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Supplement of

The conflict between sampling resolution and stratigraphic constraints from a Bayesian perspective: OSL and radiocarbon case studies

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Table of contents

1. **Table S1.** All OSL data used in this study. These ages were originally published by Stevens et al. (2018; see main text for details).

Sample	Depth (cm)	Dose (Gy)	Dose rate (Gy.ka^{-1})	Age (ka)
D38133	200	37.8 ± 1.0	2.48 ± 0.12	15 ± 1
D38134	210	38.3 ± 1.6	2.53 ± 0.13	15 ± 1
D38135	220	39.2 ± 1.6	2.74 ± 0.14	14 ± 1
D38136	230	38.5 ± 0.6	2.69 ± 0.14	14 ± 1
D38137	240	38.0 ± 1.5	2.75 ± 0.14	14 ± 1
D38138	250	38.8 ± 1.1	2.54 ± 0.13	15 ± 1
D38139	260	40.6 ± 1.2	2.53 ± 0.13	15± 1
D38140	270	37.8 ± 1.6	2.60 ± 0.13	15 ± 1
D38141	280	35.8 ± 0.8	2.66 ± 0.14	13 ± 1
D38142	290	38.6 ± 1.2	2.86 ± 0.17	14 ± 1

2. **Table S2.** All radiocarbon ages used in this study. These ages were originally published by Bayliss et al. (2015; see main text for details).

Sample	Stratigraphic Unit	^{14}C age (years BP)	Calibrated age (95% C.I., years BC)
UCIAMS-103134	4779.F16	7955±25	7037-6699
UCIAMS-98210	4555	7940±30	7035-6691
P-782	Level X	8092±98	7443-6694
OxA-21261	4853	8033±39	7074-6775
OxA-21262	4861	7955±40	7039-6696
UCIAMS-103138	4850.F151	7920±25	7031-6653
OxA-23247	4850.F149	8027±37	7070-6775
OxA-9774	4715	7935±50	7039-6696
OxA-9946	4715	7980±55	7039-6696
UCIAMS-98209	4517.F1 & F2	7990±25	7048-6775
UCIAMS-98208	4517.F7	7965±25	7041-6701
OxA-9947	4822	7985±50	7052-6697
OxA-9775	4826	8090±55	7243-6833
OxA-9948	4826	8090±50	7243-6833
OxA-23523	4828	7931±38	7037-6701
UCIAMS-103135	4828	7970±25	7037-6701
UCIAMS-103141	4869.F3 & F4	7980±25	7045-6706
OxA-23248	4869.F1 & F2	8082±37	7179-6830
OxA-27087	4867.F7	8000±40	7058-6702
UCIAMS-103140	4867.F5 & F6	8025±25	7061-6827
UCIAMS-103139	4865.F3-F5	7970±25	7043-6702
UCIAMS-103136	4836.F571	7940±25	7035-6691
UCIAMS-103137	4837.F12	7965±30	7041-6700
OxA-9949	4848	8050±50	7172-6706
OxA-23249	4878.F397 & F398	8034±35	7066-6776
OxA-9950	5276	8030±50	7128-6701
UCIAMS-109991	5279.F1 & F2	8035±30	7068-6826
UCIAMS-109992	5283.F1 & F2	8030±30	7066-6823
OxA-23250	5283.F3 & F4	8085±36	7180-6831
OxA-9976	5292	7985±55	7053-6696
OxA-23251	5308.F89 & F90	8137±36	7314-7048

UCIAMS-109993	5316.F1 & F2	8160 ±30	7316-7061
OxA-9892	5317	8150±50	7326-7047
OxA-9777	5323	8160±50	7326-7052
UCIAMS-109994	5323.F70 & F71	8210±30	7335-7077
OxA-9778	5324	8210±30	7461-7076
OxA-23252	5328	8199±36	7328-7075
OxA-9893	5329	8155±50	7326-7049
AA-27982	Pre XII.D	8195±80	7471-7047
PL-980525A	Pre XII.D	8390±90	7387,5±201,5

3. OxCal code

```
Plot()
 {
  Phase("")
  {
   Outlier_Model("General",T(5),U(0,4),"t");
   Sequence("Catalhoyuk East")
   {
    Boundary("Start Mound");
    Phase("pre XII.D")
    {
     After("core CH94")
     {
      R_Date("PL-980525A",8390,90);
      Outlier(0.05);
      R_Date("AA-27982",8195,80);
      Outlier(0.05);
     };
     Sequence("(5329)/(5328)/(5327)/(5324)")
     {
      Phase("(5329)")
      {
       R_Date("OxA-9893",8155,50);
       Outlier(0.05);
      };
      Phase("(5328)")
      {
       R_Date("OxA-23252",8199,36);
       Outlier(0.05);
      };
      Phase("(5324)")
      {
       R_Date("OxA-9778",8240,55);
```

```
   Outlier(0.05);
  };
 };
};
Date("pre XII.D/pre XII.C");
Sequence("pre XII.C")
{
 Phase("5323")
 {
  R_Date("UCIAMS-109994",8210,30);
  Outlier(0.05);
  Phase("Plant remains")
  {
   R_Date("OxA-9777",8160,50);
   Outlier(0.05);
  };
 };
 Phase("plant remains")
 {
  R_Date("OxA-9892",8150,50);
  Outlier(0.05);
 };
 R_Date("UCIAMS-109993",8160,30);
 Outlier(0.05);
 R_Date("OxA-23251",8137,36);
 Outlier(0.05);
};
Date("pre XII.C/pre XII.B");
Sequence("pre XII.B")
{
 Phase("plant remains")
 {
  R_Date("OxA-9776",7985,55);
```

```
 Outlier(0.05);
};
Phase("(5283.F3 & F4)")
{
 R_Date("OxA-23250",8085,36);
 Outlier(0.05);
 R_Date("UCIAMS-109992",8030,30);
 Outlier(0.05);
};
R_Date("UCIAMS-109991",8035,30);
Outlier(0.05);
Phase("plant remains")
{
 R_Date("OxA-9950",8030,50);
 Outlier(0.05);
};
R_Date("OxA-23249",8024,35);
Outlier(0.05);
};
Date("pre XII.B/pre XII.A");
Phase("pre XII.A")
{
Sequence("(4848)/(4837)/(4836)")
{
 Phase("(4848)")
 {
  R_Date("OxA-9949",8050,50);
  Outlier(0.05);
 };
 R_Date("UCIAMS-103137",7965,30);
 Outlier(0.05);
 Phase("(4836)")
 {
```

```
   R_Date("UCIAMS-103136",7940,25);
   Outlier(0.05);
  };
 };
 Sequence("(4865)/(4867)/(4869)")
 {
  R_Date("UCIAMS-103139",7970,25);
  Outlier(0.05);
  Phase("(4867")
  {
   R_Date("UCIAMS-103140",8025,25);
   Outlier(0.05);
   R_Date("OxA-27087",8000,40);
   Outlier(0.05);
  };
  Phase("(4869)")
  {
   R_Date("OxA-23248",8082,37);
   Outlier(0.05);
   R_Date("UCIAMS-103141",7980,25);
   Outlier(0.05);
  };
 };
};
Boundary("end pre XII.A/start Sp.199");
Phase("SP.199")
{
 Sequence("(4828)/(4826)/(4822)")
 {
  R_Combine("4828")
  {
   R_Date("UCIAMS-103135",7970,25);
   Outlier(0.05);
```

```
   R_Date("OxA-23523",7931,38);
   Outlier(0.05);
  };
  After("4826")
  {
   R_Combine("4826")
   {
    R_Date("OxA-9948",8090,50);
    Outlier(0.05);
    R_Date("OxA-9775",8090,55);
    Outlier(0.05);
   };
  };
  After("plant remains")
  {
   R_Date("OxA-9947",7985,50);
   Outlier(0.05);
  };
 };
 R_Date("UCIAMS-98209",7990,25);
 Outlier(0.05);
 R_Date("UCIAMS-98208",7965,25);
 Outlier(0.05);
};
Boundary("end Sp.199/Start Sp.198");
Phase("Sp.198")
{
 After("plant remains")
 {
  R_Combine("4715")
  {
   R_Date("OxA-9946",7980,55);
   Outlier(0.05);
```

```
      R_Date("OxA-9774",7935,50);
      Outlier(0.05);
     };
    };
    R_Date("OxA-23247",8027,37);
    Outlier(0.05);
    R_Date("UCIAMS-103138",7920,25);
    Outlier(0.05);
   };
   Boundary("end Sp.198/start B.23(E.X.I)=B.18(E.X.8)");
   Before("B.23(E.X.I)=B.18(E.X.8)")
   {
    Sequence("(4861)/(4853)")
    {
     R_Date("OxA-21261",8033,39);
     Outlier(0.05);
     R_Date("OxA-21262",7955,40);
     Outlier(0.05);
    };
    After("unindentified charcoal")
    {
     R_Date("P-782",8092,98);
     Outlier(0.05);
    };
    R_Date("UCIAMS-103134",7955,25);
    Outlier(0.05);
    R_Date("UCIAMS-98210",7940,30);
    Outlier(0.05);
   };
  };
 };
};
```

4. Chronomodel code

See attached file ‘Catalhoyuk final.chr’

5. BayLum code

```
#### This code is associated with the article entitled 'The conflict between sampling resolution and stratigraphic constraints from a Bayesian perspective' by Guérin et al.


library(BayLum)

library(ArchaeoPhases)

setwd("MyWorkingDirectory")

Path=c("MyPath")


########### Note: the samples below come from Bayliss et al. (2015). All outliers recognized as such by Bayliss et al. have been removed from the following list


C14_SampleNames = c("OxA-21261","OxA-21262","UCIAMS-98210","UCIAMS-103134","P-782","UCIAMS-103138","OxA-23247","OxA-9774","OxA-9946","UCIAMS-98208","UCIAMS-98209","OxA-9947","OxA-9775","OxA-9948","OxA-23523","UCIAMS-103135","UCIAMS_103136","UCIAMS-103137",'OxA-23248',"UCIAMS-103141","UCIAMS-103140","OxA-27087","OxA-9949","UCIAMS-103139","OxA-23249","OxA-9950","UCIAMS-109991","OxA-23250","UCIAMS-109992","OxA-9776","OxA-23251","UCIAMS-109993","OxA-9892","OxA-9777","UCIAMS-109994","OxA-9778","OxA-23252","OxA-9893","PL-980525A","AA-27982")

C14_Nb_sample = length(C14_SampleNames)

C14ages = c(8033,7955,7940,7955,8092,7920,8027,7935,7980,7965,7990,7985,8090,8090,7931,7970,7940,7965,8082,7980,8025,8000,8050,7970,8024,8030,8035,8085,8030,7985,8137,8160,8150,8160,8210,8240,8199,8155,8390,8195)

C14agesEr = c(39,40,30,25,98,25,37,50,55,25,25,50,55,50,38,25,25,30,37,25,25,50,40,25,35,50,30,36,30,55,36,30,50,50,30,55,36,50,90,80)

AC14_WithoutStratigraphicConstraints=AgeC14_Computation(Data_C14Cal=C14ages, Data_SigmaC14Cal=C14agesEr,SampleNames=C14_SampleNames, Nb_sample = C14_Nb_sample,PriorAge = rep(c(7, 13), C14_Nb_sample), SavePdf = TRUE,OutputFileName = c("MCMCplot","HPD_CalC-14Curve", "summary"),OutputFilePath = Path, SaveEstimates = TRUE, OutputTableName = c("AllC14"), OutputTablePath = c(""),StratiConstraints = c(), sepSC = c(","), Model = c("full"), CalibrationCurve = c("IntCal20"), Iter = 5000, t = 5, n.chains = 3, quiet = FALSE)
```

```
SC = matrix(data=0,ncol=40,nrow=41) ### matrix to account for
stratigraphic constraints

SC[1,]=rep(1,40)

SC[2,]=c(rep(0,1),rep(1,1),rep(0,3),rep(1,35)) #4853

SC[3,]=c(rep(0,5),rep(1,35)) #4861

SC[4,]=c(rep(0,5),rep(1,35)) #4555

SC[5,]=c(rep(0,5),rep(1,35)) #4779

SC[6,]=rep(0,40) #P782 After

SC[7,]=c(rep(0,9),rep(1,31)) #4850

SC[8,]=c(rep(0,9),rep(1,31)) #4850

SC[9,]=rep(0,40) #4715 (After)

SC[10,]=rep(0,40) #4715 (After)

SC[11,]=c(rep(0,18),rep(1,4),rep(0,1),rep(1,17)) #4517

SC[12,]=c(rep(0,18),rep(1,4),rep(0,1),rep(1,17)) #4517

SC[13,]=rep(0,40)#4822 (After)

SC[14,]=rep(0,40) #4826 (After)

SC[15,]=rep(0,40) #4826 (After)

SC[16,]=c(rep(0,16),rep(1,2),rep(0,4),rep(1,1),rep(0,1),rep(1,16))
#4828

SC[17,]=c(rep(0,16),rep(1,2),rep(0,4),rep(1,1),rep(0,1),rep(1,16))
#4828

SC[18,]=c(rep(0,17),rep(1,1),rep(0,4),rep(1,1),rep(0,1),rep(1,16))
#4836

SC[19,]=c(rep(0,22),rep(1,1),rep(0,1),rep(1,16)) #4837

SC[20,]=c(rep(0,19),rep(1,2),rep(0,1),rep(1,18)) #4869

SC[21,]=c(rep(0,19),rep(1,2),rep(0,1),rep(1,18)) #4869

SC[22,]=c(rep(0,22),rep(1,18)) #4867

SC[23,]=c(rep(0,22),rep(1,18)) #4867

SC[24,]=c(rep(0,24),rep(1,16)) #4848

SC[25,]=c(rep(0,24),rep(1,16)) #4865

SC[26,]=c(rep(0,25),rep(1,15)) #4878

SC[27,]=c(rep(0,26),rep(1,14)) #5276

SC[28,]=c(rep(0,27),rep(1,13)) #5279

SC[29,]=c(rep(0,29),rep(1,11)) #5283
```

```
SC[30,]=c(rep(0,29),rep(1,11)) #5283

SC[31,]=c(rep(0,30),rep(1,10)) #5292

SC[32,]=c(rep(0,31),rep(1,9)) #5308

SC[33,]=c(rep(0,32),rep(1,8)) #5316

SC[34,]=c(rep(0,33),rep(1,7)) #5317

SC[35,]=c(rep(0,35),rep(1,5)) #5323

SC[36,]=c(rep(0,35),rep(1,5)) #5323

SC[37,]=c(rep(0,36),rep(1,4)) #5324

SC[38,]=c(rep(0,37),rep(1,3)) #5328

SC[39,]=c(rep(0,38),rep(1,2)) #5329

SC[40,]=rep(0,40) #pre XII (After)

SC[41,]=rep(0,40) #pre XII (After)


AC14_WithStratiConstraints=AgeC14_Computation(Data_C14Cal=C14ages,
Data_SigmaC14Cal=C14agesEr, SampleNames=C14_SampleNames, Nb_sample =
C14_Nb_sample, PriorAge = rep(c(8, 10), C14_Nb_sample), SavePdf =
TRUE, OutputFileName = c("MCMCplot","HPD_CalC-14Curve", "summary"),
OutputFilePath = Path, SaveEstimates = TRUE, OutputTableName =
c("AllC14"), OutputTablePath = c(""), StratiConstraints = SC, sepSC
= c(","), Model = c("full"), CalibrationCurve = c("IntCal20"), Iter
= 500000, t = 5, n.chains = 3, quiet = FALSE)
```