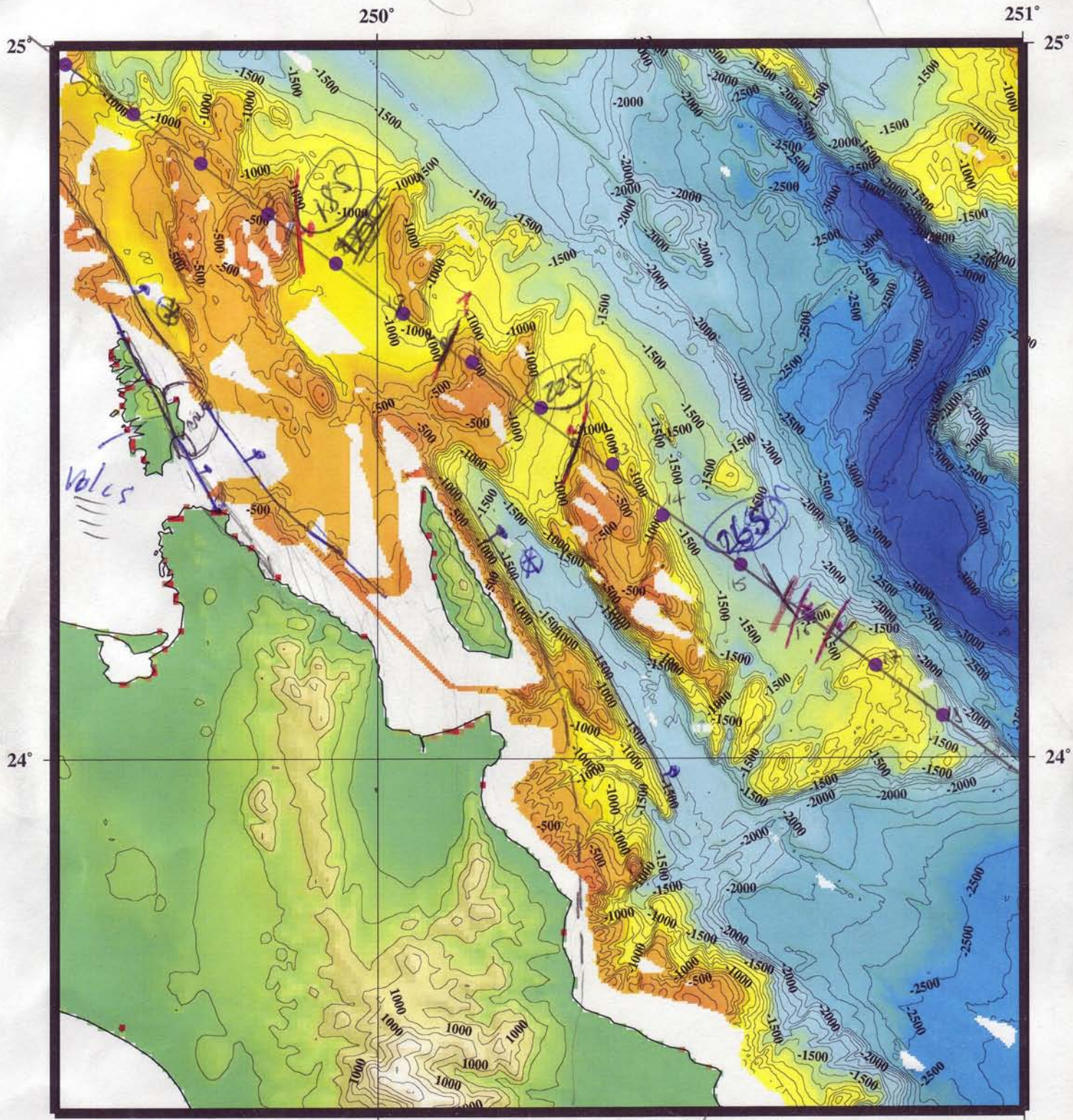
stop

Fault
or
Fluvial
scarps

San
Antonio

dikes





250°

251°

25°

25°

24°

24°

250°

251°

24.5

110

250.5

Cabo w/ Paul U.

12/19/08

- Arrive 3:00 pm; await Genaro / Avis rental
- 4pm met Genaro
- 5pm driven.

Ideas - map Cabo Fault

- Tect. geom. of Lagunas Range
- Gravity
- buy maps!
- ALSM?

Put together map

teams (Luis + Paul + Genaro)

- DEMs - Genaro has 1:50k

12-14-05A Arroyo ~~Porte Sueto~~ Puntezueto

Rancho San Pedro

- Drove through Caduano

12 Q 0618671 2580682 some pile triangular facets above

Nice fault escarp (~5m high) terminates to S and then trace steps east about 3km. This location has Cataclastic deformation (beds dipping E). Bed rock is migmatitic gneiss w/ mafic foliated dikes

- need to do strip mapping of escarp heights, Q. grad.

"Piedra Pintada" Piriguay (?) have american site

700-800 A.D.

- next escarp access would be ~3-4km N @ Miraflores

Evening @ EL Palomar in Santiago; just S. of square

- Camping site in arroyo

- Drive down 3 days ~28 hrs from PHX to Cabo
- teate → T → S

PHX - Guaymas → Ferry (?) → Sta. Rosalea → Loreto → La Paz
9hr. Ferry

Deep ~\$80/day (with ins.)

Genaro Geomorphology site?

Tect. Geom. 2 board w/ Fletcher

Cabo fault → San Juan — CSE terraces?

Marine terraces — scattered, boats, compilation

— free amino acid dating

— Revisit sites + then build from there

La Paz faults → go first

CHIRP

— Paul tie late in May trip

summer 07 cruise?
August 2011 + trip

GPS

— Campaign w/ Fletcher + Dixon — November

Ties to Larry

Genaro + Larry did the trenching, Larry has the logs, topo

Carrizal fault → 2 raptures 2 samples (seeds + charcoal)

Recent are less than 10 Ka

- Need to check the budget for Breckhorn

- Need a lot of prep time to plan the trenching

Carrizal fault + Centurano FZ — S. part Genaro is working on + then we could do the N. ends

Idea for structural work: transects ⊥ to faults

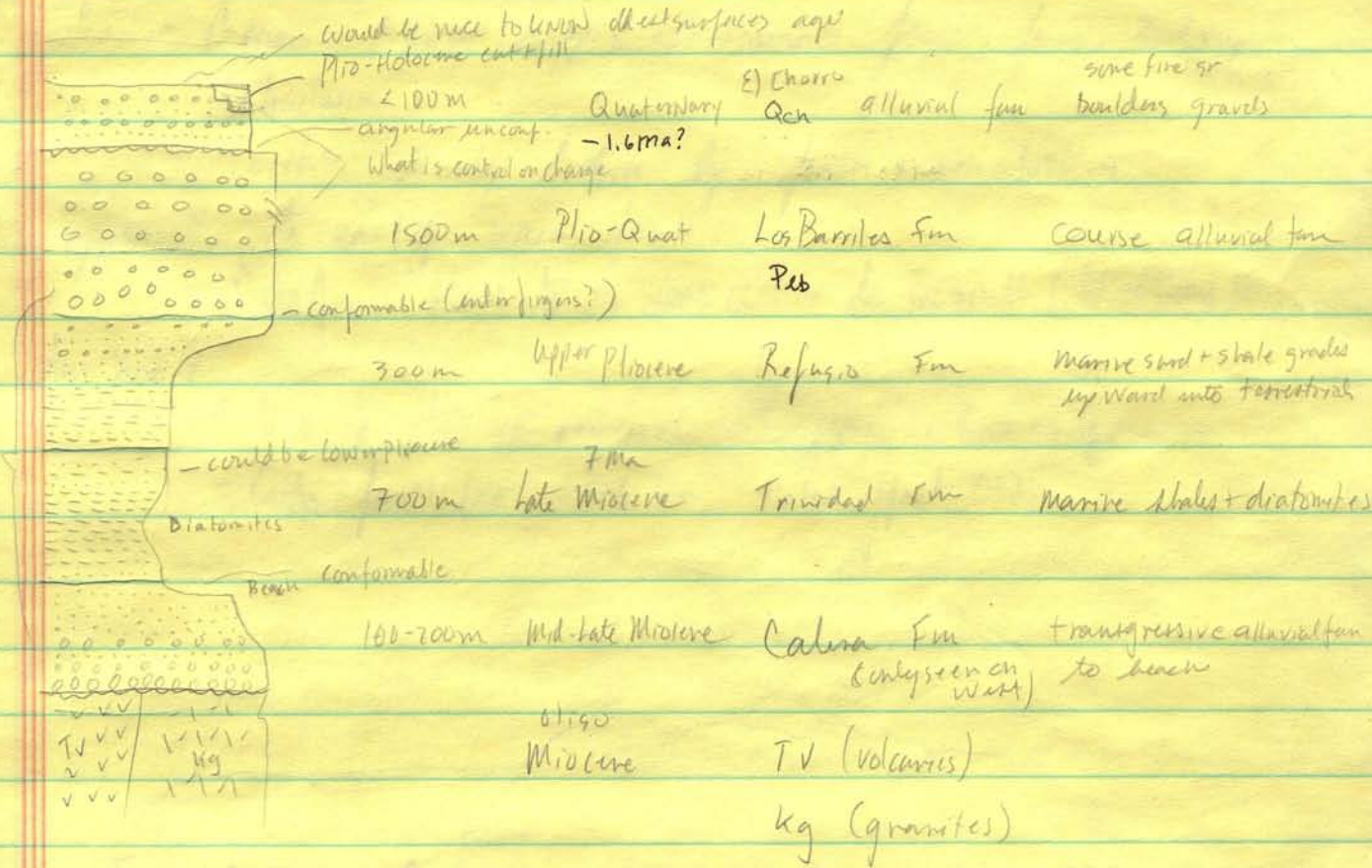
+ detailed damage zone work

Aster! — Rysoke on Chris Eisinger

12/15/05

Photos today
147-148 cut

- El Palomar is nice!
- Genaro mapped the area (Cabo basin) for his M.S. at NCSU.
 - looks like we could try to add detail in the Quat.
 - Not much soil carbonate here; there is more in Carrizal to the west.



FLORNO CUTS MAPS
 Fletcher has AFT from Sierra La Laguna — Nate compile
 some is published

Interesting drainage pattern in the Sierra La Laguna
 - some strike-slip faults may control fabric?

Genaro's M.S. was on the strat. Has pub.

1st stop Aguas Calientes (Arroyo)

149-150

0621784 - 2592776

increasing brecciation near fault

151, 152

Gneiss + Mylonites in footwall near fault. ~30m El Chorro faulted against the basement

- Benaro: previous mapping of terraces - fault, fans, and any structures

- Terraces is only broken by fault scarp which is apparently to east of main fault

- Cabo fault seems to be more active to the south (Miraflores to San Jose)

* Need to develop regional terrace chronosequence

- Cabo fault has 5-6 km total offset (?)



EDUARDO CORTES NARES

0622958

cortesnares@yahoo.com

2593512

www.bajasierradventures.com

- local guy w/ Orchard, ecotourism venture

- nice composting toilet!

- nice camp!

- nice area, big trees

* Rugged mapping conditions

Across the river at the mouth

-3-

152 view N.
153-154
view N

0621907 2592684

Fault zone across the river: 008, 46

Possible fault line scarp: differential erosion along the fault zone against the granite. Could be active as well?

Terrace fill

View to N:

→ E

active trace?

~70m - 50m

??
(hot springs)

155
156
157
158

At this site, we see 2-3m gouged, clayey sandy gravelly hanging wall fault zone material against basement (cataclased granite gneiss).

Fabric indicates dip slip [009, 49, 99° ^{slip} from 009]

CICESE thesis from Fletcher student on bedrock kinematics

in Sierra la Laguna - Aguas Calientes, Sta. Rita,

~20m wide fault damage zone. Numerous E-dipping faults, rocks pervasively fractured.

159

~10m high scarp to N of drainage

- Driving N toward Sta. Rita:



160-162

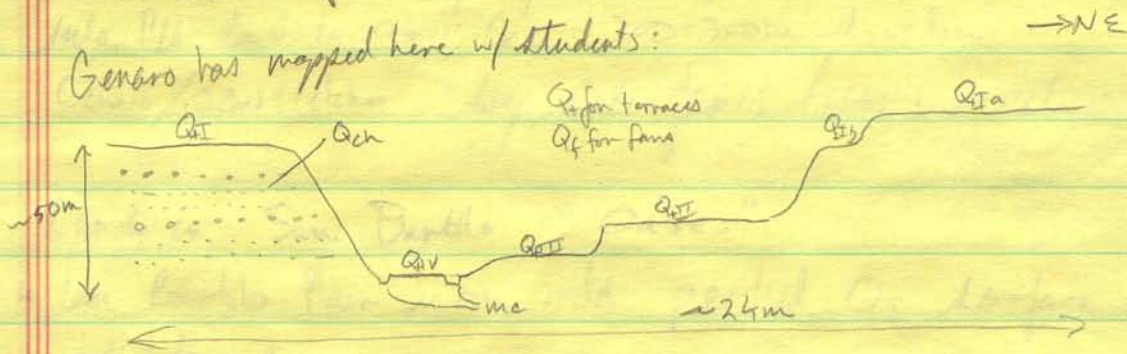
Sta. Rita overlook

624650 2596727

- 4 -

Nice views of terraced terrace steps and also a possible 10-20m scarp in the Q_{I-II} surface

Genaro has mapped here w/ students:



Aggradation of upper Q_{ch} to Q_I surface \rightarrow associated w/ faulting?
 or climatically driven (close of Isthmus of Panama + end of heavy hurricane action) end of Pliocene
 (drove deposition of Los Barriles)

* look at intra front Amnicosity

163-167

La Zorra

623917

2599193

Q_{II} has some rubification of clasts near upper surface
 Q_{II} fill terraces beyond intra front; have nice strata terraces at the same level (10-15m above active channel) upstream

Apparently Q_{II} surface is not cut to N

* Could be a nice place to map + document inactivity and then map to south

Mesa Cerralvo is big surface to E.

* Lots of discussion of terrace fm relative to paleoclimate, sea level change, and also hurricane strength

* Photogrammetric DEMs

* Not much carbonates here

* La Paz basin maybe somewhat different

Los Barriles 0629109 2620366

-5-

168

Pbb is certainly thick, NWW striking, SW-dipping 10-20°
Possible then Qch cover/regraded surface. Significant ~100m erosion
into Pbb down to Q_I Q_I - 200-300m elevation
Genaro/Sohn Fletcher say Cabo fault became inactive 2-3Ma

Lunch in San Bartolo "Oases"

- San Bartolo Plain is an odd perched Q_I surface w/ narrow outlet to east
- Turn right in San Antonio just before Road sign that says "El Triunfo" 7km

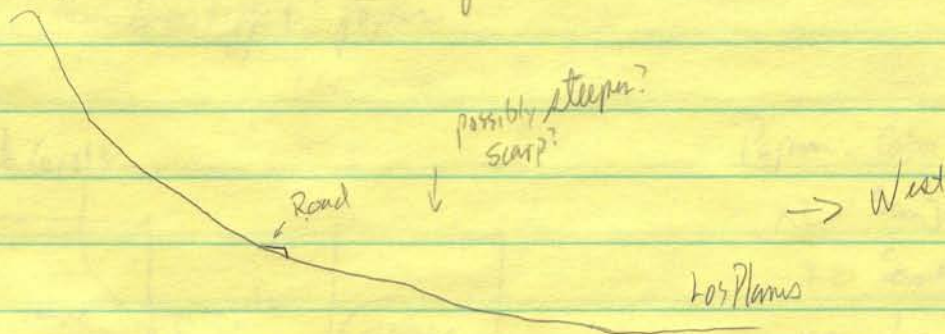
169-178

Los Planos 0598673 2639830 292m

- very flat plain, NO Q_I surfaces; low relief
- old N-drainage along mtn fronts → make many scarps, but how many are fluvial vs. fault?

East side Los Planos 0614234 2648545 124m

- mtn front was sharp on images, but no obvious sharp scarp.



12/16/05

INELI

Maps - Paper 35 pesos

New ones int'l. Baja

Geotiff 110 pesos

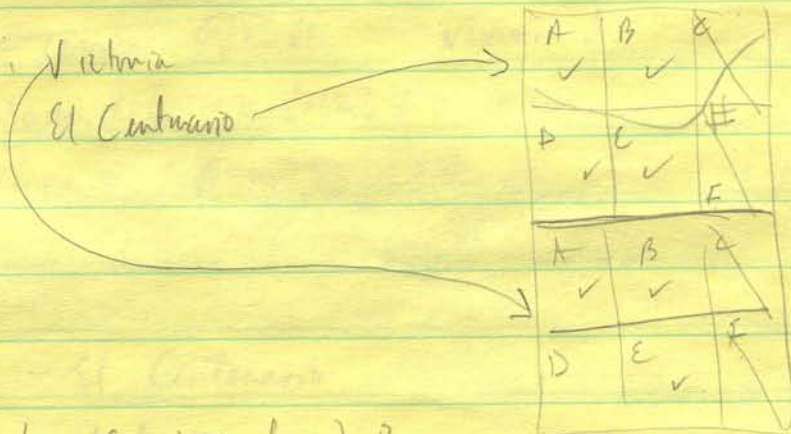
Vectors 750 pesos - contours

DEMs - 50 m pixel

Orthophotos - 2m

Projection: ^{UTM} ITRF92
+ Datum

For sure



Genero las Geotiffs for La Paz

San Antonio -> Paper

El Cent, Victoria, San Juan, El Sargento, El Coyote
- Geotiff + paper

Punta Coyote



Paper: Cabo San Lucas F12B54

X2 San Jose del Cabo F12B44

X2 Santiago F12B34

X2 Las Cuevas F12B24

X2 San Juan de la Playa F12B14

Unavailable - El Sargento G12D64

X2 La Ribera F12B25

X2 Cabo Pulmo F12B35

X2 Palo Escobedo F12B45

Popper

El Coyote G12D73 X2

La Paz G12D83 X2

San Antonio F12B13 X2

El Rosario F12B23 X2

El Cajete G12D72 X2

El Centenario G12D82 X2

Victoria F12B12 X2

~~Punta Coyote G12D61~~ ~~Nothing available~~

San Juan de la Costa G12D71 X2

El conejo G12D81 X2

Geotiff - El Centenario

Victoria

San Juan de los Planos

~~El Sargento~~ ~~Nothing available~~

El Coyote

Ortho photo - El Centenario A B D E

Victoria A B E

Paul points out that the Sierra las Lagunas is higher in the N. Is it due to a climate gradient?
Check the hypsometry of the range

Approaching El Centenario 0561022 2665072

El Centenario strand / segment of Carrizal fault / bounds measurement

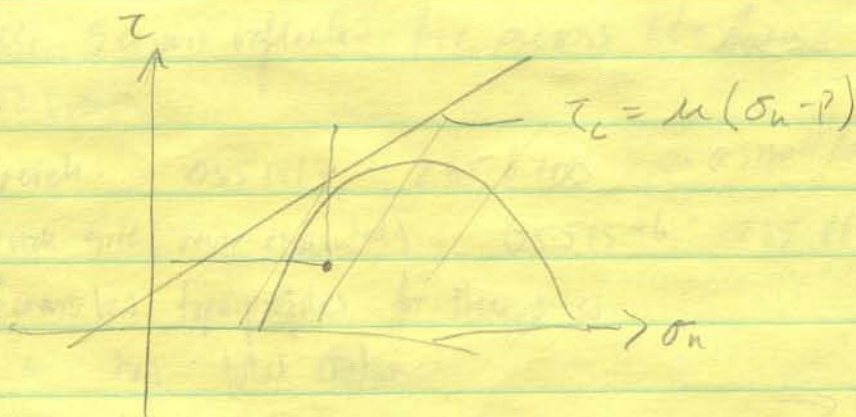
A. Lopez Mateos - left

Top of Garambollo Hills 0555618 2660031

(but subtract 33m from today's elevations)
~140m

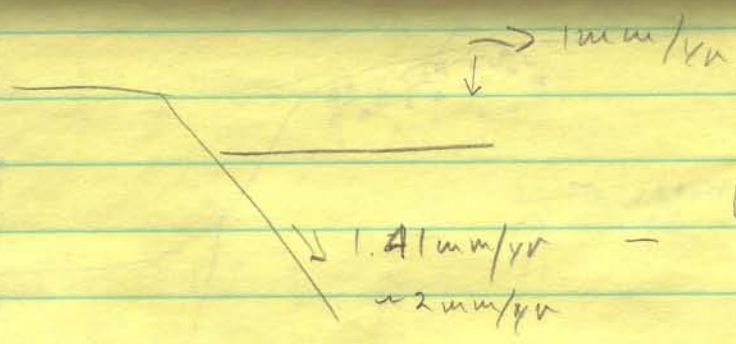
The Centenario fault zone is faint lineament. Rather straight. Stronger to the south. Could be mapped in a few days. Access to south is poor. Hills are made of poorly tilted age w/ Stage III-IV pedogenic carbonate that has been degraded because of erosion. I wonder if that represents a paleo basin surface that has been subsequently eroded.

* What is tectonic eq history?

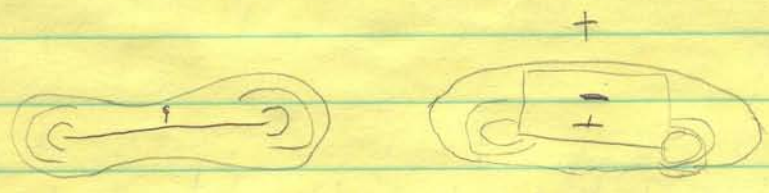


$$CFF = \tau - \mu(\sigma_n - P) \quad \uparrow \text{ promotes failure}$$

Stress, total, Basal NATE } → stress triggering



M6 $\frac{1}{2}$ $u_{max} = 50cm$
 $500mm$
 $= RI = 250yr$



- Question of stress triggering, earthquake clustering, clustered moment release
- Rates: seismicity, GPS, earthquake geology, tectonic geomorph, Neogene geology

Ranch
Pank
 Cuadrado trench @ Road 055 1577 2656732

Pimer seismic reflection line across the basin
 2002 trench

184-186

Trench: 0551517 2656700 - on a small road

2nd trench site (never excavated) 0551546 2656697

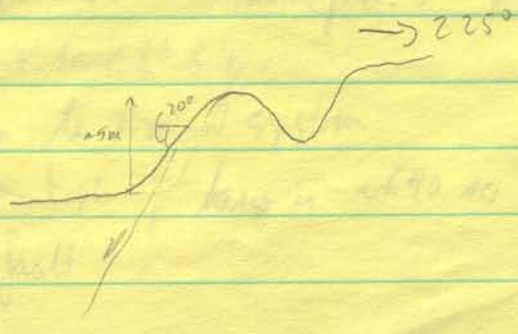
Genaro has topo profiles for these sites

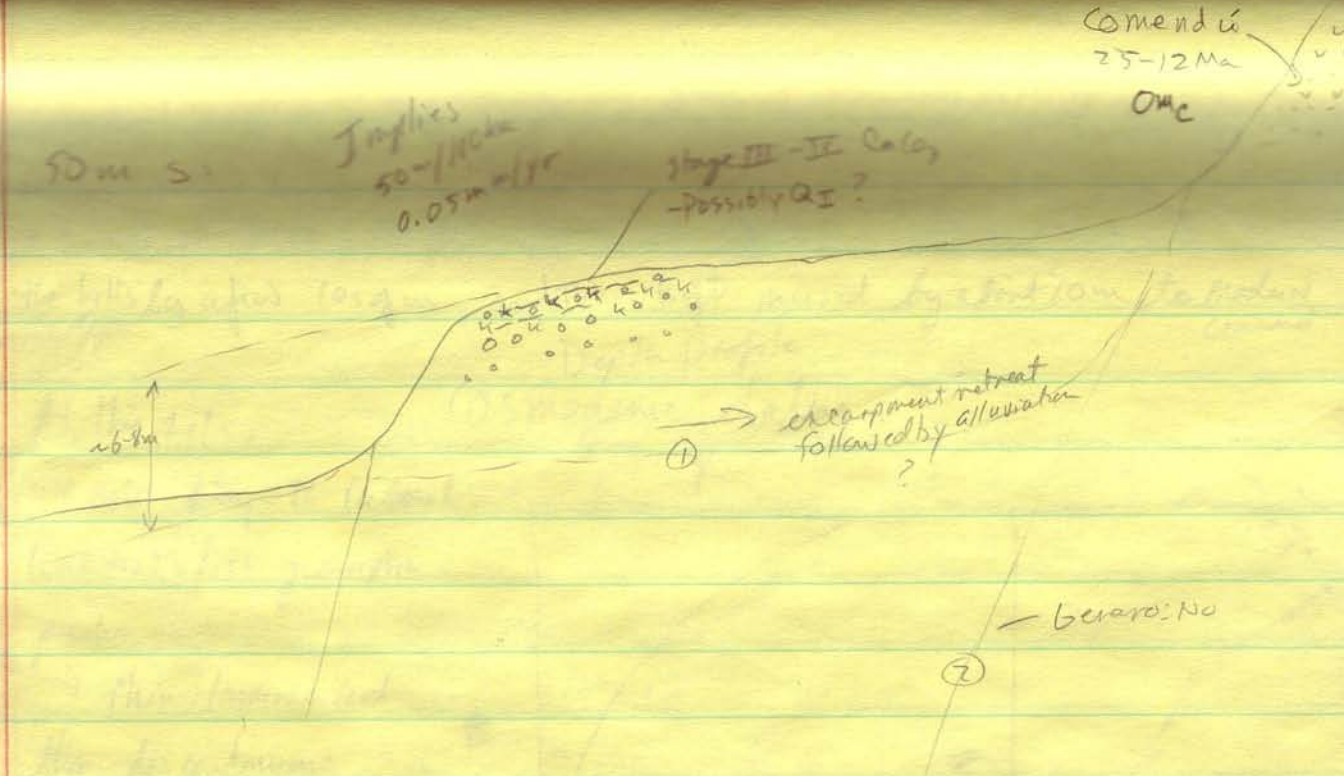
181-183

" has total station

6-8m high scarp

- Nice high (6-8m) scarp 50m south, but access is difficult for backhoe otherwise need permit

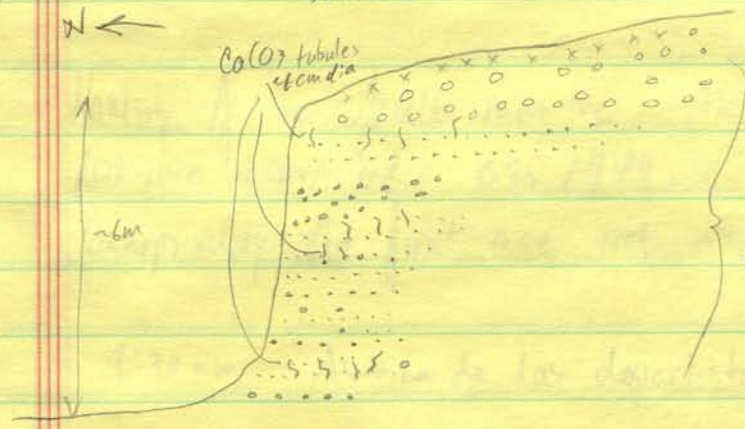




Mtn front retreat, followed by alluviation (maybe from across the Calag basin; across the Centenario fault), followed by stability, foresting + soil development

187-188

Garambullo sediments in channel cut 137m 0555273 2658118



Possible topography following Stage III-IV $CaCO_3$

What are paleocurrents? could be arid, we see 190-280

alternating planar bedded gravels w/ gravelly sands w/ occasional pebble stringers. Sands contain numerous subvertical 1cm dia $CaCO_3$ tubules (rhizoliths?) → buried Stage II salts:

- Indicates slow sedimentation rate
- Not apparently tilted

Site makes me think: slow sedimentation (alluvial fan?) + pedogenesis
 Incision + some stability
 Incision to modern system

Garambullo hills are ~190m high, later is ~40 to ~100m offset along El Centenario fault?
 - Do some gravity?

E. Gasambullo hills

0556697 2659537

119m -6-

We note an inset surface that we call Q_{II} . It is inset into the hills by a few 10s of m, and then itself incised by about 10m to modern channel

Depth profile

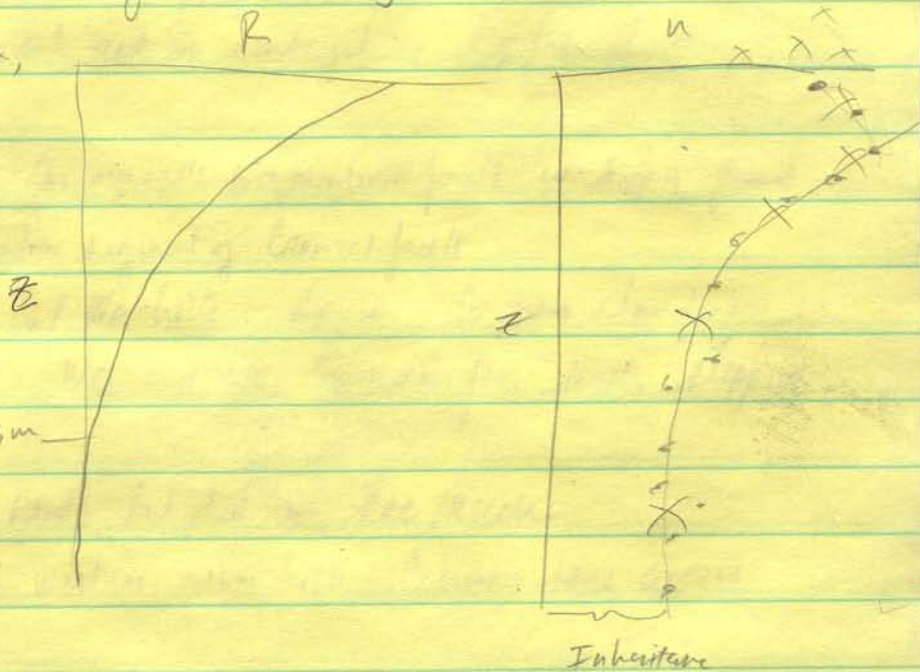
Cosmogenic dating: ?

At this site,

we note Stage II Carbonate, (consistent w/ its geomorphic position.

→ thin laminae and thin discontinuous coatings.

Almost a pavement 2-3m for the surface (also low relief)



Hunting for the fault near the metadrome along the Boulevard.
possible scarp at 0557979 2663737 ^{70m} - could be 210m over
Scarp along this front are NOT obvious! 220m

8:30 am Avenida de las deportistas - Gonaro house

12/17/05 Nice breakfast at la Terraza
various photos/panorama of escarpment across bay

189-204

Plants go beyond el Centenario + check
NW extension by the el Carrizal fault

12/17/05

West side of Garambullo hills along highway 0548518 2664086 107m
- Coming from El Centenario, N end of fault may be at the town;
E. front of hills turns to west and is embayed by big fan draining
Garambullo valley

- Here, we are along what Genaro calls Garambullo fault - W-dipping, former
grab(d) of east dipping Cuadrado segment of Carrizal fault.

- They mapped here in 1998 w/ Machette + Maym. Genaro showed us
the map (on handout base). We can see Comendin fan units stepping
back.

- They dug a trench by hand, but did not see much

- Main Carrizal fault to west is 212m high. Genaro says access
for backhoe is not good.

- Possibly geology has been mapped by Hausbach

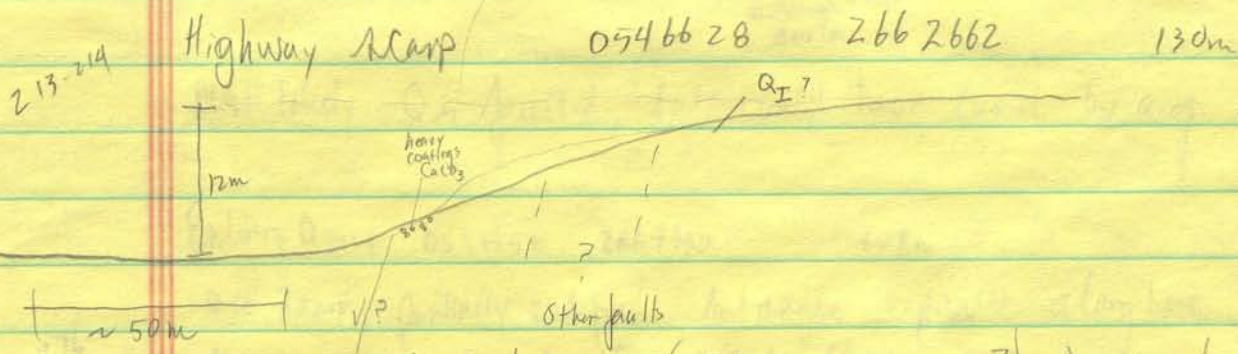
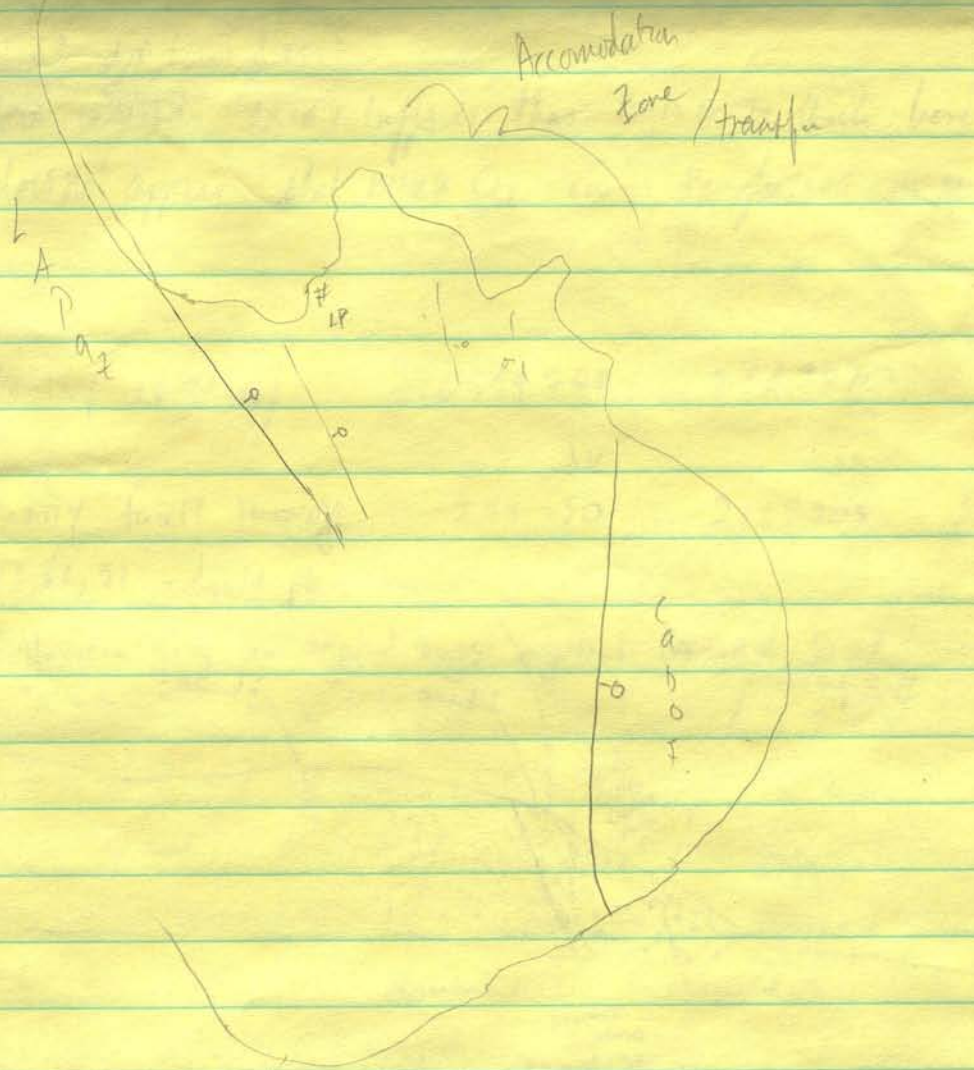
- Seems that we can infer a Southward decrease in total slip w/ $\approx 1\text{km}$ in
Bonfil near coast and only hundreds of m near the trench (Cuadrado)
from yesterday. $\rightarrow 1\text{km} / 25\text{km}$



$$\frac{u}{L} = \frac{1}{10} \rightarrow \frac{1}{1000}$$



Topo map



- Looks like a broad fold scarp (Extensional monocline?) developed in Q1 surface.
- Some exposures along the roadcuts could be explored

"Files del 35 Microondas" 0593509 2660833 282m -3-

215-220

- Comandú group gravels hold up the scarp here - mapped as Tmcc
- $\approx 2^\circ$ dip toward 255°
- Main Comandú sand + tuffs is thus > 150 m thick here.
- does not appear that much Q_I covers the footwall area.

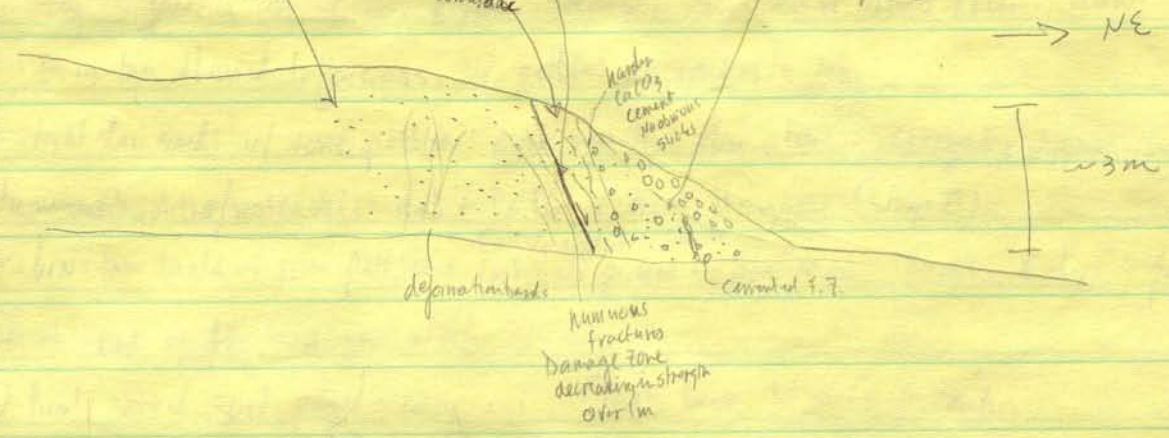
221-222
- Barranquilla
- "El Abuelito"

Quarry turn off	0544748	2669570	94m
	D16	D1	
Quarry fault turnoff	544530	2669203	103m

312, 62, 91 - fault plane

Tuffaceous grey ss against tanss against cemented Qtz
Comandú Comandú - Stage I-II

223-225



Most likely Q_I is faulted, but could have burial by a of exhumed fault

Entering Quarry 0544458 2669330 103m

226

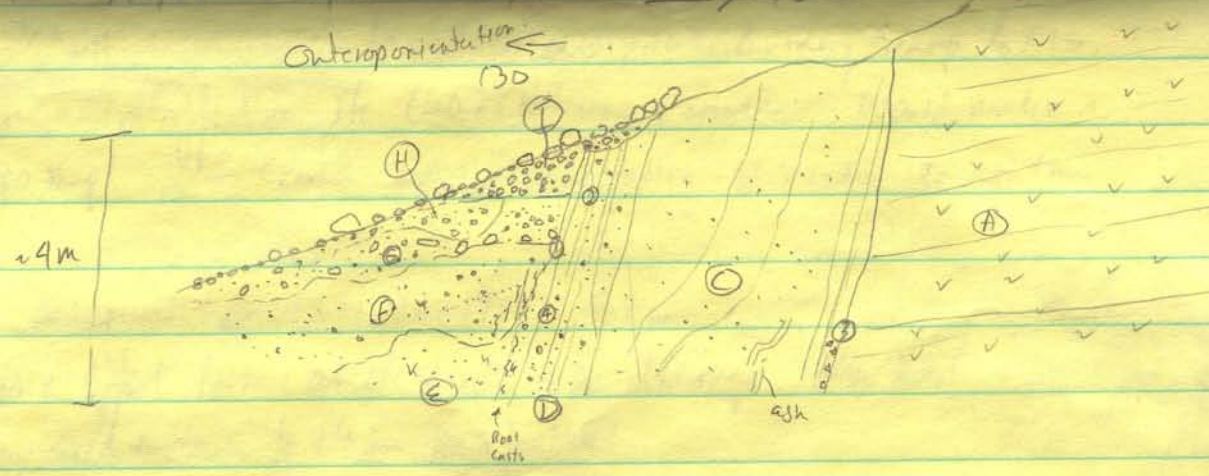
Nice Scarps, partially modified, but maybe exposable along here
Also a ≈ 200 m right step in the fault trace @ the quarry

0549553
2009023

Fault zone in the quarry, Mac lateral exposure

fault attitude

010, 74 390, 59 000, 78 7:5, 70 → 290



Units:

Feldspar + Qtz

227-237

- A Reddish phenocryst rich, porphyritic welded tuff
- B Rounded boulder cobble cgl w/ basal pebble gravel covered by lava flow
- C Grey tuffaceous ss w/ rare pebbles. Sheared. Ashy zones show shearing as well
- D Grey-tan sheared tuffaceous ss w/ pebbles increases to NE
- E light tan sands w/ some pebbles. More resistant than above. Irregular upper surface.

Event I
(1m)

- F Numerous rhizolites / root casts (undia) + CaCO₃ cement throughout (Stage II)
- G brn-tan sands w/ some pebbles + root casts picked up from below. Fairly E dipping fabric

Possibly cut by fractures on West.

Event II
(1m)

- H Poorly sorted sand, pebble, cobble cgl. Clasts have 21m CaCO₃ coating
- I Gradational contacts at top + bottom. Maybe fabric at west end

Event III
(~50cm)
?

- J Brn cobble-pebbly gravel. No CaCO₃.
- K Brn " " " Coarser than below. No CaCO₃. More clast supported than below.

234-239
metre part

Bonfil 0542492 2672213 90m ^{possibly as much as 103} - 5-

240-245

Nice offset terrace at mouth of drainage (Q_I or Q_{II} surface). ~10m height. Straight scarp connects to bedrock escarpment - bounding scarp to N+S. I imagine a 1m offset in the (late?) Holocene terrace. Would make a nice topo map! - Could imply increasing slip rates to north.

246-249 (from NE)

Bonfil Badureno 0542271 2672972 87m
Another nice offset terrace at the mouth of the drainage. New Road!
Secondary SWSide down fault in main footwall.

250-251

Road to San Juan de la Costa 0539198 2682974 43m
Possible marine terrace at ~30m above sea level. Implies some footwall uplift?

252-254

Terraces along the Road 0537041 2686465 50m
We note a series of benches + sub rounded gravels over Comendin that we associate w/ Possible Marine terraces - Stage 5e?
They are consistently 30-38m elevation.

12/18/05

Punta Coyote + Bayad!

Tidegate - try to get boat: www.palapaazul.com.mx

- Ideas from this am:

- Friedrich diagram for faults or area

- Crosssections w/ various time scale datasets from w. of Carrizal to Cabo Basin

- Can possibly drive to Las Cruces, Bahía Rosario, El Coyote

Baja Rock IV → George Potter

10:27am depart - boatman Alan - Panga - \$1500 for 4 hrs + \$150 tip

10:44am Punta Pulgero Photos to 265

- terraces w/ scarp @ ~6m height, but what is inner edge height?

- rising to s? Past pt.

10:52am Punta Coyote

266-268

0577721 2692656

- terrace seems high, but is also cut closer to inner edge

- inner edge @ 10m (?) - Kgr/Tmc contact clear

map scale →

→ | - Nice platform to S. of Pta Coyote

11:00

S. Pta. Coyote

269-271

0578128 2691011

→ Turns into nice shelf to S.

lots of grounds on coastal exposures. Small delta system during 5c time?

11:12

El Coyote

272-278, 279

0580457

268128

Terrace stays similar height; cut into Tmc

- Kgr/Tmc buttress (?) contact

11:23

S. El Coyote

281-282

0582266

2686871

- Terrace cut into fractured Kgr. ~10-15m height

- Main trends 055, 000; subvertical.

11:30 Beach

El Rosario Fault 058 3315 268 2346 24m

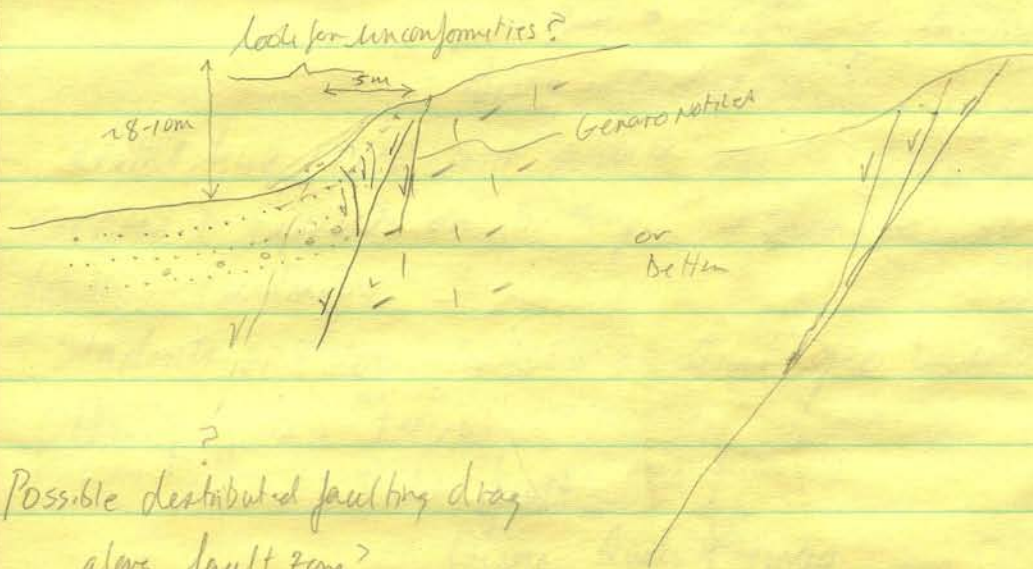
282-295

- 325,44 on beautiful granite plane w/ 10cm thick gorge zone
- Overlain by (Hanging wall) ~30m faintly laminated coarse grav w/ granite blocks occasionally + increasing toward fault. (Beach units?)

Like to fault 058 3915 268 1827 83m

296-302
303
poor soil dev.

- Fan is anomalously steep. No obvious $CaCO_3$, ^{young soils} top could be young.
- Capture of drainage from here to channel to north may explain apparent mismatch between fan + catchment. Wetter time; more glacial?



Possible distributed faulting drag along fault zone?

→ $CaCO_3$ noticed towards arroyo floor, could be paleosurface?

304-305
P:46

Back at beach - beach on fault all about 30m above ocean - could be terrace

10km Bahia el Rosario Pl. core? 0586388 2681921

306-308

170,20 approx STD on coarse cgl over tonalite? on Tem also SW striking possible fault

309-711

Don't see Genaro

Genaro had option to 521 just behind road

Water front not very sharp, but some disruption @ base

Paul suggests strike slip?



1:15 - 2:30 Return w/ pounding waves

Palapaeszul Planning

- Genaro can have a week off - probably 1st week so we can meet + discuss together

- Summer workshop - Genaro needs dates

- give him a letter of invitation

- Bring students (?)

- Seems like Bev will work on N. Bonifil +

Genaro + Ernesto on S. Bonifil + Genaro + students

South - Cuadrado

- Students will concentrate on Quat. geo basin mapping

- Other projects: ^{marine} Terraces

: Cabo fault

Genaro - Quat. terraces

- Geographic indices in drainages (DEMs)

: San Jose de los Planes - Ernesto has interest on the west side piedmonts

: N. Cabo, El Rosario, S. J. d. Pl. Genaro no plans

: But Fletcher wants to do neotectonics of Cabo fault + NNW

Semanat - permission for environmental impact

Ernesto will be here next semester

- Need Crivato's thesis - good map

-9-

- Work together on El Rosario ...

- What are Fletcher's plans?

is student available + reliable?

Marine terraces - map coastal strip

- profiles through cover sed

- elevations of inner edges

Yeats, et al for Genaro + Paul