

UNIVERSITY OF ARIZONA

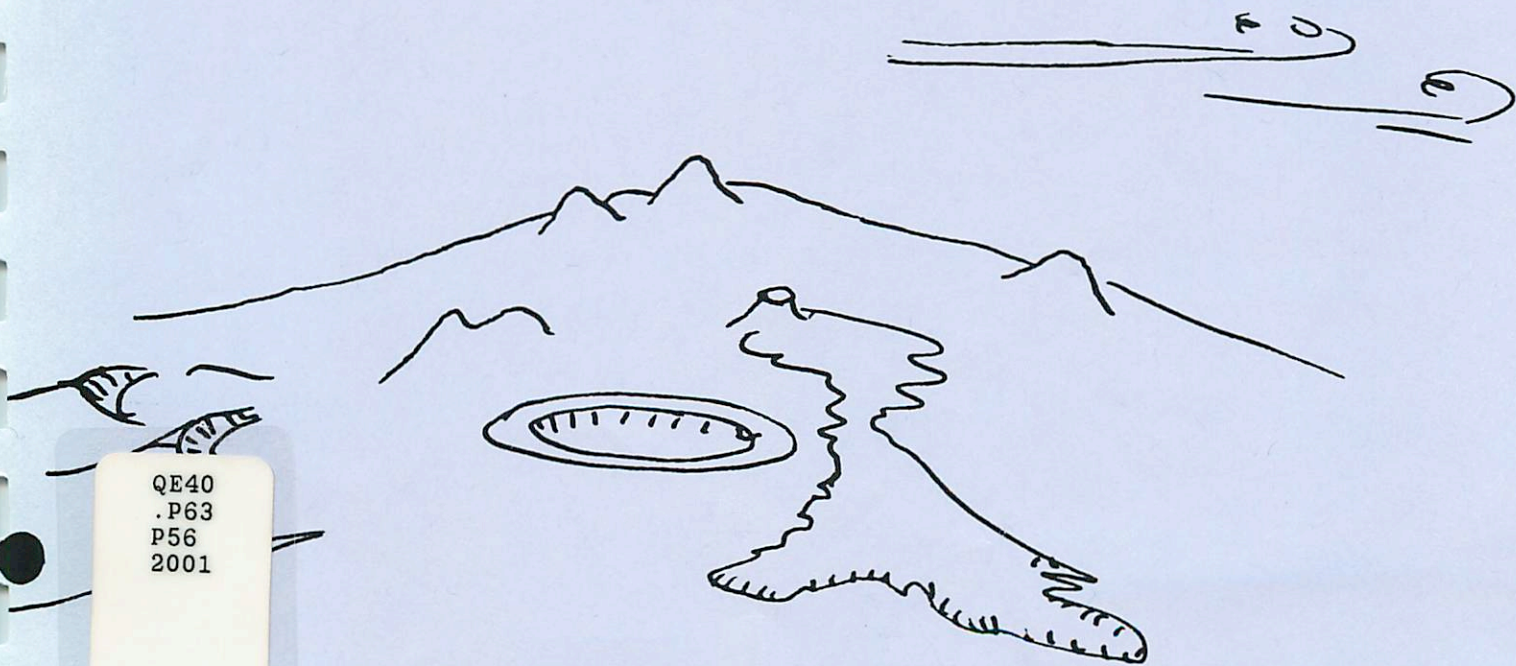
Lunar and Planetary Lab

Pty S 554

PINACATE MTS FIELD
TRIP

November 16-18, 2001

Aeolian and Volcanic Processes



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2001

LIBRARY
LUNAR & PLANETARY LAB

APPROXIMATE ITINERARY

8:00 am, Friday, November 16--Depart from in front of LPL

Drive West on Speedway to I-10

I-10 South to I-19

continue South to Ajo way exit, proceed West on Rte. 86.

10:00 Arrive Why, Rest and gas stop, proceed South on Rte 85.

11:00 Arrive Mexican Border, stop, then proceed West on Mexican Rte. 2.

12:00 Exit Rte 2 at km 71, drive up Cerro de Lava to microwave tower for lunch and overlook of region

1:00 Descend Cerro de Lava. Make a right on dirt road at base of tower to Rancho Grijalva. Drive South on farm road to McDougal Crater

2:00 Walk around rim of McDougal crater, descend onto lava bench, study geology (Possible excursion to Molino and Sykes craters if time/road conditions permit)

5:00 Depart McDougal crater, return to Rte 2, drive East to main entrance at km 51, drive South on road to Tecolote campsite.

8:00 AM Saturday, November 17--Break Camp

9:00 AM Arrive Cerro Colorado, park, and begin hike across crater floor

12:00 Depart for Tecolote aa lava flow.

12:30 Stop at Tecolote flow, lunch

2:00 Depart for Elegante crater, study rim and hike to exposed dike

6:00 camp at Red Cone campsite.

8:00 AM Sunday, November 18--Break Camp

Proceed South to Mexican Rte. 8, stop at visitor center to register, continue South

10:00 Arrive South end of Sierra Blanca at km 72, proceed North on dirt track to dune fields.

11:00 Hike into dunes.

1:00 Return to vans, lunch

2:00 Drive to lava levees, Ives pahoehoe flow, observe desert pavements

4:00 Depart for Tucson

8:00 Arrive Tucson, stop at LPL, unload vehicles, go home.

=FINIS=

Participants:

Abramov, O.
Barnes, J.
Cooper, C.
Folsom, H.
Hsu, L.
Keszthelyi, L.
Lorenz, R.
Melosh, J.
O'Brien, D.
Wasserman, A.
Zavacky, J.



SEMARNAT

Reserva de la Biosfera de El Pinacate
y Gran Desierto de Altar



REGULATIONS

Welcome to El Pinacate! You are in a biosphere reserve managed by the Mexican Federal Government (SEMARNAT, the Ministry of Ecology and Natural Resources) in collaboration with the government of the State of Sonora (IMADES).

The reserve's park rangers and other staff members are empowered to enforce the observance of these regulations and to protect the area. They have a radio and telephone link with the Federal Police, the Mexican Army, PROFEPA (the Environmental Protection Attorney General's Office) and the Attorney General's Office to prosecute immediately any violation of the law.

Help us preserve this area and avoid legal action be taken against you. Penalties can go from a verbal warning to incarceration.

GENERAL REGULATIONS:

- ❖ All visitors shall fill out registration form F-01 at the Visitor's Center or, if not possible in the field and hand it to any staff member.
- ❖ The reserve is open to all citizens; nevertheless, any visitor that might seem to be a potential danger for the reserve's or other visitor's integrity or even to himself will not be allowed to enter, such as people under the influence of intoxicating beverages or drugs.
- ❖ Weapons are strictly prohibited.
- ❖ Collection, gathering, or extraction of plants, animals, organic remains, seeds, wood, sand, rocks, minerals, archaeological remains or any other type of the area's natural or cultural resources is totally prohibited .
- ❖ The use of plants or animals for feeding, healing or ritual purposes is not allowed but in some exceptional cases and only with the reserve's authorizes personnel's written approval.
- ❖ It is strictly forbidden to let free domestic or exotic wild animals or to plant native or exotic plants.
- ❖ A special permit issued by the SEMARNAT and a payment receipt are required for commercial filming.
- ❖ Campfires are not allowed; portable gas, alcohol or other fuel stoves are permitted only in designated campgrounds or in backcountry when there is no risk of starting a fire and when not done in commonly used parking areas or roads .
- ❖ We strongly recommend that you DO NOT bring in your pets. A pet shall be let in provided it remains in your vehicle or if you keep it under control on a leash when you walk it out. In any case a permit might be denied by the staff in duty when it be considered that your pet poses a risk for the area or for other visitors.
- ❖ Very big or heavy vehicles shall not be allowed to enter, such as RV's or many-wheeled vehicles. ATV's (all terrain vehicles) or ORV's (off-road vehicles) and sand boogies are strictly forbidden.
- ❖ Vehicles transporting toxic, flammable, or hazardous materials shall not be allowed to enter ; not even when they are in transit to other destinations.
- ❖ You shall respect and observe indications of the signaling system that you will find within the reserve, such as: NOT trespassing closed roads, NOT off-driving from authorized roads, NOT speeding (25 miles maximum speed), etc.
- ❖ Climbing down craters is not allowed.
- ❖ Loud volume audio equipment is not permitted, that is, if the sound is audible at 250 yards.

- ❖ All alcoholic beverages are strictly forbidden but those of low alcohol content such as beer and only in small amounts. The staff in duty will check up each particular case. Likewise, introduction of any substance that might be used as intoxicant or narcotic is illegal.
- ❖ Any activity that maybe a possible source of air, water, or soil pollution is forbidden, such as fluid or solid waste disposal, burning or combustion of any kind of materials, etc.
- ❖ The trash that you bring or generate during your stay shall be picked up and taken away from the Reserve. Do not bury it even if it is organic garbage.
- ❖ If you defecate outdoors you shall bury your feces in a cat hole of some 8-10 inches deep; DO NOT bury toilet paper or sanitary pads in it, but put them into a plastic bag and take the bag away with you.

CAMPGROUND REGULATIONS

- ❖ If you want to camp in the Reserve it is mandatory that you apply in writing for a permit (form F-01). Hand in your application form to personnel in duty at the Visitor's Center.
- ❖ Camping shall be allowed only within predetermined sites intended for that purpose and designated by the Reserve's personnel. People allocation in campgrounds will be done based on sites carrying capacity.

Authorized campsites are as follows :

- **Red Cone:**

Capacity for 20 persons and/or 5 vehicles. Located at 16.2 miles northeast of the Visitor's Center. Access through a rocky and bad shaped dirt road. We recommend that you take a high vehicle. Four wheel drive is not necessary. This site doesn't have any kind of services or facilities but a few picnic tables and benches. It is the closest spot to the Santa Clara volcano (Pinacate) by road.

- **El Tecolote:**

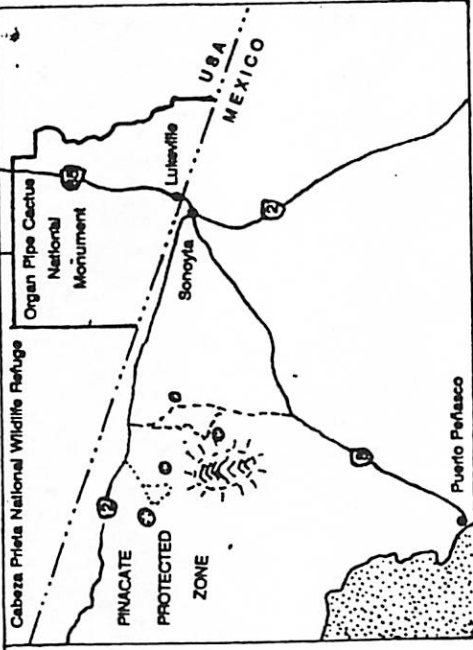
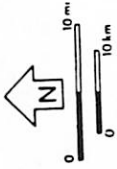
Capacity for 40 persons and/or 10 vehicles. Located at 20.6 miles north of the Visitor's Center through a moderately well-shaped dirt road, somehow sandy in parts (sand and volcanic ash). It is okay for regular vehicles ' transit. It doesn't have any services or facilities but a few picnic tables and benches. It is the nearest campground to the El Elegante crater (approximately 5 miles Northeast of it).

- **Backcountry camping:**

All sites have a maximum capacity for 3 persons and no (0) vehicles. Are located anywhere within the public area (see map) at one third of a mile away from roads, water reservoirs, craters, lava flows, lapilli areas, or archaeological sites. Access only on foot.

- ❖ We do not make camping reservations. You must register for a permit available on a first-come, first-served basis at the Visitor's Center information desk.
- ❖ If a specific campground has some vacancies it will still receive individuals or other group members that will share the place with you until the site is full to its capacity. We do not have exclusive sites.
- ❖ Pets are not allowed at either of the two established campgrounds.
- ❖ Campfires are not permitted.
- ❖ You are allowed to cook or heat your meals on portable grills or stoves within campgrounds or other campsites provided that no risk of catching fire is present, and when not done in commonly visited parking areas or roads.
- ❖ Do not use rocks to anchor tents or canvas on the ground.
- ❖ Audio equipment is not allowed unless you listen to it through a headset or at low volume and provided other people's agreement. The same applies to musical instruments such as guitars.
- ❖ It is strictly forbidden to slide downhill for recreational purposes on volcanic-ash-covered hills, as well as to do any other destructive activity that may cause a negative impact on the soil, vegetation, fauna or archaeological remains.

**AZ 85
Gila Bend to Lukeville**



Not a real crater, this cliff-walled valley gives the Crater Mountains their name

The ore body at Ajo occurs as thin spots of a light-colored Tertiary igneous rock

Truncated edges of faulted Tertiary lava and ash flows face Arizona 86

**AZ 86
Jujilotoa to Tucson**

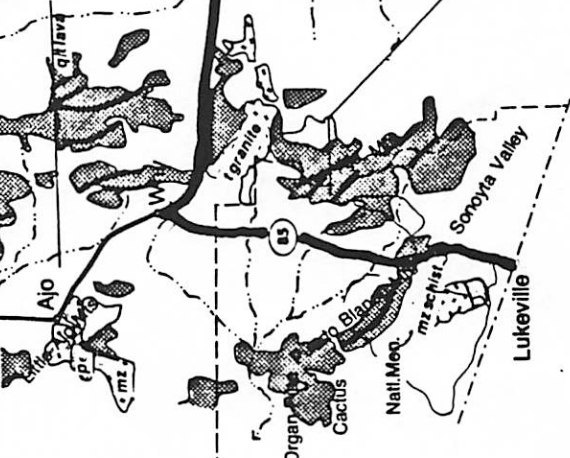
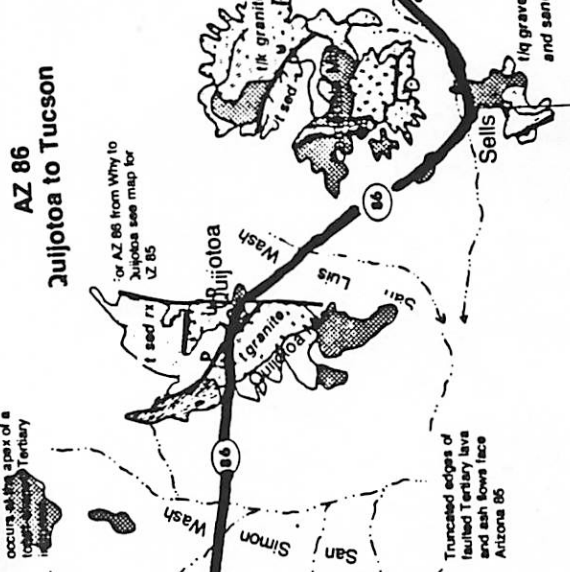
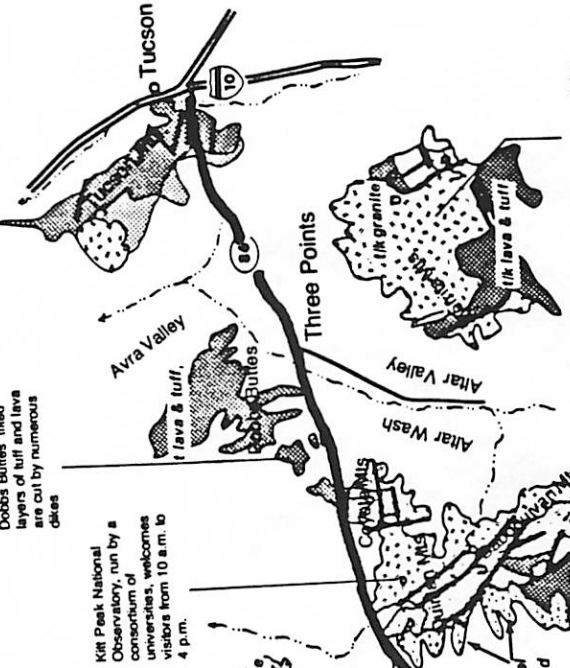
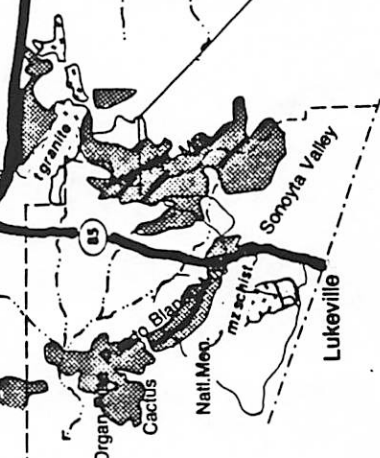
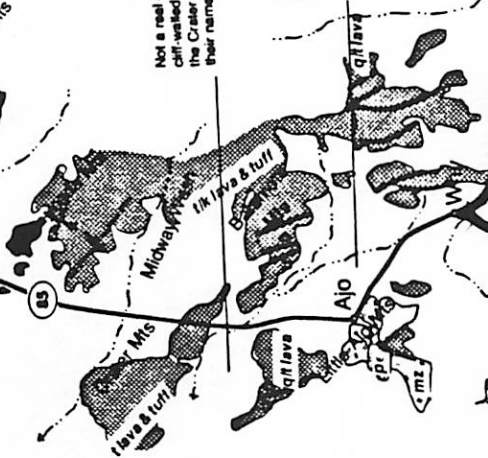
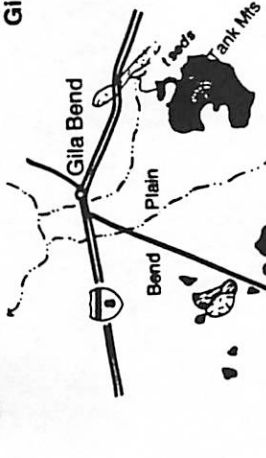
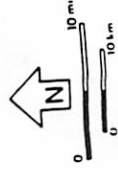
of AZ 86 from Why to Jujilotoa see map for AZ 85

Dobbs Buttes' tilted layers of tuff and lava are cut by numerous dikes

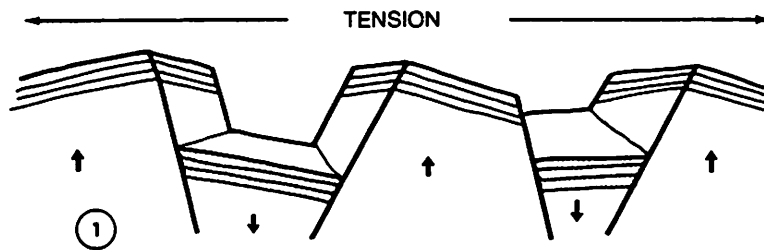
Kitt Peak National Observatory, run by a consortium of universities, welcomes visitors from 10 a.m. to 4 p.m.

Sells, originally an Indian settlement around a trading post, is now Papago Reservation headquarters

Only the center of the Sierra, overlooking projects across the surrounding pediment.

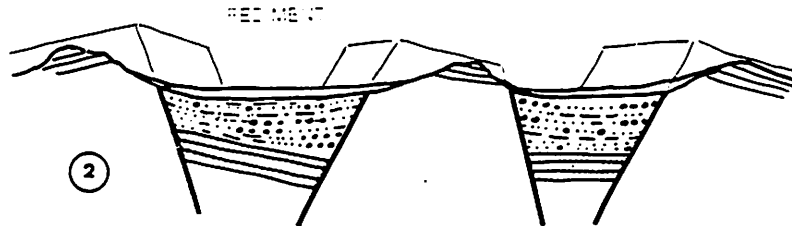


Basin and Range Extension 15-20 Myr BP



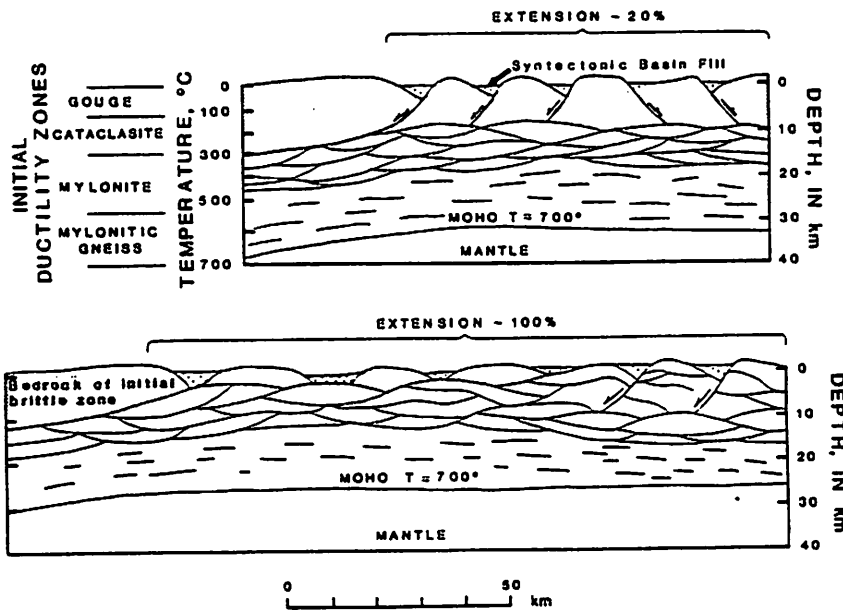
At the Surface

Basin and Range faulting created mountain blocks (color) separated by downfaulted basins. Structure within the blocks is simplified here.



As debris from mountain blocks washed into basins, mountain fronts receded, leaving sloping pediments. The transition between eroded pediment and deposited valley fill is commonly obscured by a surface layer of gravel.

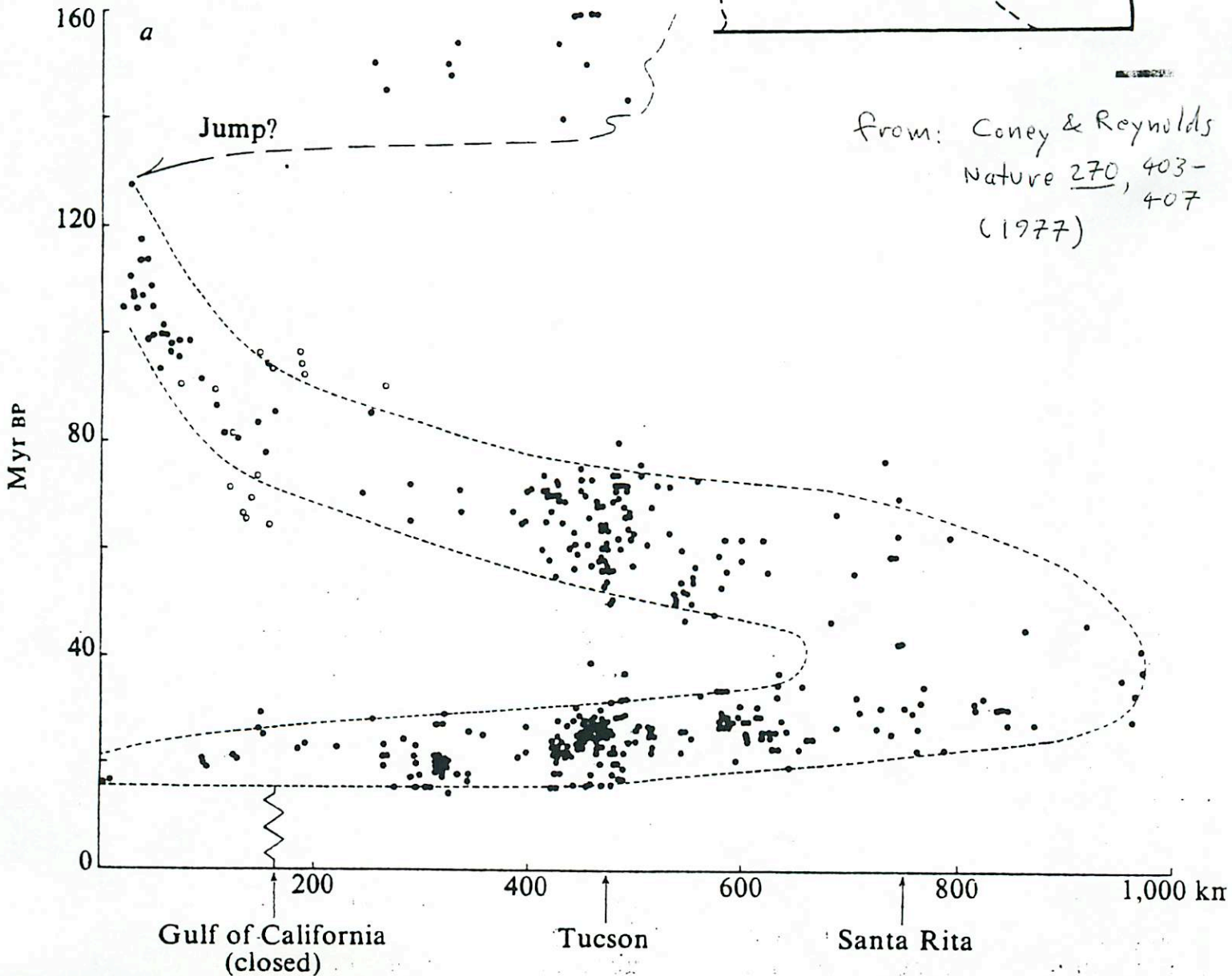
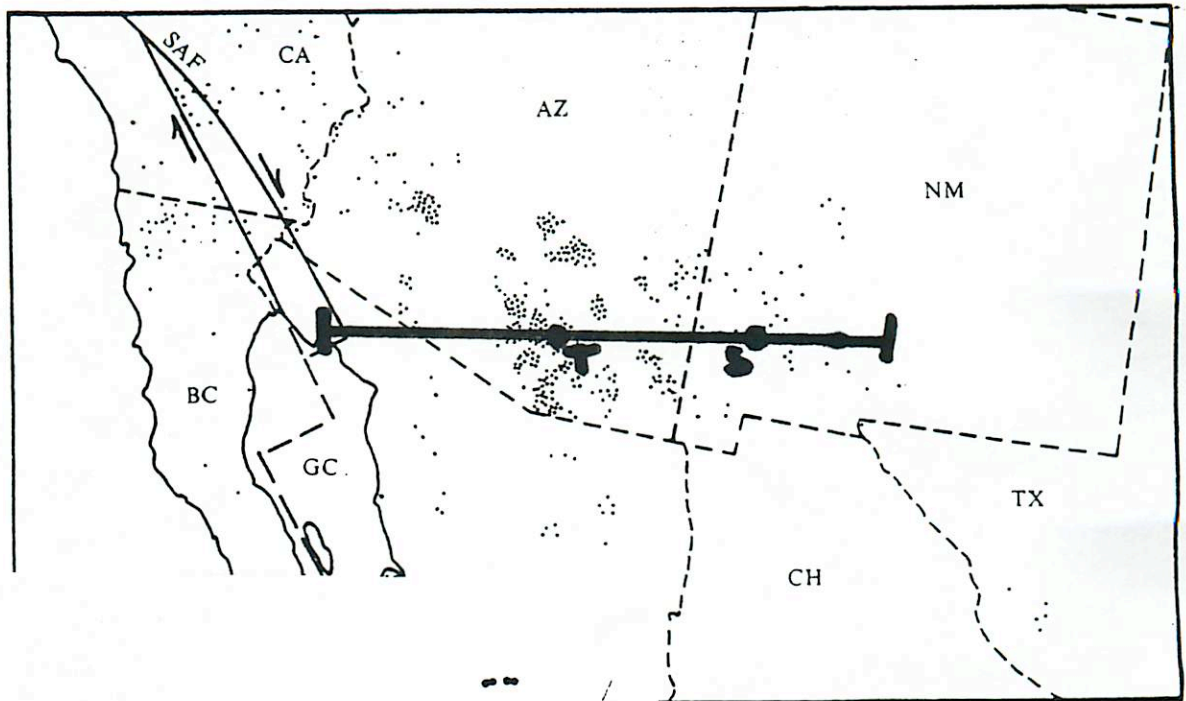
Crustal extension in the Basin and Range

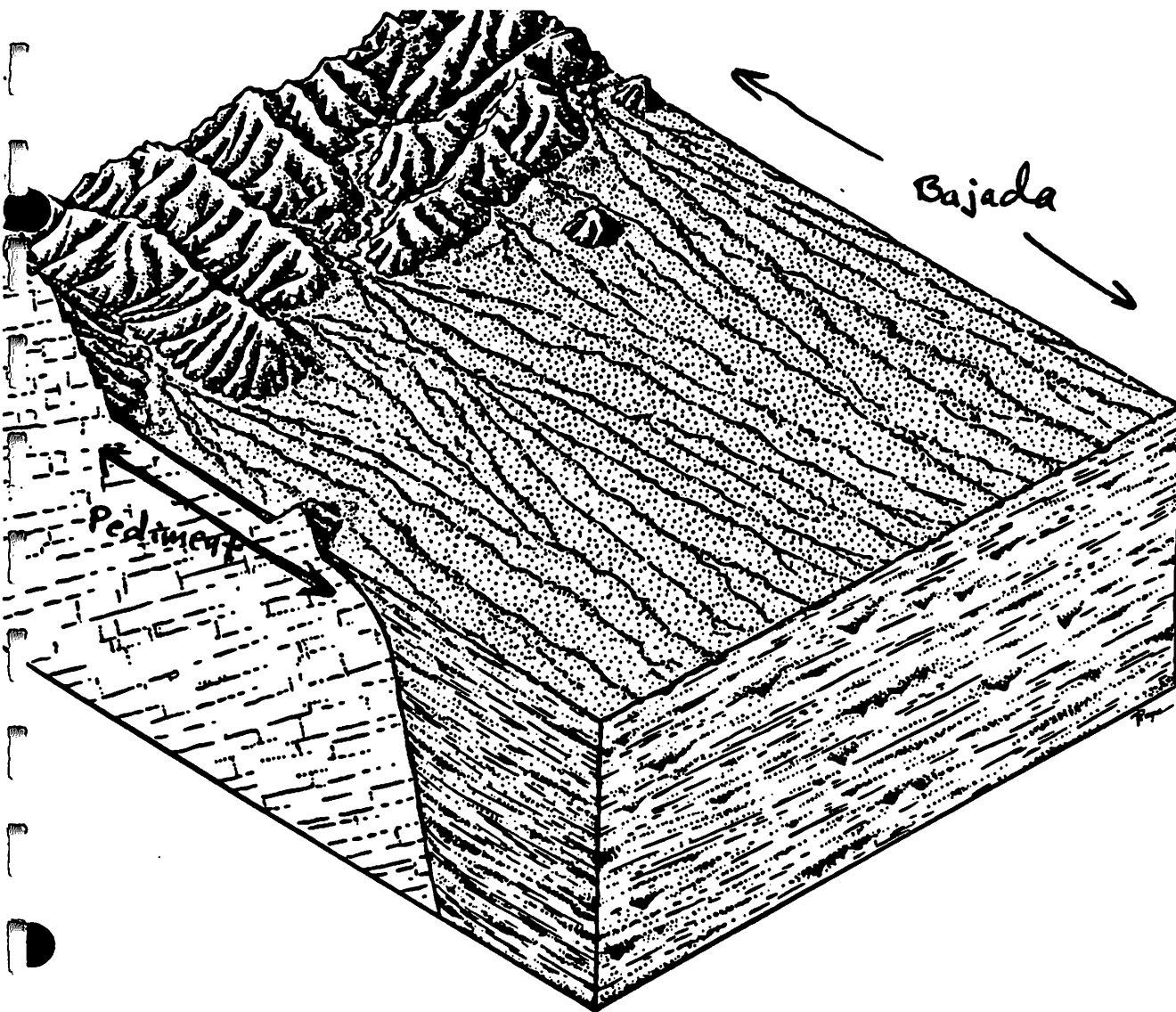


In the Crust

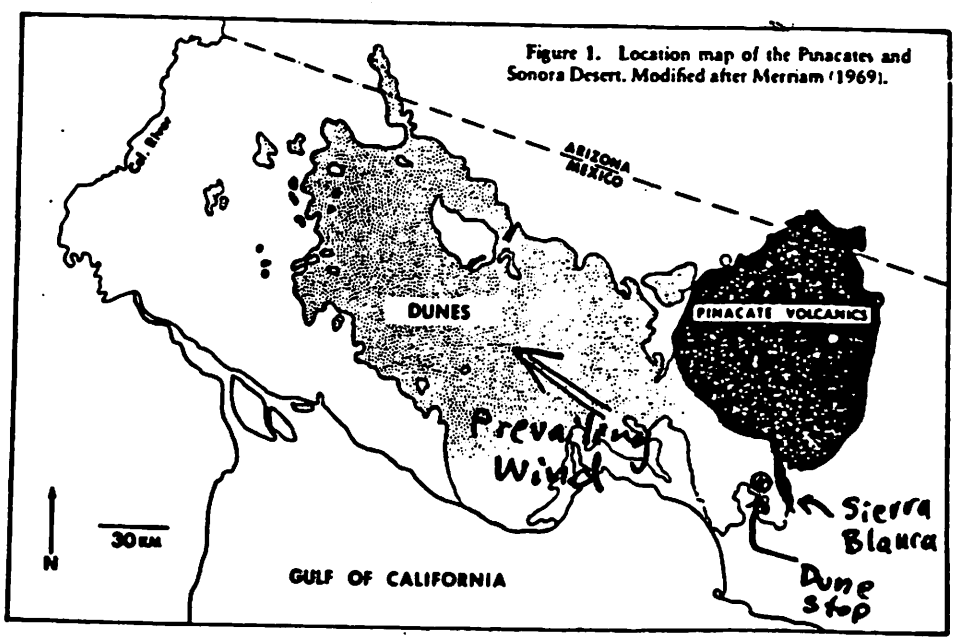
FIG. 2. Cross-sections of extending crust. Brittle upper-crust blocks rotate and separate. Middle-crust lenses slide apart along ductile shear zones; composite upper surface of lenses forms detachment faults that increase in total area with time. Lower crust flattens pervasively. Structural styles are superimposed as components rise to the surface with continuing attenuation. Attenuating crust is partly rebuilt by magmatism, and possibly also by phase change, so crust is thinned by a factor less than extension ratio. Ductility zones after Sibson (1983).

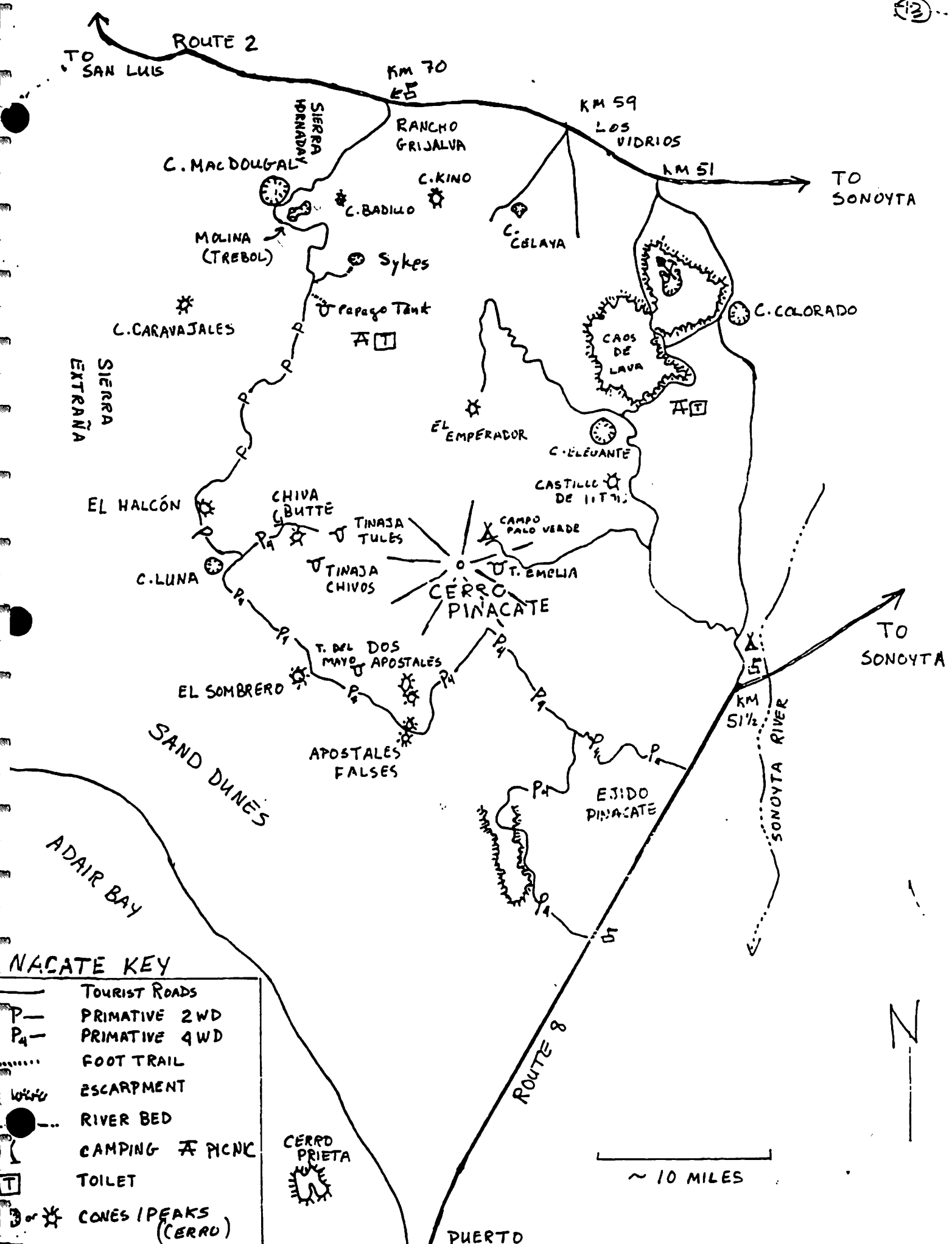
Fig. 1 Distribution of radiometric age determinations in southwestern United States and adjacent northwestern Mexico. Published dates from refs 14, 18-20, 44, 45. S. B. Keith and S. J. Reynolds compiled dates, lists and maps which are available from P. Damon, University of Arizona. Unpublished ages taken from refs 23, 44, and P. Damon, R. Nielson and W. Rehrig personal communication. T, Tucson; S, Santa Rita; SAF, San Andreas Fault; CA, California; AZ, Arizona; NM, New Mexico; BC, Baja California; GC, Gulf of California; SN, Sonora; CH, Chihuahua; TX, Texas.

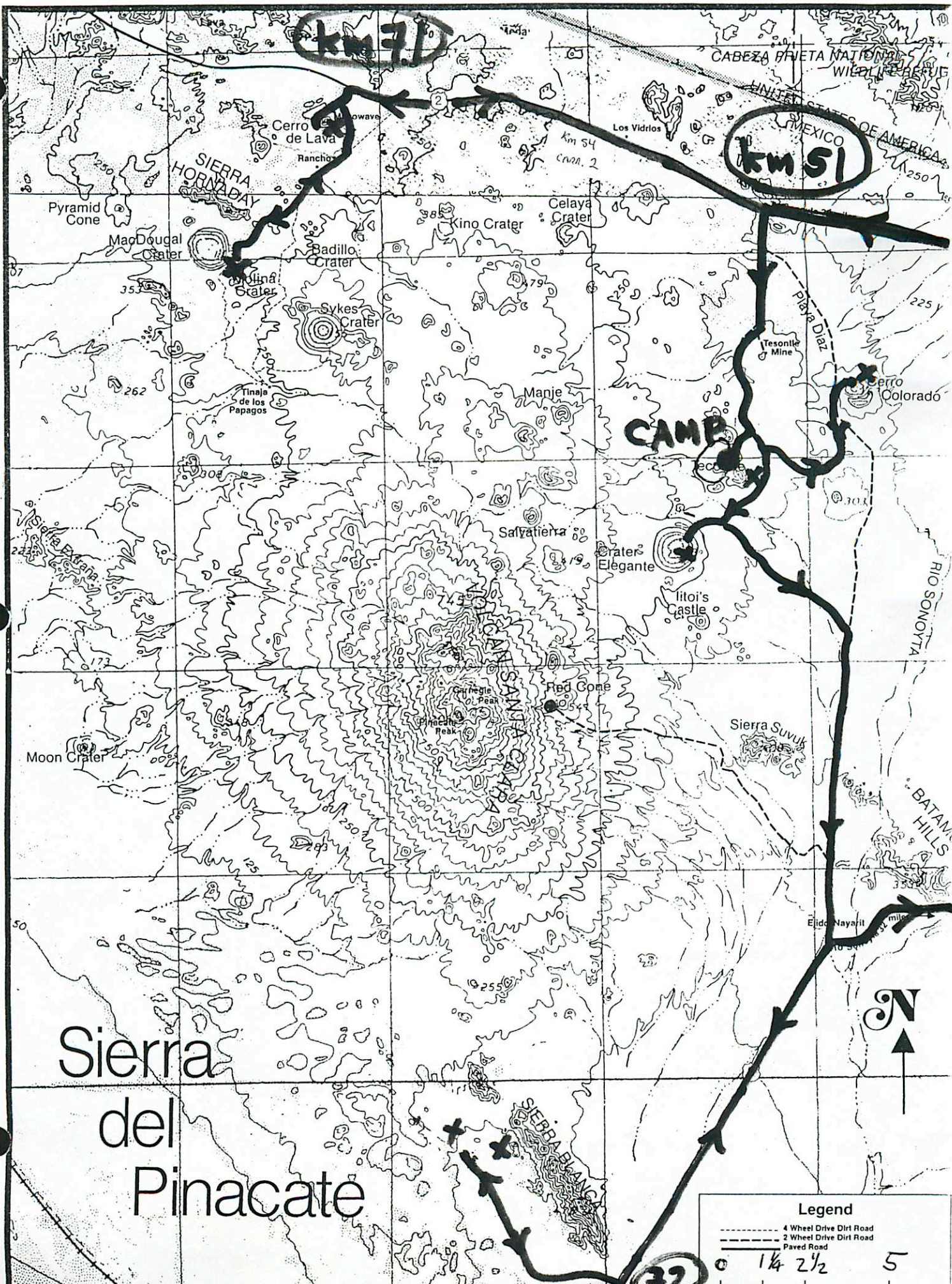




1.11 Diagrammatic sketch showing a tectonically stable terrain with a single erosion surface that truncates the rock of the mountains, the fault, and the alluvial fans that had been deposited in the basin.







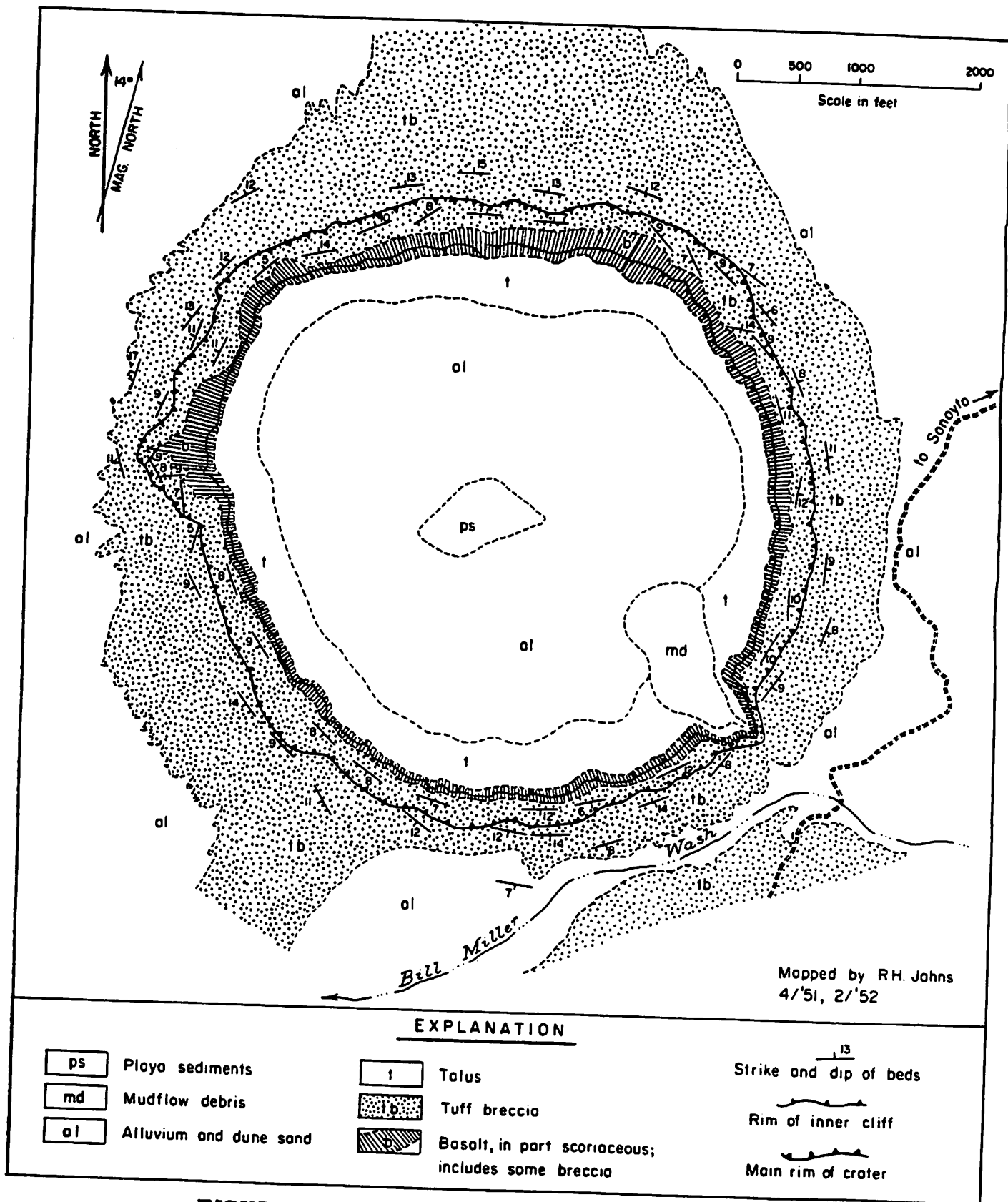


FIGURE 35. Geologic map of MacDougal Crater.

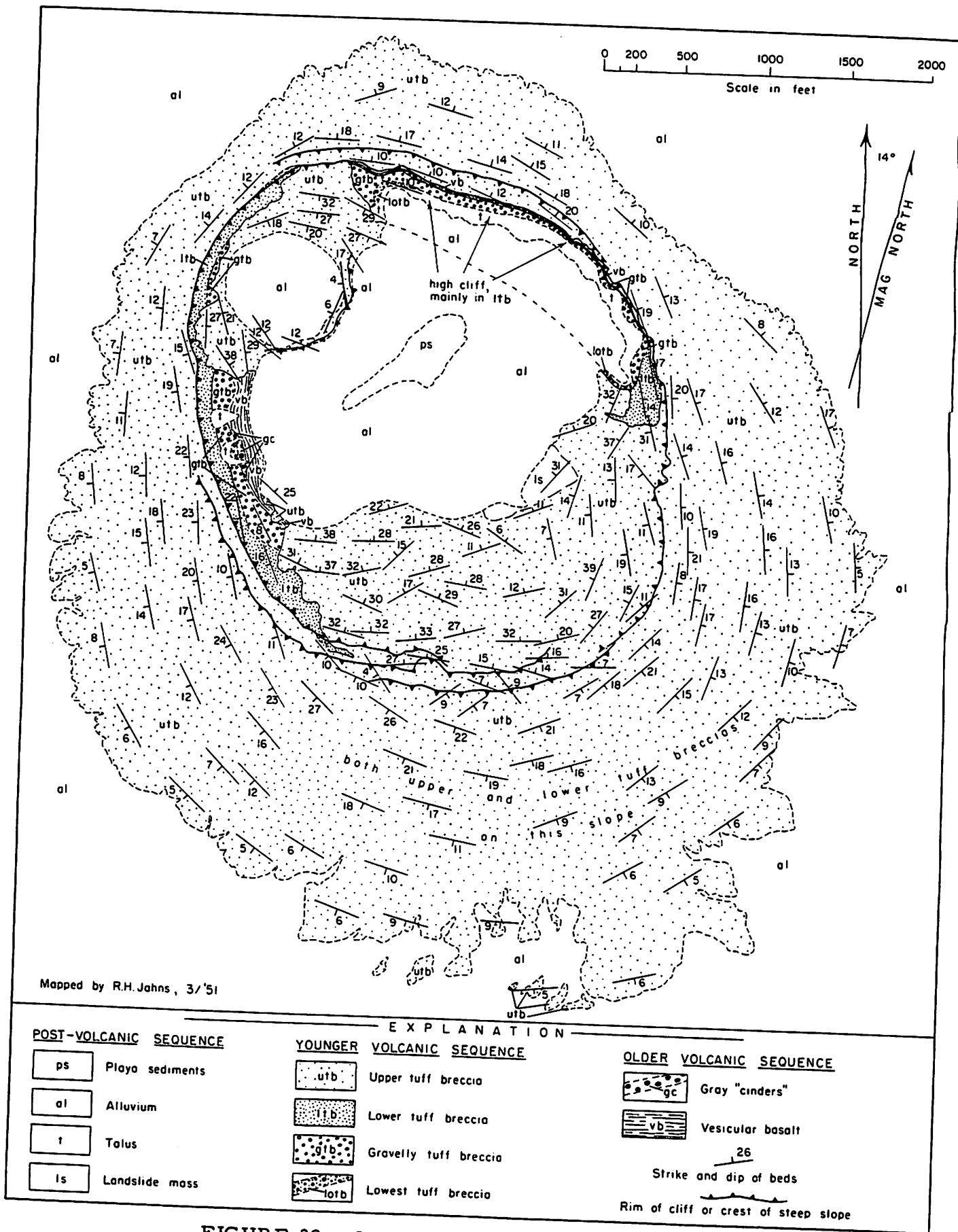


FIGURE 39. Geologic map of Cerro Colorado.

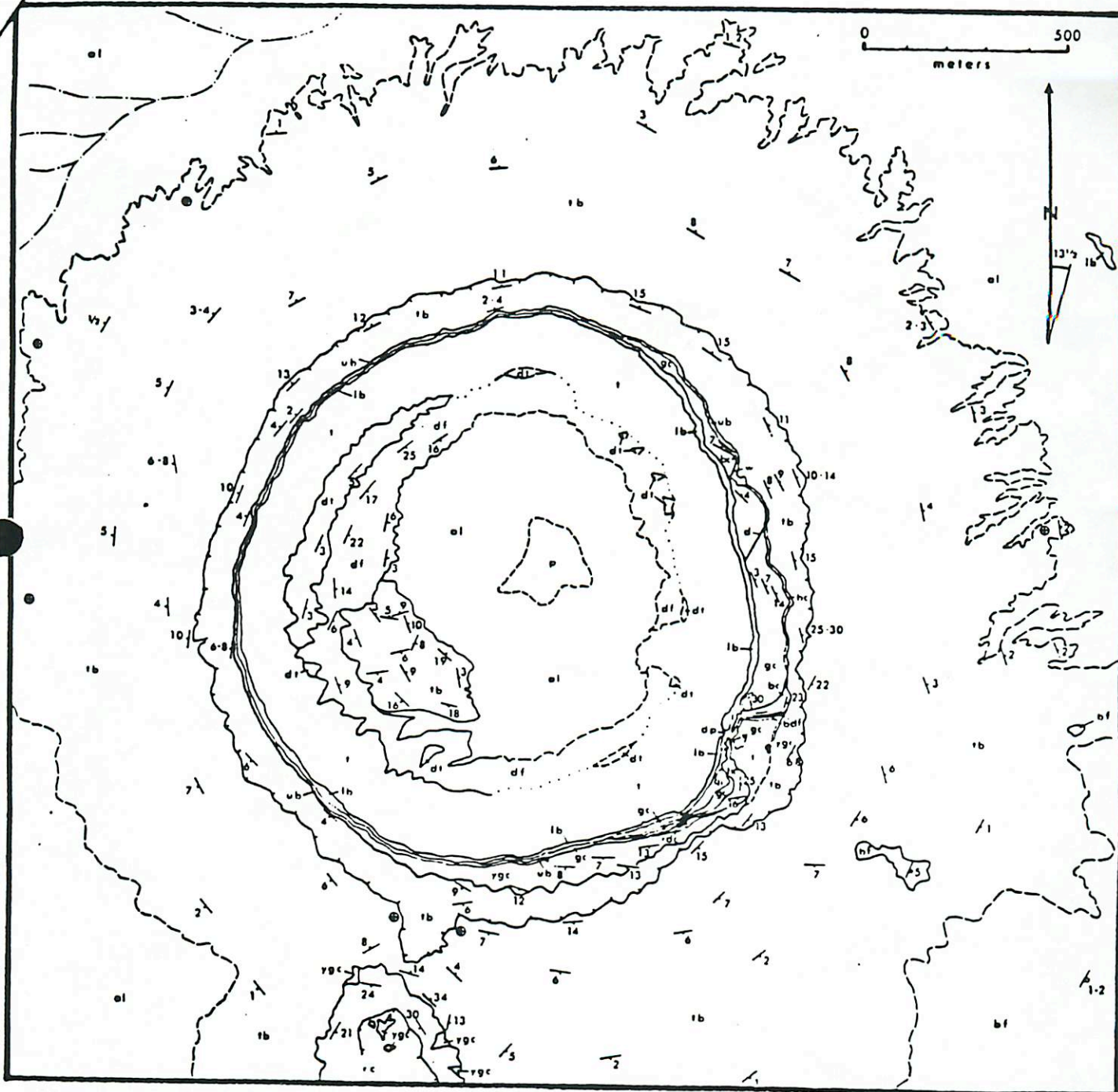


Figure 2. Geologic map of Crater Elegante, Sonora, Mexico. Geologic contacts dashed where approximately located, dotted where inferred. Rim of crater shown with hachures toward vent. Map symbols in general order of increasing age of unit (relative ages of volcanic units shown precisely in explanation of Fig. 3): al, alluvium, p, playa sediments; t, talus; dt, lacustrine deltaic topset deposits; df, lacustrine deltaic foreset deposits; tb, tuff breccia; vgc, younger gray cinders; rdc, ribbon dike and associated sill and cinders; dp, Devil's Pitchfork; d, composite dike; ub, upper basalts; w, Wedge intrusion; brown flow; bdf, dikes and flow within and upon brown cinders; bc, brown cinders; gi, gray intrusions; gc, gray cinders; lb, lower basalts; rc, cinders of the south of crater.