

Figure 1. Ilopango caldera (“Volcán Ilopango”) is situated within the northwestern region of the Central American Volcanic Arc (CAVA) chain of late Quaternary volcanoes (triangles). The Los Chorros and El Mico tree subfossil sampling sites from this study are indicated by stars.

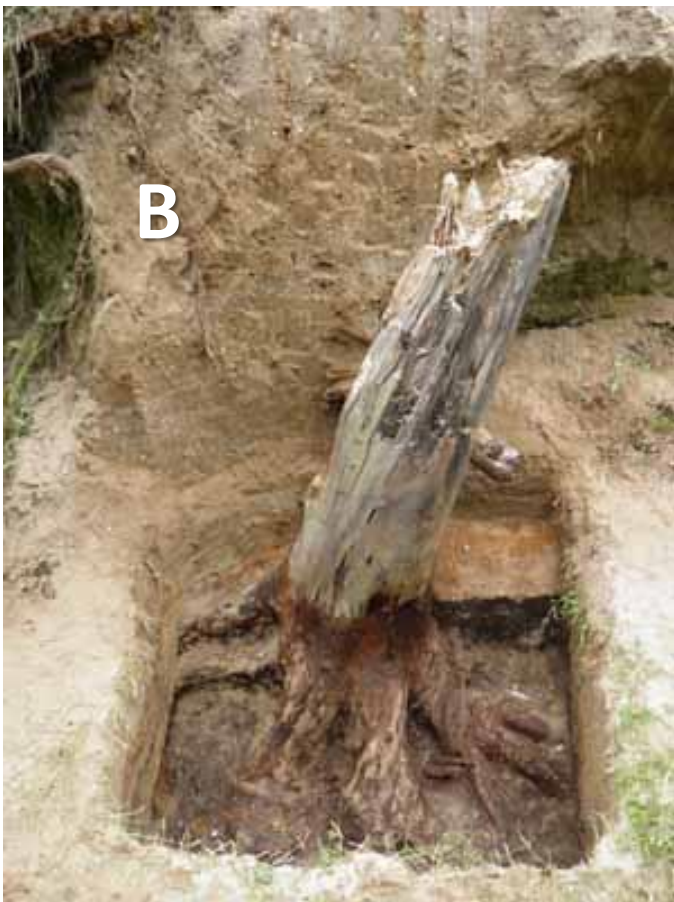


Fig. 2 El Mico site excavation and sampling. A) El Mico-A tree being sampled with a chainsaw. B) El Mico-A tree excavation pit showing rooted tree stump and TBJ tephra (light) overlying paleosol (dark). C) cross section of El Mico-A showing rotted pith section. D) El Mico-B being sampled with a chainsaw. Photos courtesy of P.A. and R.D.

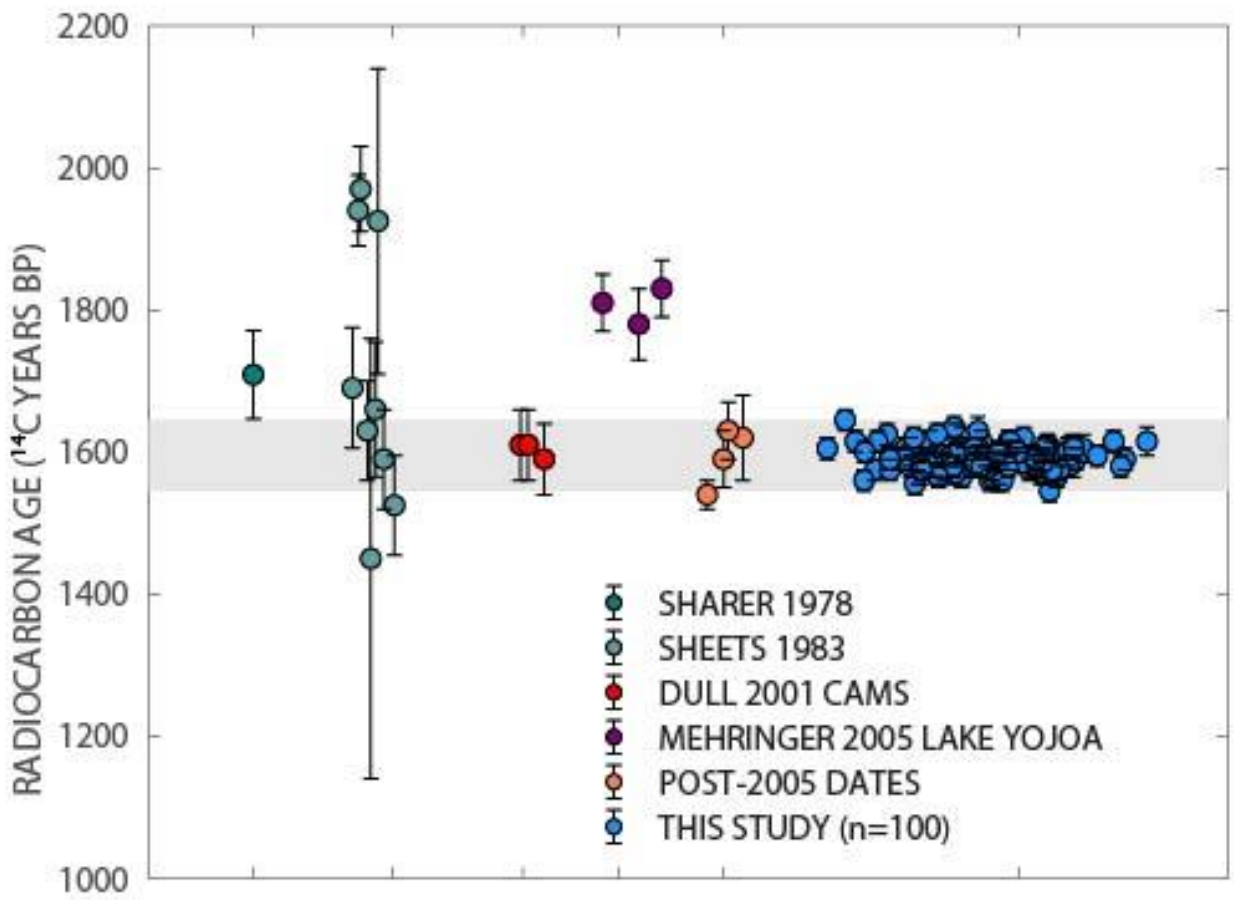


Fig. 3. All know reported TBJ ^{14}C dates (uncalibrated) with error bars from 1978 (far left) through the present (far right). Dates are reported in Sharer 1978, Sheets 1983, Dull et al. 2001, Mehringer et al. 2005. "Post-2005" Dates include those from Scott et al. 2006, Kitamura 2010, McNeil et al. 2010. "This study" includes all 100 of the uncalibrated ^{14}C dates reported in this study.

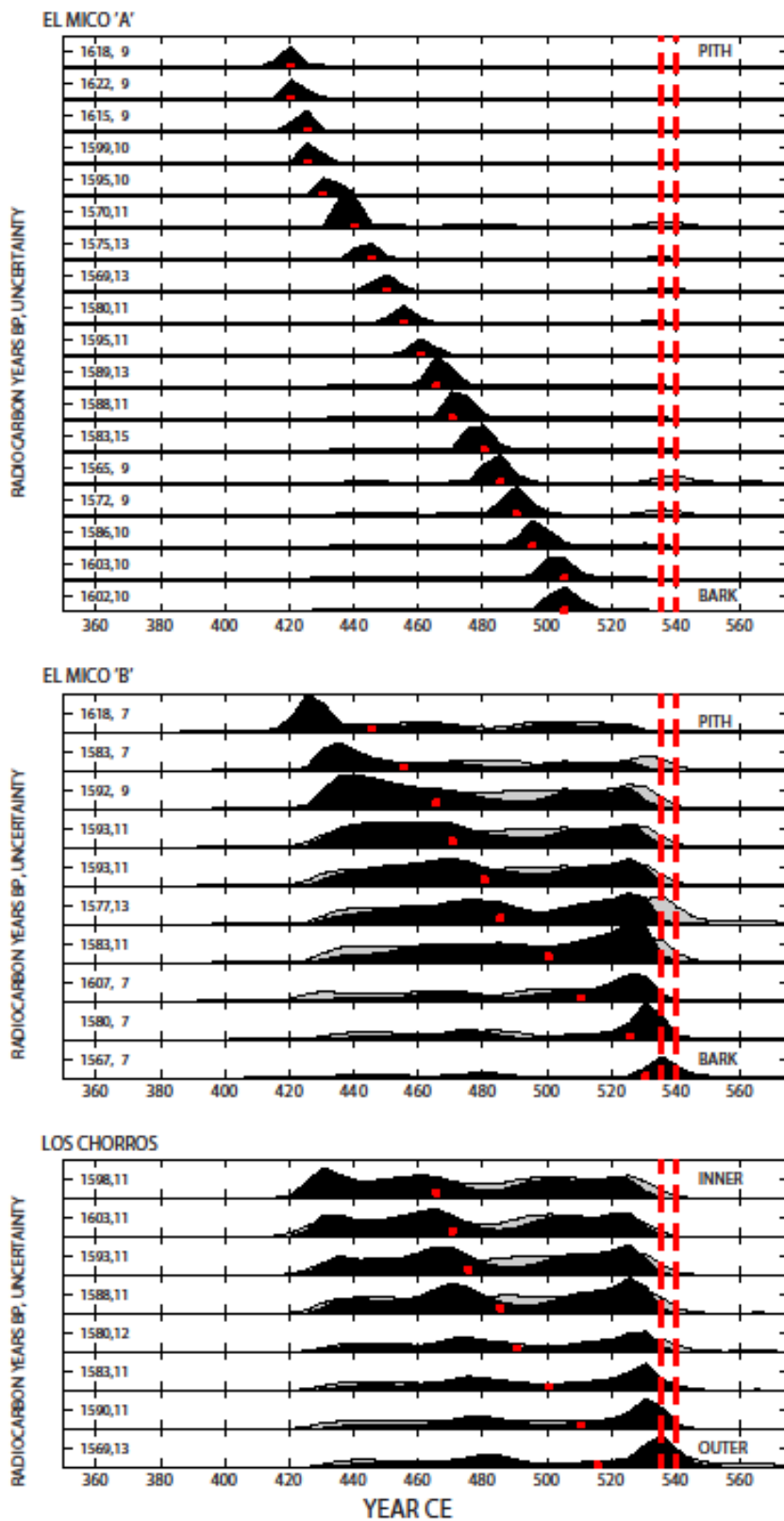
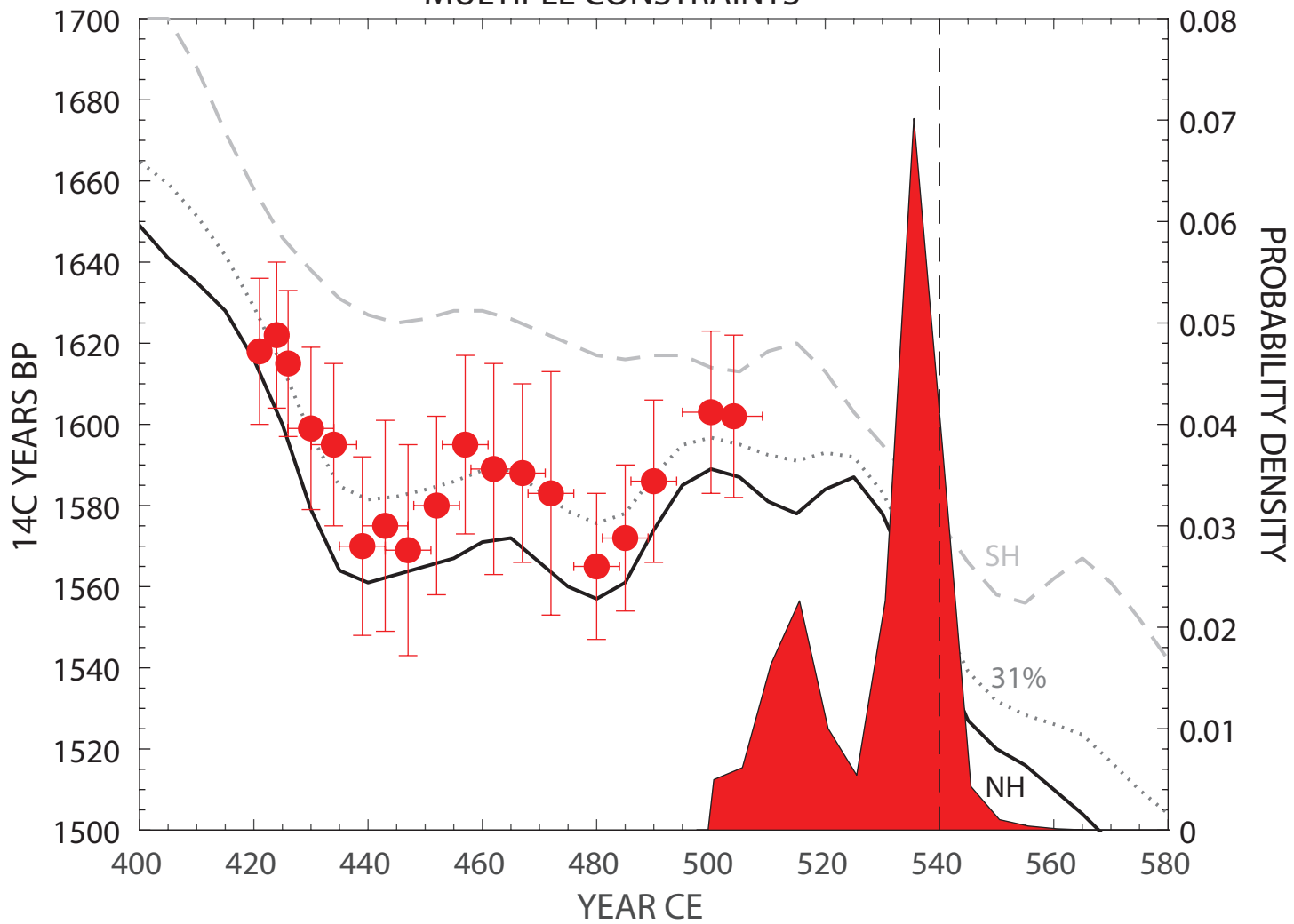
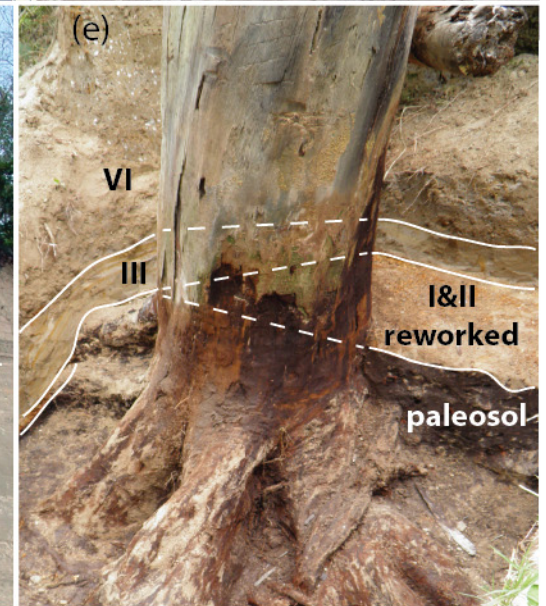
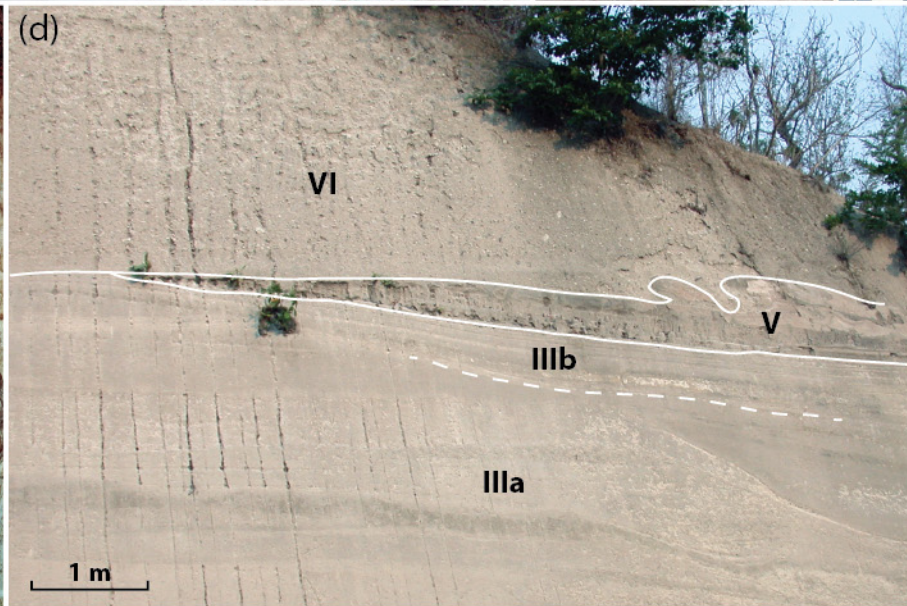
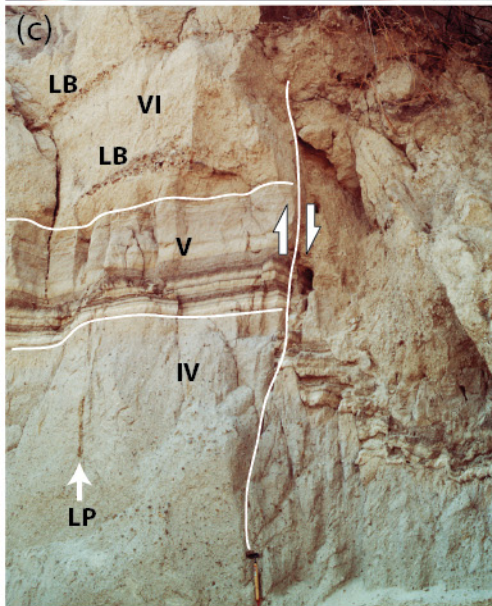
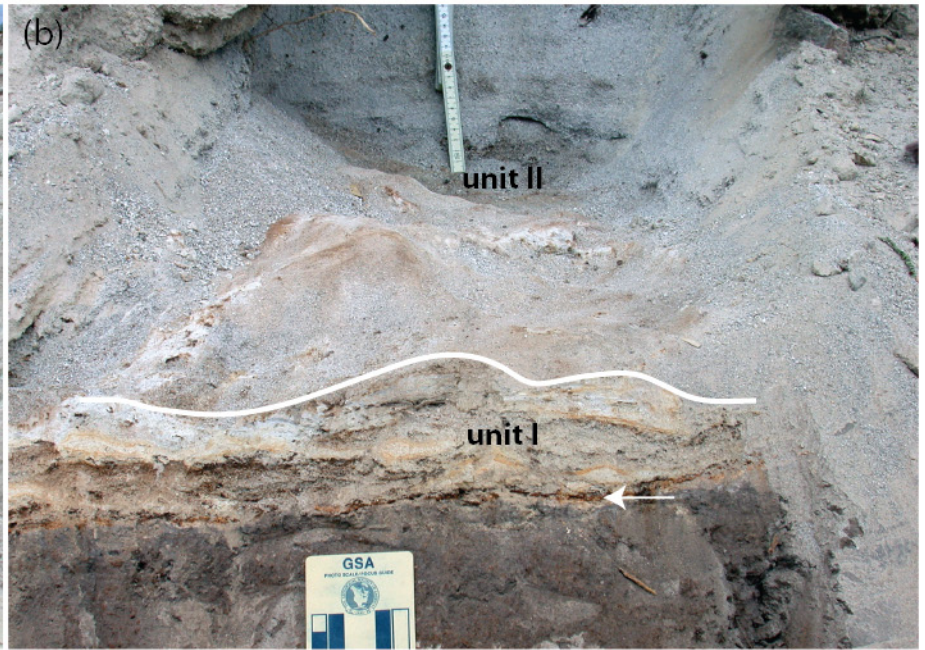
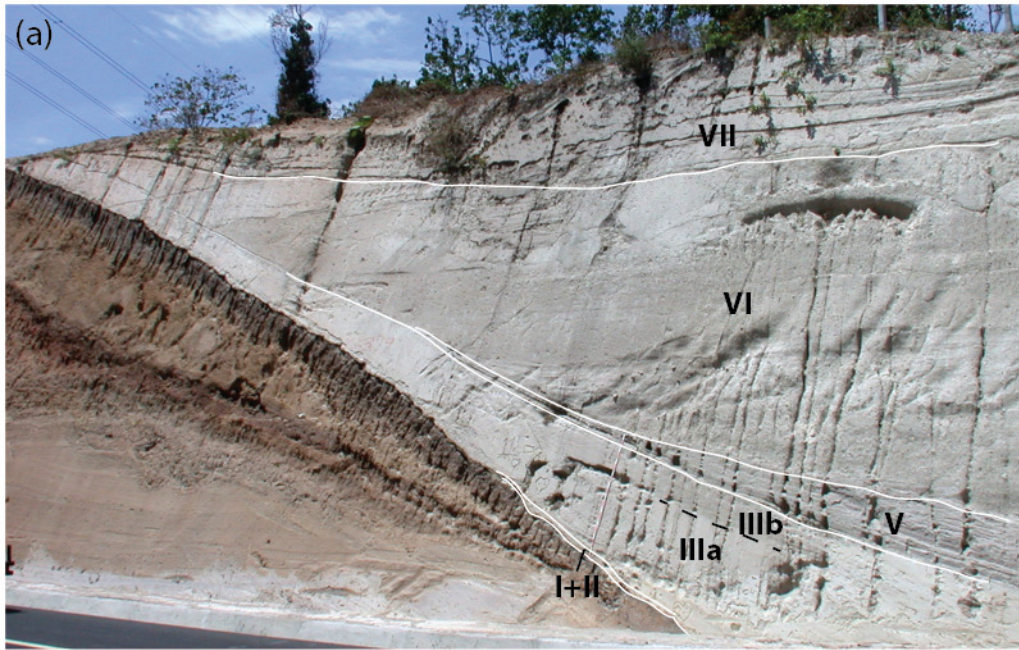
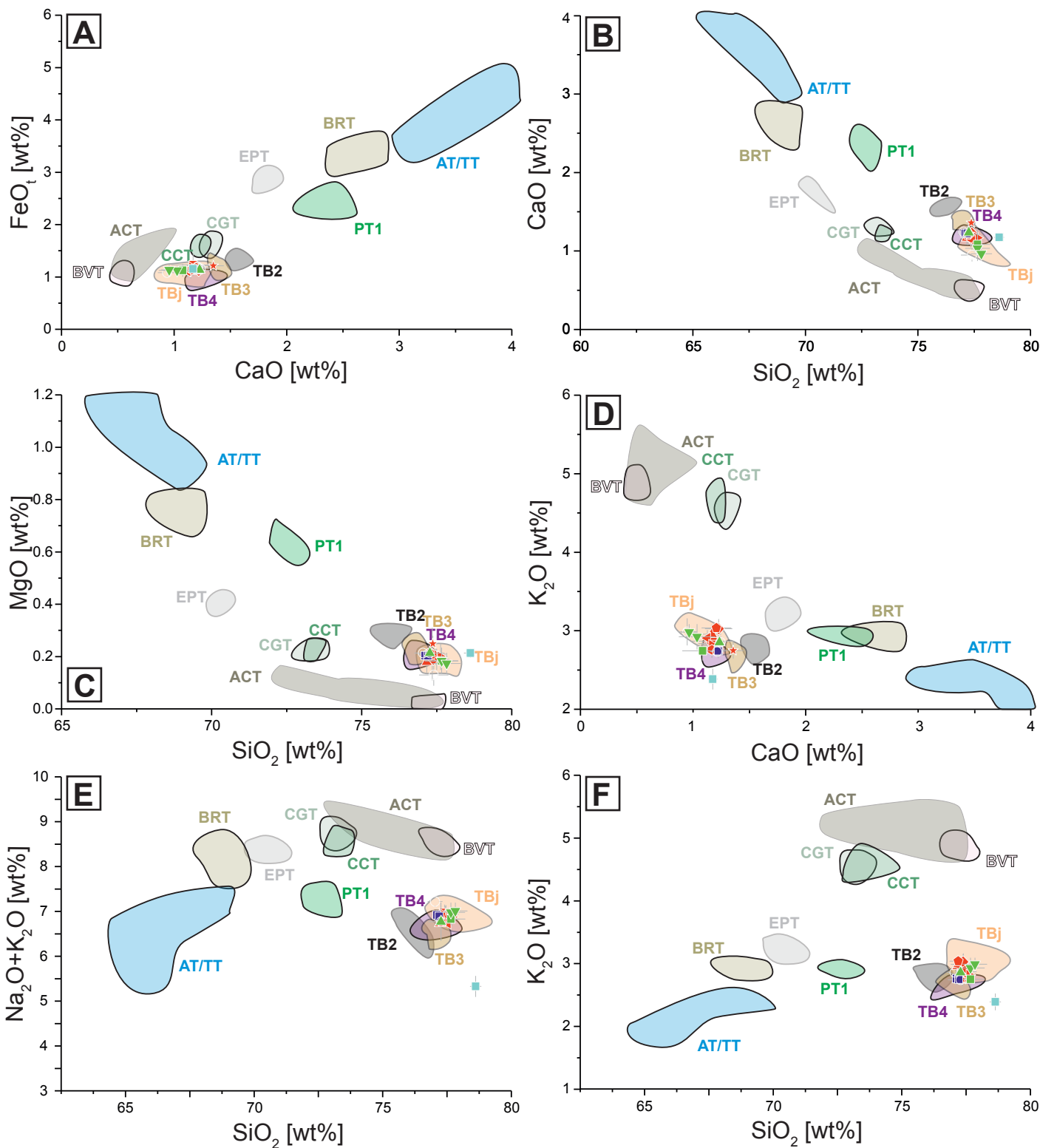


Figure 4. Results of radiocarbon dating, calibration, and Bayesian sequential modeling from three subfossil tree trunks enveloped in TBJ tephra deposits. Gray shaded regions in each plot show the distribution of calibrated ages for the sample prior to Oxcal sequence modeling, while the black shaded region shows the posterior distribution once the order and spacing of the individual samples is included as additional information in the calibration. The red cross in each plot is the weighted median of the posterior distribution. Vertical red dashed lines indicate 536 and 540 CE.

MULTIPLE CONSTRAINTS







marine TBJ tephras

- SO173-11_20-30
- SO173-13_2-10
- ▲ SO173-15_22-25
- ▼ SO173-17_24-31
- ◆ SO173-18_112-115

terrestrial TBJ tephras

- ◀ M66-222_15-17
- ▶ M66-223_0-14
- ◈ M66-226_0-13
- ★ M66-228_0-6
- ◆ M66-229_20-30

El Salvadorian Pliniann eruptions (1.5 - 100 ka)

- Ilopango Caldera (El Salvador)
- Chalcupha (El Salvador)
- ▲ El Trapiche (El Salvador)
- ▼ San Miguel (El Salvador)
- Lago de Yojoa (Honduras)
- Petapilla Pond (Honduras)
- Lake Amatitlan (Guatemala)

Correlation fields El Salvadorian Pliniann eruptions (1.5 - 100 ka)

- BRT= Blanca Rossa , 75 ka
- AT/TT= A- and Twins , 60 ka
- PT1= Pacayal , ~52ka
- TB4= Terra Blanca 4 , 36 ka
- TB3= Terra Blanca 3 , ~15 ka
- TB2= Terra Blanca 2 , ~10 ka
- TBj= Terra Blanca Joven , 1.6 ka
- EPT= Empalisada , ~100ka
- BVT= Bella Vista , 77 ka
- ACT= Arce , 72 ka
- CGT= Congo , 53ka
- CCT= Conacaste , 51 ka

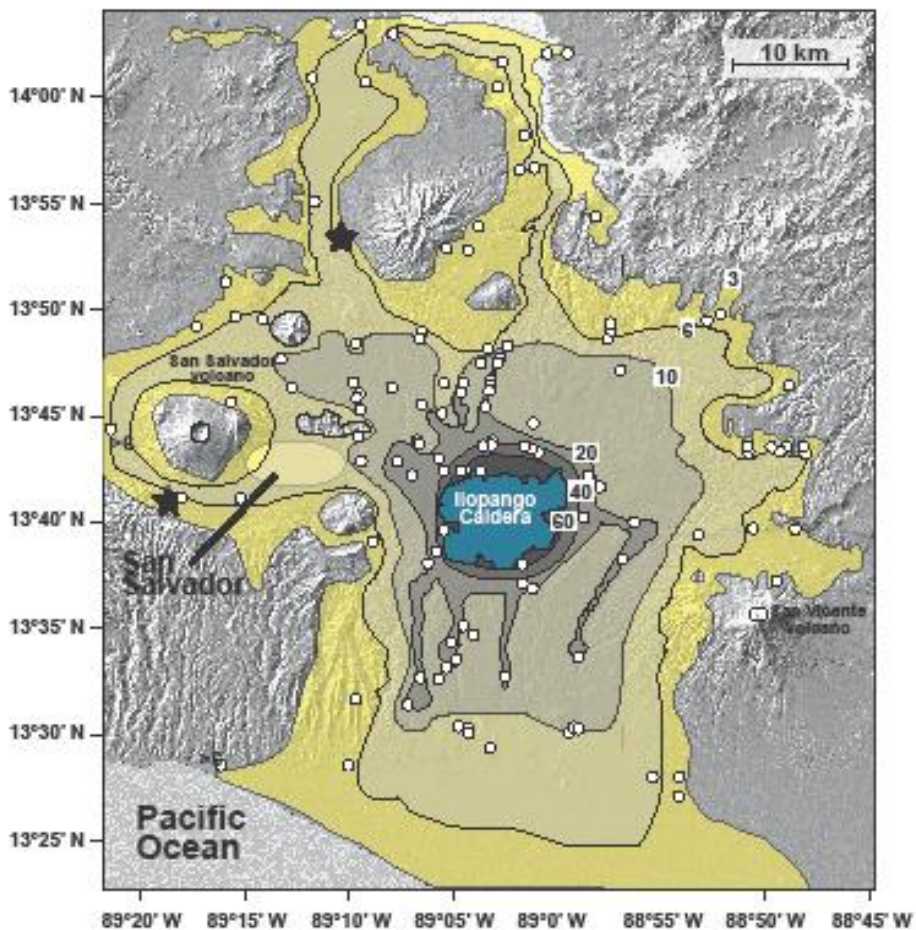


Figure 5. Map of the $\sim 2065 \text{ km}^2$ area adjoining the Ilopango caldera that was affected by pyroclastic density currents. Mapped ignimbrite thicknesses range from 3–60+ m. The two stars indicate the two distal ignimbrite subfossil tree sampling sites, Los Chorros to the southwest of present-day San Salvador and El-Mico to the north of San Salvador. White dots denote field measurements of ignimbrite thickness. Units of thickness are in meters.

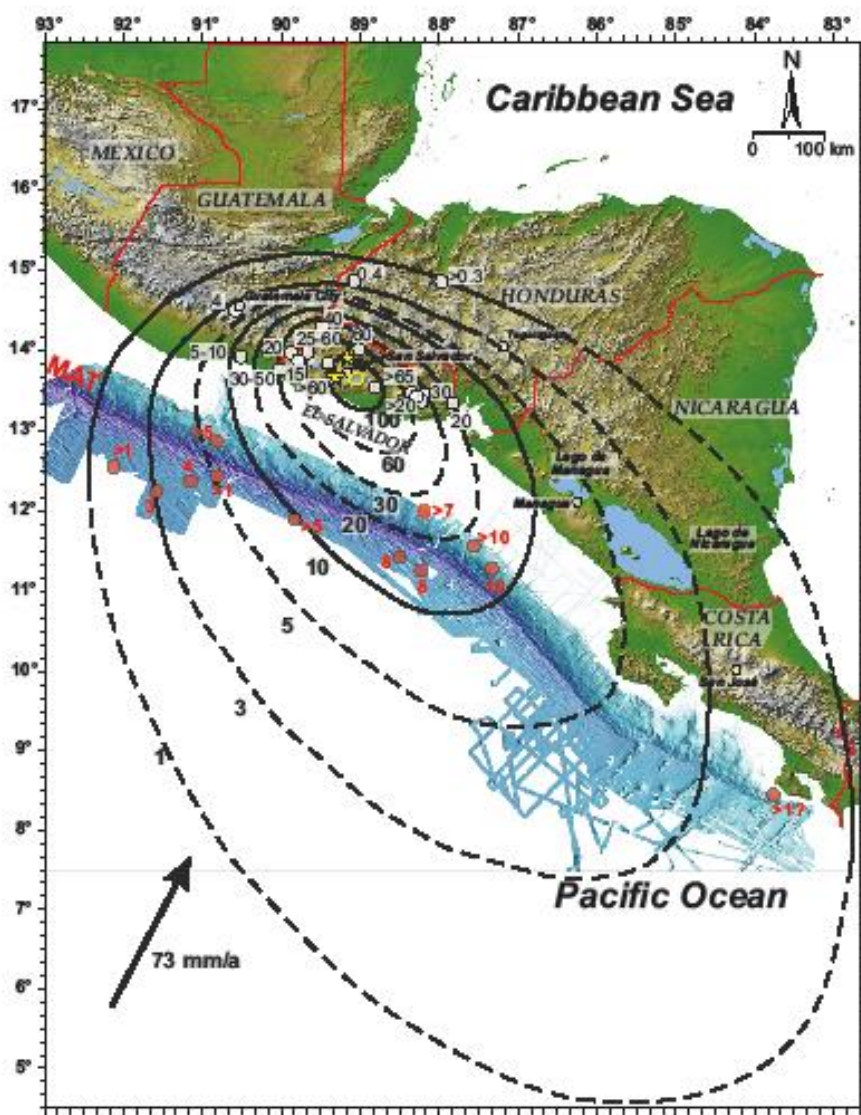


Figure 6. Isopach map for Ilopango's TBJ tephra fall deposits, showing terrestrial (white dots) and marine (red dots) sites where thickness was recorded (units in meters). The dominant trajectory of the tephra plume and resulting fallout is to the southeast of Ilopango caldera, running roughly parallel to and astride the Middle American Trench (MAT). The two yellow stars are the subfossil tree sampling sites.

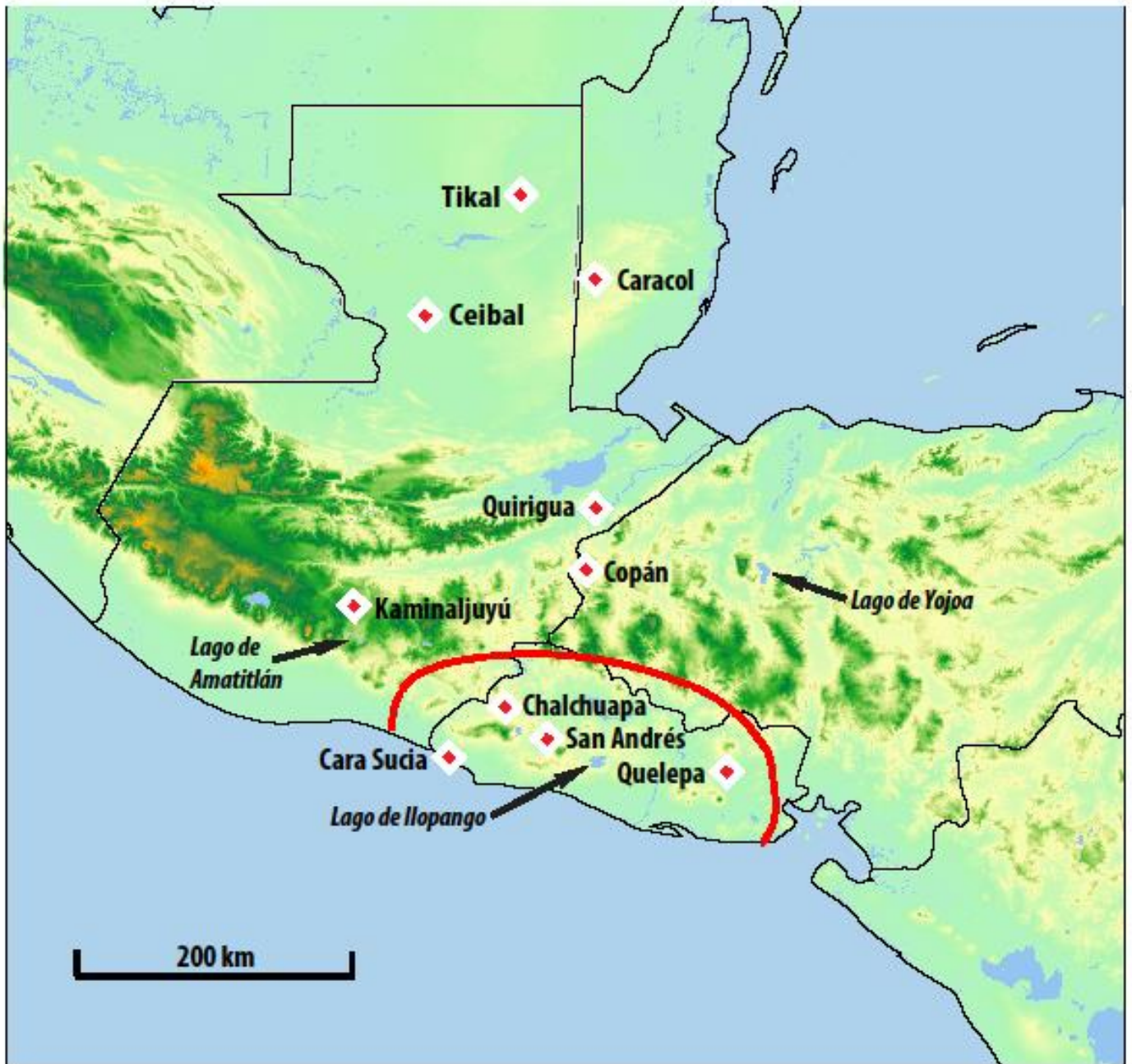


Figure 7. Map of the devastated southeastern periphery of the Maya Realm (red dashed-line ellipse), where four major archaeological sites in El Salvador were abandoned within the zone of demographic collapse that spread over an area of $\sim 20,000$ km² following Ilopango's TBJ eruption due to the emplacement of deep (>35 cm) deposits of tephra fallout.

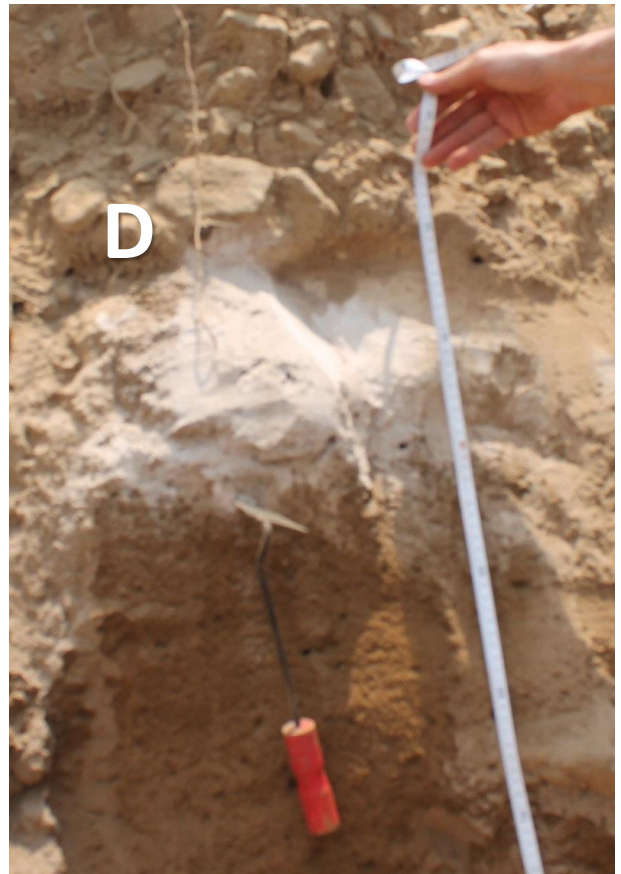
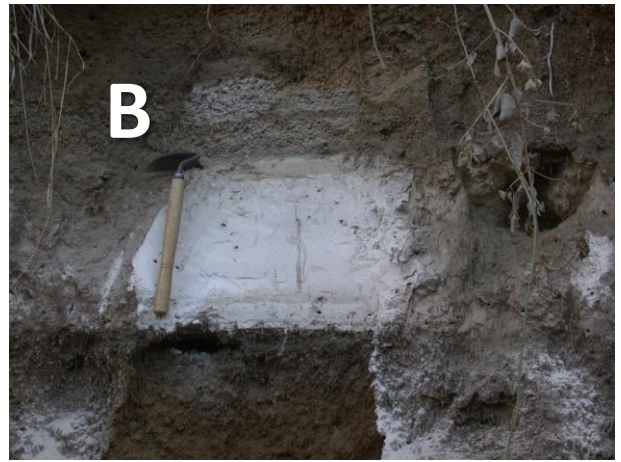


Fig. 8. Ilopango TBJ tephra deposits in Eastern El Salvador. A&B) Deposits on flank of San Miguel volcano. C) deposit near La Union. D) deposit near Joya Ancha. Photos courtesy of W.A. and USGS photographs courtesy of C.A. Gardner and W.E. Scott (Gardner et al. 2006).

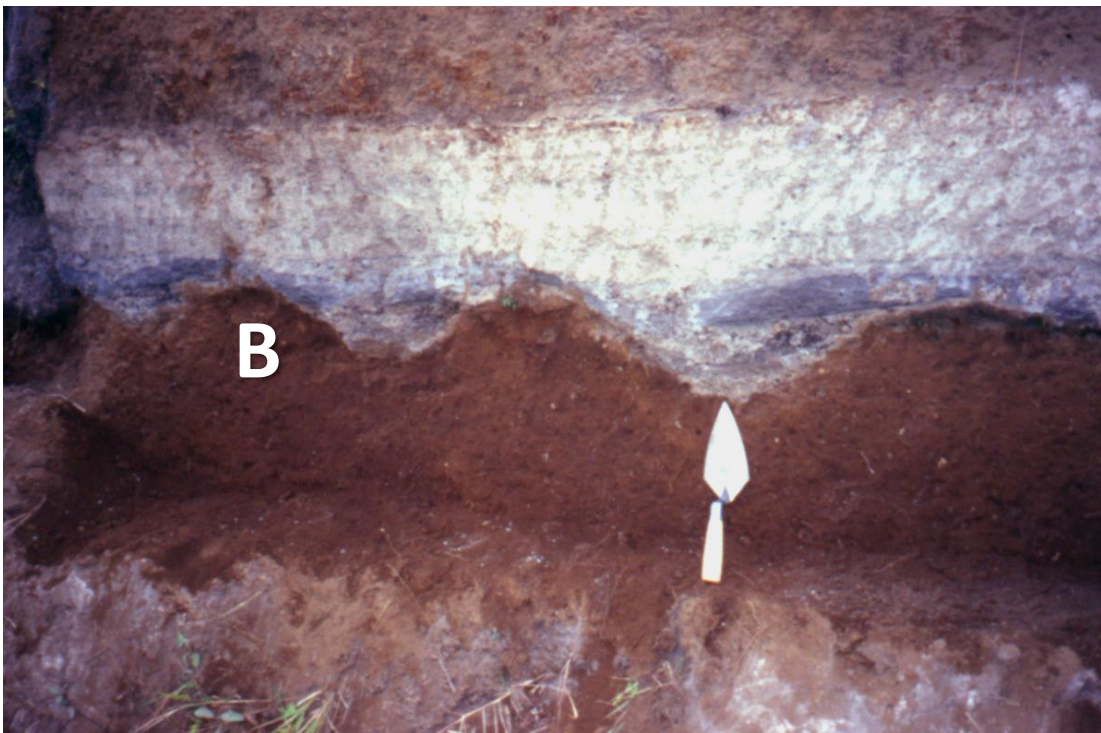


Fig. 9. High performance *milpa* agricultural fields buried under:
A) the ca. 540 CE Ilopango tephra; and B) the ca. 830 BCE Cuzcátan
(Plan de la Laguna) tephra. Photos courtesy of S.K. and R.D.

Table S1 (a). Uncalibrated 14C ages for El Mico-A tree

| UCIAMS # | SAMPLE CODE | ¹⁴ C AGE (years BP) | ± |
|----------|-------------|--------------------------------|----|
| 118184 | EMA01 | 1610 | 15 |
| 118521 | EMA01 | 1625 | 15 |
| 119013 | EMA01 | 1620 | 15 |
| 118185 | EMA01-03 | 1615 | 15 |
| 118522 | EMA01-04 | 1645 | 15 |
| 119014 | EMA01-05 | 1605 | 15 |
| 118186 | EMA04-05 | 1610 | 15 |
| 118523 | EMA04-06 | 1620 | 15 |
| 119015 | EMA04-07 | 1615 | 15 |
| 118187 | EMA06-10 | 1600 | 15 |
| 118524 | EMA06-11 | 1615 | 20 |
| 119016 | EMA06-12 | 1590 | 15 |
| 118188 | EMA11-15 | 1590 | 15 |
| 118525 | EMA11-15 | 1605 | 15 |
| 119017 | EMA11-15 | 1585 | 20 |
| 118189 | EMA16-20 | 1575 | 15 |
| 119018 | EMA16-20 | 1565 | 15 |
| 118190 | EMA21-25 | 1585 | 20 |
| 119019 | EMA21-25 | 1570 | 15 |
| 118191 | EMA26-30 | 1575 | 20 |
| 119020 | EMA26-30 | 1565 | 15 |
| 118192 | EMA31-35 | 1590 | 15 |
| 119021 | EMA31-35 | 1570 | 15 |
| 118204 | EMA36-40 | 1585 | 15 |
| 119022 | EMA36-40 | 1605 | 15 |
| 118194 | EMA41-45 | 1580 | 15 |
| 119024 | EMA41-45 | 1605 | 20 |
| 118195 | EMA46-50 | 1580 | 15 |
| 119025 | EMA46-50 | 1595 | 15 |
| 118196 | EMA51-55 | 1585 | 20 |
| 119026 | EMA51-55 | 1580 | 20 |
| 118197 | EMA56-60 | 1575 | 15 |
| 118526 | EMA56-60 | 1560 | 15 |
| 119027 | EMA56-60 | 1560 | 15 |
| 118198 | EMA61-65 | 1575 | 15 |
| 118527 | EMA61-65 | 1570 | 15 |
| 119028 | EMA61-65 | 1570 | 15 |
| 118199 | EMA66-70 | 1570 | 15 |
| 118528 | EMA66-70 | 1595 | 15 |
| 119029 | EMA66-70 | 1600 | 20 |
| 118200 | EMA71A | 1605 | 20 |
| 118529 | EMA71A | 1615 | 15 |
| 119030 | EMA71A | 1590 | 15 |
| 118201 | EMA71B | 1600 | 15 |
| 118530 | EMA71B | 1605 | 15 |
| 119031 | EMA71B | 1600 | 20 |

Table S1 (b). Uncalibrated 14C ages for El Mico-B tree

| UCIAMS # | SAMPLE CODE | ¹⁴ C AGE (years BP) | ± |
|----------|-------------|--------------------------------|----|
| 117861 | EMB-L | 1635 | 15 |
| 117863 | EMB-L | 1595 | 15 |
| 118536 | EMB-L | 1625 | 15 |
| 118541 | EMB-L | 1630 | 20 |
| 119182 | EMB-L | 1615 | 15 |
| 119189 | EMB-L | 1615 | 15 |
| 117860 | EMB-J | 1560 | 15 |
| 118535 | EMB-J | 1600 | 15 |
| 118540 | EMB-J | 1580 | 15 |
| 119181 | EMB-J | 1585 | 15 |
| 119188 | EMB-J | 1590 | 15 |
| 117859 | EMB-H | 1580 | 15 |
| 119180 | EMB-H | 1590 | 15 |
| 119187 | EMB-H | 1605 | 15 |
| 117858 | EMB-G | 1595 | 15 |
| 119179 | EMB-G | 1590 | 15 |
| 117857 | EMB-F | 1590 | 15 |
| 119178 | EMB-F | 1595 | 15 |
| 117856 | EMB-E | 1580 | 20 |
| 119177 | EMB-E | 1575 | 15 |
| 117855 | EMB-D | 1600 | 15 |
| 119176 | EMB-D | 1565 | 15 |
| 117853 | EMB-C | 1580 | 15 |
| 117854 | EMB-C | 1615 | 15 |
| 118534 | EMB-C | 1620 | 15 |
| 118539 | EMB-C | 1625 | 15 |
| 119175 | EMB-C | 1600 | 15 |
| 119186 | EMB-C | 1575 | 15 |
| 118533 | EMB-B | 1585 | 15 |
| 118538 | EMB-B | 1570 | 15 |
| 119174 | EMB-B | 1580 | 15 |
| 119185 | EMB-B | 1585 | 15 |
| 117852 | EMB-A | 1555 | 15 |
| 117862 | EMB-A | 1545 | 15 |
| 118532 | EMB-A | 1585 | 20 |
| 118537 | EMB-A | 1580 | 15 |
| 119173 | EMB-A | 1560 | 15 |
| 119184 | EMB-A | 1585 | 15 |

Table S1 (c). Uncalibrated 14C ages for Los Chorros tree

| UCIAMS # | SAMPLE CODE | ¹⁴ C AGE (years BP) | ± |
|----------|-------------|--------------------------------|----|
| 68282 | LOC17-18H | 1615 | 15 |
| 68281 | LOC17-18C | 1580 | 15 |
| 69057 | LOC14-15S | 1605 | 15 |
| 69051 | LOC14-15R | 1600 | 15 |
| 68280 | LOC12-13H | 1605 | 15 |
| 68279 | LOC12-13C | 1580 | 15 |
| 69056 | LOC08-09S | 1580 | 15 |
| 69050 | LOC08-09R | 1595 | 15 |
| 68278 | LOC06-07H | 1580 | 15 |
| 68277 | LOC06-07C | 1580 | 20 |
| 69055 | LOC03-04S | 1575 | 15 |
| 69049 | LOC03-04R | 1590 | 15 |
| 68276 | LOC01-02H | 1580 | 15 |
| 68275 | LOC01-02C | 1600 | 15 |
| 69054 | LOC0-1S | 1565 | 15 |
| 69048 | LOC0-1R | 1575 | 20 |

Table S2. Results of Laser ICP-MS analyses of matrix glass used to geochemically fingerprint TBJ tephra. S2a terrestrial tephra samples were analyzed at the USGS Tephrochronology Project Laboratory in Menlo Park, CA. S2b marine tephra samples were analyzed at GEOMAR, Helmholtz Center for Ocean Research, Kiel, Germany.

| S2a: Tierra Blanca Joven Tephra Chemical Compositions – Terrestrial | | | | | | | | | | | |
|---|-------------------|-----------------|--------------------------------|------------------|------------------|-----------------|------------------|-----------------|------------------|----------------|-----|
| Terrestrial | Na ₂ O | MgO | Al ₂ O ₃ | SiO ₂ | K ₂ O | CaO | TiO ₂ | MnO | FeO _t | Alkalis | (n) |
| Ilopango Caldera | 4.101 (0.13) | 0.181 (0.03) | 12.919 (0.39) | 77.657 (0.55) | 2.743 (0.12) | 1.076 (0.18) | 0.149 (0.05) | 0.055 (0.03) | 1.118 (0.12) | 6.84 (0.12) | 20 |
| Lago de Yojoa, Honduras | 4.183 (0.13) | 0.201 (0.02) | 13.143 (0.09) | 77.108 (0.13) | 2.748 (0.10) | 1.224 (0.05) | 0.175 (0.02) | 0.087 (0.03) | 1.132 (0.06) | 6.93 (0.12) | 18 |
| Lago de Yojoa, Honduras | 4.159 (0.15) | 0.203 (0.01) | 13.081 (0.10) | 77.196 (0.14) | 2.738 (0.08) | 1.216 (0.03) | 0.184 (0.03) | 0.079 (0.04) | 1.144 (0.06) | 6.90 (0.12) | 17 |
| Chalchuapa, El Salvador | 4.381 (0.12) | 0.208 (0.02) | 12.882 (0.21) | 77.035 (0.28) | 2.848 (0.08) | 1.235 (0.03) | 0.167 (0.03) | 0.090 (0.04) | 1.153 (0.07) | 7.23 (0.11) | 26 |
| Petapilla Pond, Honduras | 4.055 (0.41) | 0.212 (0.02) | 13.065 (0.25) | 77.268 (0.48) | 2.729 (0.07) | 1.211 (0.06) | 0.192 (0.06) | 0.079 (0.03) | 1.188 (0.07) | 6.78 (0.42) | 18 |
| El Trapiche, El Salvador | 3.931 (0.11) | 0.206 (0.01) | 13.147 (0.06) | 77.270 (0.14) | 2.846 (0.06) | 1.226 (0.03) | 0.183 (0.03) | 0.061 (0.03) | 1.129 (0.06) | 6.78 (0.13) | 19 |
| Lake Amatitlan, Guatemala | 2.955 (0.15) | 0.207 (0.01) | 13.275 (0.11) | 78.622 (0.21) | 2.382 (0.13) | 1.166 (0.04) | 0.181 (0.02) | 0.065 (0.02) | 1.148 (0.07) | 5.34 (0.23) | 19 |
| San Miguel, El Salvador | 4.070 (0.19) | 0.177 (0.05) | 12.758 (0.39) | 77.656 (0.54) | 2.923 (0.16) | 1.032 (0.16) | 0.184 (0.03) | 0.080 (0.03) | 1.121 (0.08) | 6.99 (0.21) | 31 |
| San Miguel, El Salvador | 4.049 (0.18) | 0.165 (0.04) | 12.642 (0.25) | 77.831 (0.46) | 2.976 (0.10) | 0.956 (0.07) | 0.185 (0.03) | 0.070 (0.02) | 1.128 (0.10) | 7.02 (0.18) | 36 |
| S2b: Tierra Blanca Joven Tephra Chemical Compositions - Marine | | | | | | | | | | | |
| Marine | Na ₂ O | MgO | Al ₂ O ₃ | SiO ₂ | K ₂ O | CaO | TiO ₂ | MnO | FeO _t | Alkalis | (n) |
| SO173-11/20-30 | 3.94 (0.09) | 0.19 (0.04) | 12.78 (0.21) | 77.51 (0.41) | 2.87 (0.15) | 1.18 (0.19) | 0.18 (0.10) | n/a | 1.23 (0.21) | 6.81 (0.11) | 10 |
| SO173-13/2-10 | 3.93 (0.14) | 0.13 (0.04) | 13.26 (0.33) | 77.41 (0.48) | 2.99 (0.17) | 0.95 (0.08) | 0.14 (0.09) | n/a | 1.08 (0.08) | 6.92 (0.20) | 21 |
| SO173-15/22-25 | 3.76 (0.06) | 0.18 (0.04) | 13.29 (0.15) | 77.18 (0.17) | 2.96 (0.12) | 1.17 (0.08) | 0.20 (0.08) | n/a | 1.11 (0.08) | 6.72 (0.07) | 16 |
| SO173-17/24-31 | 4.14 (0.16) | 0.21 (0.10) | 12.85 (0.32) | 77.36 (0.45) | 2.84 (0.13) | 1.16 (0.11) | 0.18 (0.10) | n/a | 1.13 (0.16) | 6.98 (0.15) | 40 |
| SO173-18/112-115 | 3.87 (0.14) | 0.19 (0.02) | 12.86 (0.17) | 77.40 (0.24) | 3.03 (0.12) | 1.23 (0.12) | 0.20 (0.07) | n/a | 1.12 (0.09) | 6.90 (0.20) | 20 |
| M66-222/15-17 | 3.81 (0.21) | 0.20 (0.03) | 13.08 (0.19) | 77.48 (0.21) | 2.91 (0.10) | 1.13 (0.05) | 0.15 (0.09) | n/a | 1.11 (0.12) | 6.72 (0.07) | 12 |
| M66-223/0-14 | 4.04 (0.12) | 0.20 (0.05) | 12.67 (0.22) | 77.64 (0.22) | 2.82 (0.16) | 1.17 (0.12) | 0.16 (0.10) | n/a | 1.18 (0.06) | 6.86 (0.19) | 10 |
| M66-226/0-13 | 4.05 (0.14) | 0.21 (0.02) | 12.99 (0.16) | 77.37 (0.21) | 2.76 (0.10) | 1.17 (0.08) | 0.16 (0.09) | n/a | 1.14 (0.09) | 6.82 (0.15) | 24 |
| M66-228/0-6 | 4.14 (0.14) | 0.25 (0.03) | 12.67 (0.17) | 77.38 (0.15) | 2.75 (0.10) | 1.36 (0.09) | 0.15 (0.10) | n/a | 1.21 (0.06) | 6.89 (0.20) | 15 |
| M66-229/20-30 | 3.88 (0.22) | 0.21 (0.01) | 13.05 (0.23) | 77.21 (0.33) | 3.04 (0.05) | 1.21 (0.13) | 0.11 (0.04) | n/a | 1.17 (0.10) | 6.91 (0.26) | 17 |