[Supplementary material]

Human responses to the Ilopango Tierra Blanca Joven eruption: excavations at San Andrés, El Salvador

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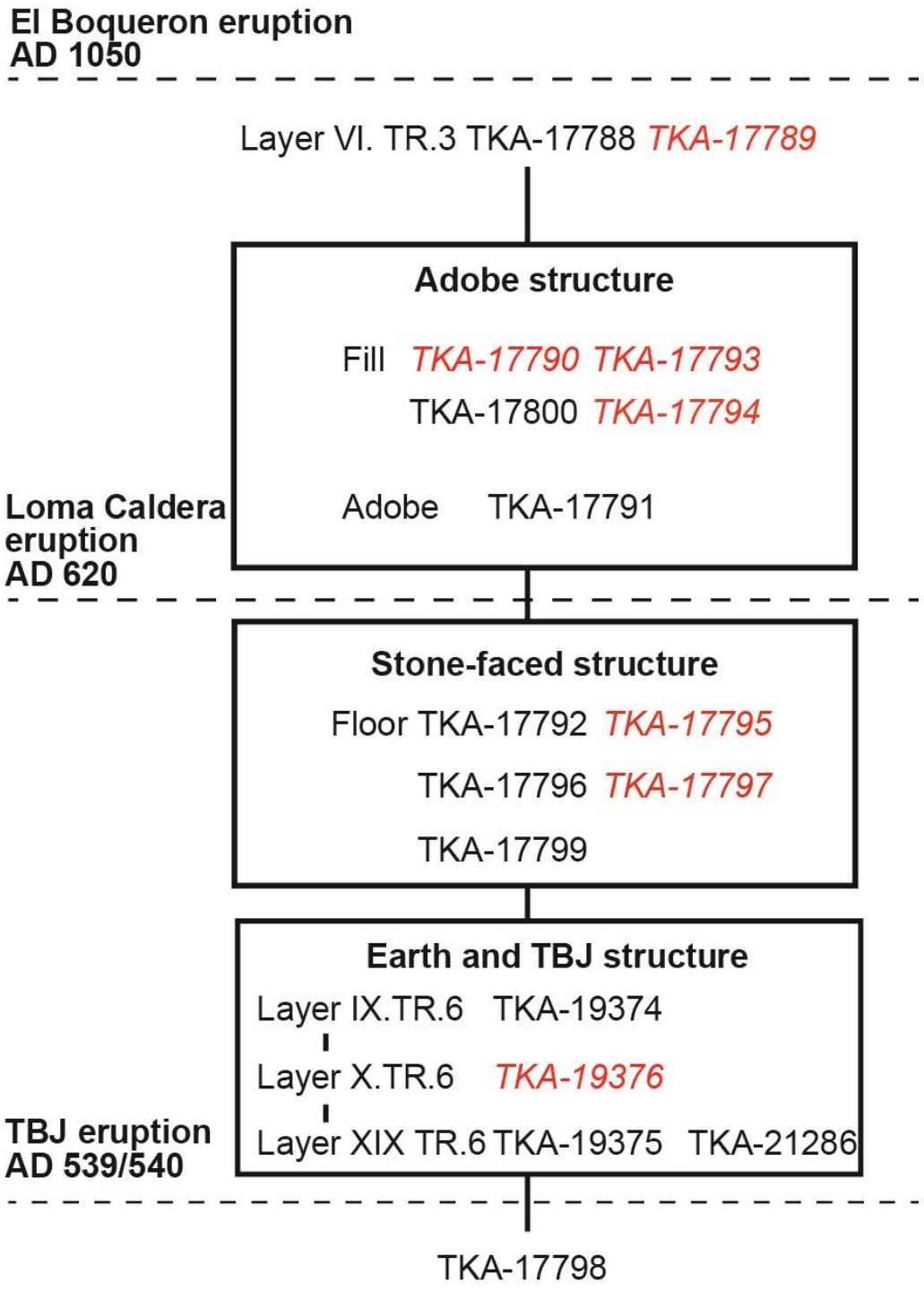

Figure S1. Stratigraphic sequence at the Campana structure (red colour indicates the outlier sample) (figure by A. Ichikawa).

OxCal code (Oxcal v.4.4.2)

The agreement indices are necessary above 60 per cent (Bronk Ramsey 2009: 125). The following code has good agreement indices; $A_{model} = 97.4\%$, $A_{overall} = 98.7\%$:

```
Plot()
 {
  Outlier_Model("General",T(5),U(0,4),"t");
  Comment("San Andres");
  Sequence("Campana")
  {
   Boundary("Campana");
   R_Date("TKA-17798_Layer_XIX_TR.3", 1613, 15)
   {
    Outlier(0.05);
   };
   Date("TBJ", U(539, 540));
   Sequence("Earth-TBJ_Structure")
   {
    Boundary("Start_Earth-TBJ");
    Phase("Phase_Earth-TBJ")
    {
     R_Date("TKA-19375_Layer_XIX_TR.6", 1545, 19)
     {
      Outlier(0.05);
```

```
    };
    R_Date("TKA-21286_TBJ_redeposit_TR.11",  1510, 20)
    {
      Outlier(0.05);
    };
    R_Date("TKA-19376_Layer_X_TR.6",  1474, 20)
    {
      Outlier();
    };
    R_Date("TKA-19374_Layer_IX_TR.6",  1554, 19)
    {
      Outlier(0.05);
    };
  };
  Boundary("End_Earth-TBJ");
};
Boundary("Transition_Earth-TBJ/Stone-faced");
Phase("Stone-faced_Structure")
{
  R_Date("TKA-17795_On_floor_TR.3",  2114, 22)
  {
    Outlier();
  };
  R_Date("TKA-17797_On_floor_TR.3",  2110, 22)
```

```
  {
   Outlier();
  };
  R_Date("TKA-17792_On_floor_TR.3",  1509, 15)
  {
   Outlier(0.05);
  };
  R_Date("TKA-17799_On_floor_TR.3",  1506, 15)
  {
   Outlier(0.05);
  };
  R_Date("TKA-17796_On_floor_TR.3",  1480, 15)
  {
   Outlier(0.05);
  };
};
Boundary("LC");
Sequence("Adobe_Structure")
{
  Boundary("Start_Adobe_Structure");
  Phase("Construction_Fill")
  {
   R_Date("TKA-17791_TR.3_Adobe",  1332, 15)
    {
```

```
    Outlier(0.05);
    };
    R_Date("TKA-17794_TR.3",  2140, 15)
    {
      Outlier();
    };
    R_Date("TKA-17790_TR.3",  1477, 15)
    {
      Outlier();
    };
    R_Date("TKA-17800_TR.3",  1413, 18)
    {
      Outlier(0.05);
    };
    R_Date("TKA-17793_TR.3",  1135, 15)
    {
      Outlier();
    };
  };
  Boundary("End_Adobe_Structure");
};
Boundary("End_Architecture  complex");
Boundary("Start_Possible_Decline_Period");
Phase("Possible_Decline_Period")
```

```
  {
    R_Date("TKA-17788_layer_VI_TR.3",  885, 20)
    {
      Outlier(0.05);
    };
  };
  Boundary("End_Possible_Decline_Period");
  Boundary("End_Campana");
};
Line();
Sequence("Loma_Caldera_eruption")
{
  Tau_Boundary("Start_Loma_Caldera_eruption");
  Phase("Ceren")
  {
    R_Date("TX6600",  1520, 70)
    {
      Outlier(0.05);
    };
    R_Date("ELS-40",  1440, 135)
    {
      Outlier();
    };
    R_Date("TX3119A",  1420, 50)
```

```
 {
  Outlier(0.05);
 };
 R_Date("A-10743",  1360, 50)
 {
  Outlier(0.05);
 };
 R_Date("TX6601",  1350, 90)
 {
  Outlier(0.05);
 };
 R_Date("TX3113A",  1330, 90)
 {
  Outlier(0.05);
 };
 R_Date("TX3120",  1510, 390)
 {
  Outlier();
 };
 R_Date("AA105791",  1419, 25)
 {
  Outlier(0.05);
 };
};
```

```
    Boundary("=LC");
  };
};
```

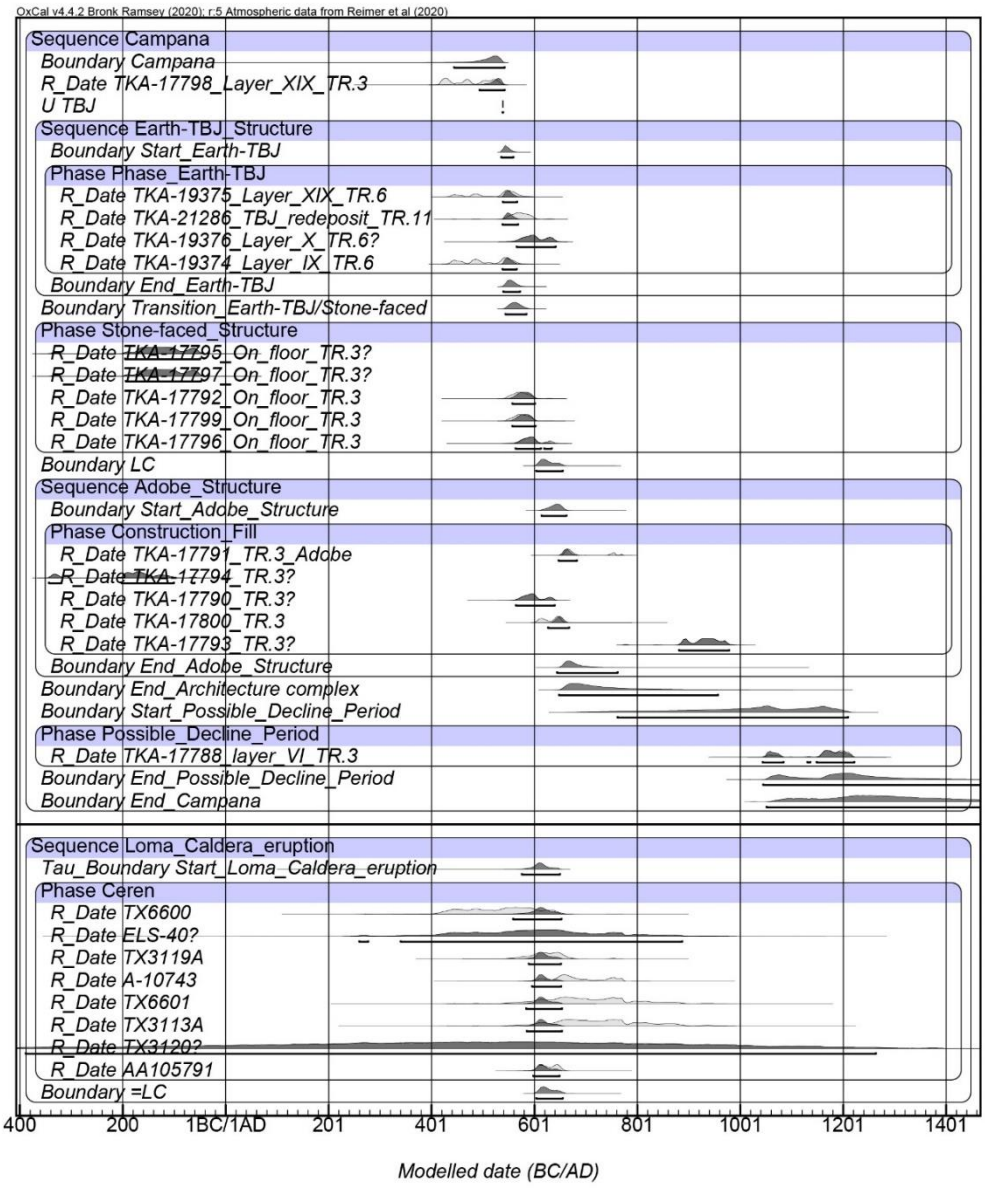

Figure S2. Results of Bayesian analysis of radiocarbon dates obtained from San Andrés and Cerén (including outlier data, indicated in italics with the symbol "?") (dates modelled in OxCal v4.4.2 using the IntCal20 atmospheric curve (Bronk Ramsey 2020; Reimer et al*. 2020) (figure by A. Ichikawa).*

Table S1. Description of excavated area at San Andrés during 2015–2019 field seasons.

No.	Location	Dimension (m^2)	Total depth (m)	Thickness of TBJ tephra (m)	Thickness of LC tephra (m)
Trench 1	West side of Campana platform	8	4.45	0.35–0.40	–
Trench 2	East side of Mound B	27	3.25	0.45	–
Trench 3	West side of Campana platform	72	2.02	0.52	0.20
Trench 4	West side of Campana pyramidal structure	12	2.9	–	–
Trench 5	On Campana platform	15	5.26	–	–
Trench 6	Centre line of Campana pyramidal structure	12	8	0.16	0.30
Trench 7	West side of rectangular platform	8	3.36	0.03	–
Trench 8	West side of Structure 6	298	3.84	0–0.10	0.20
Trench 9	East side of Structure 10	12	3.7	0.20	0.03
Trench 10	East side of Structure 9	8	2.22	0.30	0.22
Trench 11	West side of Campana platform	61	3.8	0.5–0.12	0.26
Trench 12	West side of Campana platform	8	3.66	0.40	0.20
Trench 13	North side of Campana platform	16	3.86	0.16	0.16
Trench 14	East side of Camapana platform	14	5.42	–	0.20
Pit 1	North side of North Plaza	4	1.04	0.20	–
Pit 2	Centre of North Plaza	40	1.06	–	–
Pit 3	South side of North Plaza	4	3.2	0.46	0.05–0.06
Pit 4	Southeast side of Mound A	8	2.2	0.10–0.20	–

Pit 5	Southeast side of Mound A	4	0.9	–	–

Table S2. Calibrated radiocarbon dates from the Campana structure at San Andrés and Cerén.

Lab. number	Context description	Sample types	$\delta^{13}C$ (‰)	Radiocarbon date (yr BP)	Unmodelled calibrated date (2σ 95.4 %)	Modelled calibrated date (2σ=95.4 %)
Campana structure (Str. 5), San Andrés						
TKA-17788	Str. 5, Tr. 3, layer VI	Charcoal	−28.1	885±20	Cal AD 1050–1220	Cal AD 1045–1220
TKA-17789*	Str. 5, Tr. 3, layer VI	Charcoal	−22.7	127±19	Cal AD 1680–1940	–
TKA-17790*	Str. 5, Tr. 3, Adobe structure (construction fill)	Charcoal	−26.0	1477±15	Cal AD 565–640	–
TKA-17791	Str. 5, Tr. 3, Adobe structure (into adobe)	Charcoal	−21.6	1332±15	Cal AD 655–775	Cal AD 650–685
TKA-17792	Str. 5, Tr. 3, Stone structure (on floor)	Charcoal	−22.5	1509±15	Cal AD 545–600	Cal AD 560–600
TKA-17793*	Str. 5, Tr. 3, Adobe structure (construction fill)	Charcoal	−26.8	1135±15	Cal AD 880–980	–
TKA-17794*	Str. 5, Tr. 3, Adobe structure (construction fill)	Charcoal	−24.5	2140±15	345–60 cal BC	–
TKA-17795*	Str. 5, Tr. 3, Stone-faced structure (on floor)	Charcoal	−25.3	2114±22	195–50 cal BC	–
TKA-17796	Str. 5, Tr. 3, Stone-faced structure (on floor)	Charcoal	−26.0	1480±15	Cal AD 560–640	Cal AD 565–635
TKA-17797*	Str. 5, Tr. 3, Stone-faced structure (on floor)	Charcoal	−22.9	2110±22	195–50 cal BC	–
TKA-17798	Str. 5, Tr. 3, layer XIX, under the TBJ	Charcoal	−22.1	1613±15	Cal AD 415–540	Cal AD 495–545
TKA-17799	Str. 5, Tr. 3, Stone-faced structure (on floor)	Charcoal	−26.9	1506±15	Cal AD 550–600	Cal AD 560–605
TKA-	Str. 5, Tr. 4, layer	Charcoal	−23.3	1413±18	Cal AD	Cal AD 625–

17800	IV, Adobe structure (construction fill)				605–655	670
TKA-19374	Str. 5, Tr. 6, layer IX	Charcoal	−24.4	1554±19	Cal AD 435–570	Cal AD 540–565
TKA-19375	Str. 5, Tr. 6, layer XIX	Charcoal	−21.9	1545±19	Cal AD 435–585	Cal AD 540–565
TKA-19376*	Str. 5, Tr. 6, layer X	Charcoal	−26.2	1474±20	Cal AD 565–640	–
TKA-21286	Str. 5, Tr. 11 TBJ redeposit	Charcoal	−29.8	1510±20	Cal AD 540–605	Cal AD 540–570
Cerén (McKee 2002: 7; Sheets 1983: 7: Slotten 2015: 72)						
TX3113A	Str. 1	Grass thatch	–	1330±90	Cal AD 560–940	Cal AD 585–655
TX6601	Str. 2	Grass thatch	–	1350±90	Cal AD 540–890	Cal AD 585–655
A-10743	Str. 1	Grass thatch	–	1360±50	Cal AD 600–775	Cal AD 595–655
TX3119A	Str. 1	Wooden Post	–	1420±50	Cal AD 550-–755	Cal AD 590–652
ELS-40*	Str. 1	Grass thatch	–	1440±135	Cal AD 260–890	–
TX6600	Str. 3	Grass thatch	–	1520±70	Cal AD 420–650	Cal AD 560–655
TX3120*	Str. 1	Wooden Post	–	1510±390	390 cal BC–Cal AD 1255	–
AA105791	-	Achene	–	1419±25	Cal AD 600–660	Cal AD 600–650

* Outliers, which are not included in the Bayesian modelling.

Table S3. Minimum estimates in years for the Campana structure and per-capita labour cost.

Size of workforce	Work-year				Per capita labour costs (d-p)
	30 days	60 days	90 days	120 days	
100	53	27	18	13	1600
250	21	11	7	5	640
500	11	5	4	3	320
1000	5	3	2	1	160
1500	4	2	1.2	0.9	107

References

BRONK RAMSEY, C. 2020. Oxcal v.4.4.2. Released 2020 August 19. Oxford Radiocarbon Accelerator Unit (ORAU). Available at: http://c14.arch.ox.ac.uk (accessed 30 December 2020).

REIMER, P.J. *et al*. 2020. The IntCal20 northern hemisphere radiocarbon age calibration curve (0–55 cal kBP). *Radiocarbon* 62: 725–57. https://doi.org/10.1017/RDC.2020.41