[] Dendrochronology Program Library Run QURU Program COF 10:41 Wed 24 Jan 2018 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30341

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: QURU\_RR\_EWLW\_ORIGINAL-50

File of DATED series: QURU\_RR\_EWLW

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

RUN CONTROL OPTIONS SELECTED VALUE

1 Cubic smoothing spline 50% wavelength cutoff for filtering

32 years

2 Segments examined are 50 years lagged successively by 25 years

3 Autoregressive model applied A Residuals are used in master dating series and testing

4 Series transformed to logarithms Y Each series log-transformed for master dating series and testing

5 CORRELATION is Pearson (parametric, quantitative)

Critical correlation, 99% confidence level .3281

6 Master dating series saved N

7 Ring measurements listed Y

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1897 to 2016 120 years

Continuous time span is 1897 to 2016 120 years

Portion with two or more series is 1908 to 2016 109 years

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*C\* Number of dated series 31 \*C\*

\*O\* Master series 1897 2016 120 yrs \*O\*

\*F\* Total rings in all series 2561 \*F\*

\*E\* Total dated rings checked 2550 \*E\*

\*C\* Series intercorrelation .627 \*C\*

\*H\* Average mean sensitivity .197 \*H\*

\*A\* Segments, possible problems 2 \*A\*

\*\*\* Mean length of series 82.6 \*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ABSENT RINGS listed by SERIES: (See Master Dating Series for absent rings listed by year)

No ring measurements of zero value

1900 -2.668 1 1950 -.771 27 2000 -.756 31

1901 1.033 1 1951 .454 28 2001 -.801 31

1902 2.307 1 1952 -.400 29 2002 -.207 31

1903 -.085 1 1953 -1.803 29 2003 -1.870 31

1904 1.120 1 1954 -2.973 29 2004 .587 31

1905 -.211 1 1955 -.524 29 2005 1.293 31

1906 -.048 1 1956 1.048 29 2006 .415 31

1907 .127 1 1957 .452 29 2007 .105 31

1908 1.519 2 1958 .581 29 2008 1.031 31

1909 .389 3 1959 .580 29 2009 1.514 31

1910 .042 4 1960 .498 29 2010 -.970 31

1911 -.968 5 1961 .688 29 2011 -.040 31

1912 .660 5 1962 .110 29 2012 .609 31

1913 -.365 5 1963 -.539 29 2013 .415 31

1914 -2.217 5 1964 1.596 29 2014 -1.066 31

1915 -.659 5 1965 -.549 29 2015 .100 31

1916 -.086 5 1966 -1.790 29 2016 -1.167 31

1917 .765 5 1967 .709 29

1918 2.099 5 1968 1.238 29

1919 -1.267 5 1969 1.016 29

1920 1.367 5 1970 -.567 29

1921 .302 7 1971 -.538 29

1922 .955 7 1972 1.392 29

1923 -.705 8 1973 .057 30

1924 -.379 8 1974 .138 30

1925 .939 8 1975 .060 30

1926 .697 8 1976 .227 30

1927 -.805 10 1977 -2.392 31

1928 -.029 10 1978 .152 31

1929 .719 11 1979 -1.003 31

1930 -.293 11 1980 .700 31

1931 -.509 11 1981 -.897 31

1932 .649 12 1982 -.213 31

1933 -.720 16 1983 -.645 31

1934 -1.058 16 1984 -1.237 31

1935 -.249 17 1985 -.511 31

1936 -.734 18 1986 .751 31

1937 -.178 19 1987 .982 31

1938 -.840 19 1988 1.330 31

1939 1.114 20 1989 .764 31

1940 1.284 21 1990 -.066 31

1941 -.642 21 1991 -1.808 31

1942 -.366 21 1992 .391 31

1943 .256 21 1993 .417 31

1944 1.304 22 1994 -.091 31

1945 .237 25 1995 -.844 31

1946 .210 25 1996 .650 31

1897 1.090 1 1947 1.329 25 1997 -.493 31

1898 -.509 1 1948 .765 25 1998 1.634 31

1899 -1.926 1 1949 -1.506 25 1999 -.408 31

PART 5: CORRELATION OF SERIES BY SEGMENTS: QURU\_RR\_EWLW\_ORIGINAL-50 10:41 Wed 24 Jan 2018 Page 5

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Correlations of 50-year dated segments, lagged 25 years

Flags: A = correlation under .3281 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1900 1925 1950 1975

1949 1974 1999 2024

--- -------- --------- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----

1 1302A 1927 2016 .65 .75 .66

2 1302B 1908 2016 .54 .77 .75 .65

3 1303A 1897 2016 .65 .71 .81 .76

4 1303B 1909 2016 .62 .59 .66 .62

5 1304A 1944 2016 .87 .82 .80

6 1304B 1937 2016 .73 .79 .73

7 1305A 1950 2016 .74 .82

8 1305B 1921 2016 .55 .55 .79 .73

9 1306A 1977 2016 .35

10 1306B 1973 2016 .24A

11 1307A 1936 2016 .51 .55 .45

12 1307B 1932 2016 .54 .53 .45

13 1308A 1950 2016 .45 .38

14 1308B 1935 2016 .43 .58 .55

15 1309A 1945 2016 .83 .80 .74

16 1309B 1940 2016 .80 .78 .67

17 1310A 1933 2016 .59 .68 .46

18 1310B 1933 2016 .38 .40 .29A

19 1311A 1923 2016 .61 .63 .71 .70

20 1311B 1921 2016 .51 .53 .76 .80

21 1312A 1911 2016 .71 .74 .77 .78

22 1312B 1910 2016 .71 .75 .78 .76

23 1313B 1927 2016 .54 .58 .63

24 1314A 1945 2016 .79 .80 .79

25 1314B 1951 2016 .75 .70

26 1315A 1952 2016 .61 .64

27 1315B 1945 2016 .66 .65 .63

28 1316A 1933 2016 .41 .41 .58

29 1316B 1939 2016 .68 .65 .63

30 1317A 1933 2016 .75 .68 .65

31 1317B 1929 2016 .60 .56 .55

Av segment correlation .61 .64 .66 .63

PART 6: POTENTIAL PROBLEMS: QURU\_RR\_EWLW\_ORIGINAL-50 10:41 Wed 24 Jan 2018 Page 5

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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1302A 1927 to 2016 90 years Series 1

[B] Entire series, effect on correlation ( .687) is:

Lower 1934< -.023 2014> -.023 1927> -.017 1977> -.011 1970> -.008 1968< -.006 Higher 1954 .029 2003 .016

1302A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 518 517 506

1930 515 495 554 462 391 489 440 407 438 483

1940 472 396 374 517 539 442 467 573 520 362

1950 429 437 437 271 249 447 535 572 577 562

1960 580 707 524 476 612 407 334 437 437 525

1970 523 445 475 494 409 400 555 378 438 350

1980 448 383 359 286 286 298 446 384 352 351

1990 342 258 294 331 307 277 335 302 390 262

2000 264 258 269 215 344 392 374 321 342 372

2010 288 316 311 297 335 296 253

====================================================================================================================================

1302B 1908 to 2016 109 years Series 2

[B] Entire series, effect on correlation ( .611) is:

Lower 1912< -.039 2016< -.017 1923> -.014 1913> -.011 2014> -.008 2010> -.007 Higher 2003 .013 1953 .012

1302B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1908 275 289

1910 287 306 275 350 272 328 349 376 428 382

1920 535 531 468 472 415 428 469 438 449 479

1930 439 421 501 377 338 375 360 412 366 364

1940 404 336 347 345 400 333 347 445 364 239

1950 260 339 333 204 214 438 435 393 331 342

1960 306 366 311 321 408 244 222 331 338 362

1970 293 290 339 315 267 275 267 233 281 266

1980 332 277 266 202 201 217 276 283 274 290

1990 253 216 238 245 235 193 247 234 312 239

2000 226 222 247 206 301 357 317 270 285 313

2010 285 310 276 286 293 296 259

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1303A 1897 to 2016 120 years Series 3

[\*] Early part of series cannot be checked from 1897 to 1907 -- not matched by another series

[B] Entire series, effect on correlation ( .724) is:

Lower 1925< -.012 1970> -.009 1957< -.009 1985< -.008 1919> -.007 1930> -.007 Higher 1977 .033 1954 .014

1303A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1897 255 205 170

1900 158 258 298 231 262 232 237 241 291 233

1910 228 205 265 245 200 226 231 274 270 216

1920 232 205 255 201 190 198 222 191 204 229

1930 222 174 187 203 175 167 190 192 157 195

1940 244 175 179 211 221 198 210 242 172 147

1950 185 201 163 126 120 178 186 138 156 209

1960 184 184 165 161 234 154 119 189 237 237

1970 204 175 240 175 181 196 190 123 170 168

1980 196 179 166 156 161 142 179 219 178 177

1990 157 131 149 159 138 134 152 141 167 145

2000 143 123 154 143 160 178 157 126 172 187

2010 130 141 147 150 128 126 133

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1303B 1909 to 2016 108 years Series 4

[B] Entire series, effect on correlation ( .619) is:

Lower 1986< -.015 1996< -.013 1936> -.013 1973< -.009 1931< -.009 1942< -.009 Higher 1977 .048 1954 .024

1303B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1909 196

1910 171 165 208 158 141 150 194 210 249 165

1920 188 181 171 150 156 168 195 169 164 203

1930 174 133 167 180 163 142 176 178 135 174

1940 194 153 117 159 186 175 176 184 143 108

1950 145 153 130 113 111 181 154 138 172 195

1960 158 155 151 160 181 126 141 208 189 185

1970 163 133 146 119 129 138 132 103 146 139

1980 129 119 129 121 115 114 111 149 150 132

1990 128 111 126 121 100 111 106 108 123 112

2000 113 93 126 97 113 113 88 84 111 111

2010 87 83 97 96 86 91 75

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1304A 1944 to 2016 73 years Series 5

[B] Entire series, effect on correlation ( .834) is:

Lower 1995< -.016 2013< -.014 1990> -.008 1997> -.007 1967< -.006 1969< -.005 Higher 1977 .027 1954 .018

1304A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 488 397 402 474 432 278

1950 293 361 326 284 230 359 476 414 325 381

1960 469 350 323 278 548 357 228 303 391 334

1970 269 340 431 333 329 314 274 190 271 266

1980 334 221 256 218 220 243 262 284 364 327

1990 302 207 302 249 219 170 280 279 272 210

2000 243 210 226 204 318 306 245 276 282 355

2010 215 266 282 211 212 252 224

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1304B 1937 to 2016 80 years Series 6

[B] Entire series, effect on correlation ( .729) is:

Lower 1940< -.037 1970< -.018 2014< -.013 1969< -.013 1938> -.011 1965> -.010 Higher 1977 .043 1954 .022

1304B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 409 423 448

1940 341 329 392 472 482 428 404 472 450 298

1950 271 369 272 227 170 311 434 379 362 370

1960 325 322 314 257 455 330 198 277 312 238

1970 164 275 327 311 320 272 253 148 266 246

1980 339 205 250 277 227 198 291 348 449 374

1990 330 219 339 210 172 176 322 255 350 221

2000 261 179 252 210 354 306 281 272 277 335

2010 206 236 292 279 180 245 227

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1305A 1950 to 2016 67 years Series 7

[B] Entire series, effect on correlation ( .768) is:

Lower 1954> -.032 1953< -.016 1976< -.012 1952< -.007 1984> -.007 2000< -.006 Higher 1977 .014 2003 .010

1305A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 209 231 188 162 245 294 420 272 376 418

1960 369 420 335 298 416 271 227 351 460 439

1970 223 281 372 332 296 289 266 252 363 316

1980 371 280 278 291 320 311 332 338 390 320

1990 294 263 349 328 304 290 340 266 346 276

2000 238 245 313 243 314 312 237 269 311 297

2010 183 210 242 278 179 211 170

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1305B 1921 to 2016 96 years Series 8

[B] Entire series, effect on correlation ( .625) is:

Lower 1943< -.031 1933> -.024 1938> -.014 2005< -.013 1931> -.010 1949> -.010 Higher 1954 .048 1977 .027

1305B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 90 107 61 79 108 81 78 76 92

1930 84 114 100 129 96 82 89 91 136 165

1940 150 119 172 111 152 137 197 224 230 199

1950 208 243 218 180 114 253 366 370 380 336

1960 341 316 280 251 382 326 270 331 381 364

1970 245 270 411 241 242 278 276 206 284 293

1980 385 273 261 275 300 344 360 319 292 257

1990 247 212 257 261 256 213 233 223 292 244

2000 239 258 277 220 316 257 225 234 322 350

2010 236 274 369 324 260 342 243

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1306A 1977 to 2016 40 years Series 9

[B] Entire series, effect on correlation ( .352) is:

Lower 1977> -.128 1986< -.045 2001> -.024 1981> -.021 2016> -.016 1995> -.015 Higher 1991 .084 2010 .064

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1977 +3.8 SD

1306A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1977 308 272 187

1980 271 314 371 320 237 278 220 240 271 297

1990 246 190 311 419 381 376 354 320 483 374

2000 338 425 383 339 354 421 361 361 368 341

2010 273 286 295 300 272 306 295

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1306B 1973 to 2016 44 years Series 10

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1973 2016 0 -.04 .04 .01 -.15 .14 -.13 .08 -.04 .21 .16 .24\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .239) is:

Lower 1977> -.099 2004< -.061 2010> -.051 1987< -.045 1992< -.028 2001> -.019 Higher 1991 .073 2016 .069

1973 to 2016 segment:

Lower 1977> -.099 2004< -.061 2010> -.051 1987< -.045 1992< -.028 2001> -.019 Higher 1991 .073 2016 .069

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1977 +3.8 SD

1306B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1973 366 239 259 279 286 221 197

1980 255 214 264 220 207 218 204 179 251 282

1990 229 160 194 292 314 287 253 255 370 296

2000 260 346 301 251 233 340 313 330 322 340

2010 346 301 318 306 240 296 229

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1307A 1936 to 2016 81 years Series 11

[B] Entire series, effect on correlation ( .479) is:

Lower 1938< -.028 2011< -.016 1995> -.014 2014> -.013 2003> -.013 1966> -.011 Higher 1991 .026 1954 .026

1307A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 140 169 103 221

1940 207 177 191 305 325 227 208 269 279 255

1950 310 300 303 254 209 253 357 377 395 270

1960 265 284 314 268 315 242 329 392 380 357

1970 266 395 739 448 285 205 243 253 491 444

1980 488 326 230 214 266 421 346 364 296 254

1990 235 205 448 539 524 538 491 310 568 383

2000 540 460 449 405 637 508 478 384 337 344

2010 257 290 466 422 427 417 336

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1307B 1932 to 2016 85 years Series 12

[B] Entire series, effect on correlation ( .492) is:

Lower 1955< -.024 2014> -.018 1938< -.017 2011< -.015 1991> -.015 1979> -.012 Higher 1954 .066 1966 .018

1307B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 111 131 107 101 103 207 85 217

1940 220 219 242 197 334 196 202 253 298 223

1950 278 287 284 237 136 130 275 298 232 289

1960 256 436 367 311 345 322 198 372 318 397

1970 365 284 280 233 236 216 250 172 266 298

1980 394 279 181 121 136 404 427 319 245 237

1990 236 270 316 381 272 167 249 310 536 325

2000 288 315 304 241 423 500 475 430 406 330

2010 237 196 228 266 326 312 252

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1308A 1950 to 2016 67 years Series 13

[B] Entire series, effect on correlation ( .409) is:

Lower 2009< -.034 1990< -.032 1966> -.029 2016> -.027 1984> -.019 1978< -.015 Higher 1991 .034 2010 .034

1308A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 87 73 70 62 44 201 323 294 267 276

1960 250 268 269 191 294 229 270 292 213 202

1970 188 168 259 201 167 160 186 162 144 135

1980 183 132 203 231 256 269 254 219 227 283

1990 194 172 277 273 253 291 404 311 411 345

2000 352 376 402 320 385 368 302 271 245 208

2010 161 244 268 327 231 237 264

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1308B 1935 to 2016 82 years Series 14

[B] Entire series, effect on correlation ( .481) is:

Lower 1935< -.037 1968< -.024 2010> -.016 2006< -.012 1938> -.012 1954> -.010 Higher 1977 .040 2003 .032

1308B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1935 77 89 112 114 101

1940 137 93 111 125 157 148 135 133 90 74

1950 62 57 45 38 62 167 336 310 231 184

1960 188 288 259 166 239 179 178 177 127 180

1970 146 138 212 193 142 140 168 112 124 104

1980 136 134 163 216 194 220 228 215 241 342

1990 265 209 303 335 289 287 336 283 393 354

2000 313 343 321 221 310 295 249 315 331 319

2010 338 378 471 469 267 244 253

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1309A 1945 to 2016 72 years Series 15

[B] Entire series, effect on correlation ( .769) is:

Lower 1995> -.019 2009< -.012 2013< -.011 1993< -.009 2001> -.009 1955> -.007 Higher 1977 .040 1954 .033

1309A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1945 371 348 416 389 318

1950 315 370 287 247 167 387 449 433 444 540

1960 439 367 361 347 379 323 302 326 424 423

1970 373 318 418 354 354 320 283 197 346 307

1980 388 259 282 228 200 258 319 363 366 357

1990 266 232 272 233 267 357 343 252 353 324

2000 288 349 271 221 380 445 468 450 570 410

2010 316 351 348 269 252 288 260

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1309B 1940 to 2016 77 years Series 16

[B] Entire series, effect on correlation ( .712) is:

Lower 2010> -.040 2013< -.020 1995> -.017 2016> -.013 1949> -.011 2001> -.011 Higher 1954 .038 2003 .017

1309B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 229 208 226 243 326 279 300 373 350 319

1950 311 367 290 298 207 461 462 389 425 593

1960 461 423 469 403 494 437 344 469 559 555

1970 427 441 507 393 395 358 355 297 401 355

1980 504 365 416 371 339 357 525 463 440 443

1990 346 308 397 404 410 452 415 324 396 328

2000 311 423 359 277 427 460 408 448 508 491

2010 516 460 511 317 283 380 394

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1310A 1933 to 2016 84 years Series 17

[B] Entire series, effect on correlation ( .517) is:

Lower 2016> -.047 2014> -.021 2012< -.020 1938> -.017 1936< -.008 1997> -.008 Higher 1991 .023 1954 .021

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

2016 +4.6 SD

1310A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 133 142 208 120 155 184 230

1940 224 127 135 156 157 155 159 211 174 122

1950 131 192 229 194 151 182 300 307 318 281

1960 282 332 310 292 334 213 206 246 272 261

1970 167 161 181 124 140 121 129 114 132 110

1980 123 110 124 154 133 159 187 170 180 221

1990 203 150 222 241 226 231 252 250 411 257

2000 171 182 140 121 142 162 152 151 167 165

2010 141 148 122 122 127 121 124

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1310B 1933 to 2016 84 years Series 18

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1967 2016 0 -.01 -.19 .13 -.03 -.01 .06 .22 -.22 .03 -.15 .29\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .402) is:

Lower 1977> -.083 1972< -.018 2010> -.017 1946< -.014 1934> -.013 1995> -.012 Higher 1954 .071 1991 .038

1967 to 2016 segment:

Lower 1977> -.139 2010> -.028 1972< -.023 1995> -.021 2001> -.016 1997> -.014 Higher 1991 .084 1998 .040

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1977 +4.3 SD

1310B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 137 155 214 63 79 120 166

1940 151 104 107 149 166 142 110 160 174 122

1950 144 193 185 197 153 239 397 340 353 321

1960 341 441 412 388 475 408 331 345 322 307

1970 222 223 245 232 252 276 269 322 302 260

1980 267 233 285 312 292 314 309 291 309 327

1990 279 219 291 393 344 382 364 353 495 354

2000 275 383 293 200 274 280 326 288 269 342

2010 341 300 370 373 291 260 216

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1311A 1923 to 2016 94 years Series 19

[B] Entire series, effect on correlation ( .653) is:

Lower 1992< -.014 1932< -.011 1929< -.009 1923> -.009 1934> -.009 2015< -.009 Higher 1977 .021 1939 .007

1311A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1923 125 123 154 170 40 31 30

1930 37 30 25 25 42 44 40 31 31 93

1940 91 66 100 64 82 77 92 114 95 62

1950 81 106 95 71 57 153 372 349 378 346

1960 340 536 480 357 391 351 288 393 359 409

1970 329 303 359 336 389 322 351 274 311 237

1980 286 267 281 291 209 245 291 269 307 343

1990 288 137 153 260 279 181 253 218 374 244

2000 281 293 278 250 393 550 455 442 525 579

2010 403 363 371 412 280 220 196

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1311B 1921 to 2016 96 years Series 20

[B] Entire series, effect on correlation ( .675) is:

Lower 1929< -.022 1948< -.012 1932< -.011 1934> -.011 1928< -.009 1966> -.009 Higher 1977 .048 2003 .012

1311B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 157 154 113 124 155 142 26 21 14

1930 14 27 20 21 31 20 22 27 22 56

1940 64 44 71 47 82 81 62 88 60 58

1950 70 118 102 74 81 189 392 368 365 358

1960 346 377 340 266 358 302 284 342 328 321

1970 227 221 270 226 280 237 315 194 212 176

1980 249 218 224 212 182 199 234 246 219 337

1990 251 173 181 254 245 186 224 193 316 189

2000 196 223 188 155 268 341 308 251 310 388

2010 264 282 341 342 224 212 159

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1312A 1911 to 2016 106 years Series 21

[B] Entire series, effect on correlation ( .747) is:

Lower 1956< -.012 1926< -.009 1981> -.008 1931> -.007 1914> -.006 1997> -.006 Higher 1977 .010 1991 .009

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1977 -5.7 SD

1312A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1911 137 270 164 134 192 192 190 269 130

1920 241 163 196 137 166 268 158 146 211 252

1930 194 233 244 121 161 193 154 164 155 216

1940 262 125 101 144 193 143 133 238 171 76

1950 93 186 113 68 43 73 73 71 94 108

1960 117 113 85 88 176 92 79 157 173 146

1970 114 113 160 137 122 110 112 53 110 92

1980 110 108 102 85 96 93 116 130 141 106

1990 97 74 109 94 117 110 174 124 143 92

2000 99 90 83 76 117 115 134 93 134 148

2010 95 107 94 133 86 104 77

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1312B 1910 to 2016 107 years Series 22

[B] Entire series, effect on correlation ( .738) is:

Lower 2010> -.010 2002< -.009 1942< -.008 1914> -.007 1956< -.007 1981> -.005 Higher 1977 .029 1954 .014

1312B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1910 265 147 222 132 136 192 182 214 328 147

1920 311 207 266 216 258 361 226 216 352 370

1930 253 277 331 147 187 213 205 211 180 242

1940 296 135 106 172 187 151 133 225 199 83

1950 102 180 125 96 52 74 92 104 103 103

1960 119 114 95 86 188 108 73 149 177 135

1970 108 102 169 141 146 146 154 69 147 124

1980 131 123 124 112 110 126 136 141 134 119

1990 114 72 102 114 112 99 140 105 113 89

2000 84 72 72 85 135 122 119 109 149 203

2010 125 142 125 164 108 128 94

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1313B 1927 to 2016 90 years Series 23

[B] Entire series, effect on correlation ( .582) is:

Lower 2004< -.043 1989< -.024 1956< -.022 1937< -.010 1953> -.010 2002< -.009 Higher 1977 .066 2003 .019

1313B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 258 382 366

1930 243 328 352 182 208 258 186 144 176 277

1940 312 188 182 263 237 177 165 233 241 101

1950 96 206 158 111 58 76 53 57 61 55

1960 62 86 65 82 130 85 83 136 136 124

1970 111 86 123 114 121 102 152 78 151 94

1980 147 137 125 134 150 140 193 219 215 136

1990 164 153 176 168 205 170 207 203 240 145

2000 197 178 114 96 93 165 211 194 215 296

2010 172 176 154 189 165 185 127

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1314A 1945 to 2016 72 years Series 24

[B] Entire series, effect on correlation ( .787) is:

Lower 1984< -.017 2010> -.009 1945< -.007 1991> -.007 2014< -.006 1971> -.005 Higher 1977 .030 1966 .006

1314A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1945 211 324 391 530 244

1950 293 411 272 170 178 265 341 296 312 288

1960 408 335 259 187 350 254 152 337 466 319

1970 227 319 441 262 266 310 343 150 307 234

1980 250 183 211 168 92 126 302 258 199 153

1990 146 134 230 173 123 102 170 177 276 185

2000 173 162 215 163 267 397 356 254 308 329

2010 202 242 207 172 119 185 159

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1314B 1951 to 2016 66 years Series 25

[B] Entire series, effect on correlation ( .688) is:

Lower 2014> -.025 2010< -.020 1955< -.011 1997> -.008 2012< -.007 1999> -.006 Higher 1977 .044 2009 .008

1314B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1951 352 309 204 160 197 314 337 278 234

1960 374 416 263 204 384 283 165 337 448 280

1970 208 256 304 193 192 254 234 126 238 205

1980 243 155 227 171 132 159 228 234 222 140

1990 136 133 180 141 123 103 138 165 156 136

2000 117 101 147 140 220 203 138 145 159 206

2010 107 156 159 144 169 171 145

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1315A 1952 to 2016 65 years Series 26

[B] Entire series, effect on correlation ( .662) is:

Lower 1985< -.084 1991> -.022 1959< -.015 1986< -.015 1952> -.011 1978< -.009 Higher 1977 .043 1964 .013

1315A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 345 215 175 236 315 312 351 236

1960 308 290 323 296 433 245 181 286 333 308

1970 277 261 332 256 323 274 233 141 165 150

1980 168 164 175 152 152 103 128 149 182 164

1990 163 164 230 180 176 150 245 168 253 203

2000 170 145 199 152 234 259 260 274 263 238

2010 173 243 257 242 160 243 191

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1315B 1945 to 2016 72 years Series 27

[B] Entire series, effect on correlation ( .688) is:

Lower 1991> -.049 1985< -.020 1994< -.007 1999> -.007 1981> -.006 2009< -.006 Higher 1977 .020 2003 .011

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1991 +3.6 SD

1315B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1945 412 410 383 489 217

1950 209 348 247 173 144 192 255 240 209 181

1960 179 228 188 181 251 153 115 181 191 193

1970 184 186 268 211 274 217 203 128 152 134

1980 154 151 183 149 137 100 148 160 209 175

1990 197 207 219 153 120 108 176 142 192 185

2000 169 139 190 150 207 263 261 314 273 240

2010 202 266 249 228 200 260 220

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1316A 1933 to 2016 84 years Series 28

[B] Entire series, effect on correlation ( .486) is:

Lower 1954> -.028 1999< -.024 1977> -.017 1952> -.015 1941> -.011 1946< -.011 Higher 2003 .026 1949 .015

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1952 +3.6 SD

1316A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 231 276 422 239 238 289 429

1940 445 413 387 392 459 450 283 276 298 206

1950 320 473 549 306 232 247 315 231 219 188

1960 179 176 201 209 261 245 217 350 420 345

1970 302 314 334 258 326 351 247 193 215 188

1980 206 146 156 170 137 211 228 262 278 211

1990 184 174 194 222 188 171 189 178 180 118

2000 122 118 166 131 153 210 170 166 226 253

2010 195 170 209 184 139 159 165

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1316B 1939 to 2016 78 years Series 29

[B] Entire series, effect on correlation ( .657) is:

Lower 1991> -.024 1939< -.017 1976< -.016 1940< -.010 2006< -.009 1975> -.008 Higher 1954 .021 2003 .015

1316B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1939 330

1940 339 311 368 345 403 487 563 617 544 265

1950 344 381 360 265 187 218 380 385 384 483

1960 544 447 378 342 392 307 255 321 405 392

1970 329 300 345 260 305 363 242 185 226 234

1980 221 169 192 168 153 170 197 215 282 201

1990 173 176 209 202 176 152 180 190 194 170

2000 148 131 194 164 247 293 202 203 208 307

2010 195 238 283 252 222 263 232

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1317A 1933 to 2016 84 years Series 30

[B] Entire series, effect on correlation ( .690) is:

Lower 1991> -.019 1961< -.016 1997< -.014 2016> -.011 1980< -.008 1936> -.007 Higher 1977 .028 1954 .026

1317A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1933 439 400 510 505 501 443 526

1940 542 479 477 517 623 539 553 502 482 364

1950 394 385 278 214 161 292 370 271 331 312

1960 278 208 205 230 260 185 161 236 265 254

1970 227 244 257 225 253 288 200 130 184 155

1980 157 162 162 179 136 156 172 207 237 189

1990 231 194 232 165 200 150 191 118 168 153

2000 142 129 179 143 167 210 191 219 237 265

2010 136 187 208 192 139 160 167

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1317B 1929 to 2016 88 years Series 31

[B] Entire series, effect on correlation ( .597) is:

Lower 1977> -.045 1993< -.018 1931< -.017 1997< -.017 1991> -.015 1973> -.009 Higher 1954 .021 1964 .010

1317B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 340

1930 279 260 366 305 306 368 389 466 381 494

1940 522 424 391 352 428 452 447 472 391 222

1950 214 257 177 151 126 185 216 175 239 258

1960 237 173 196 171 245 177 155 217 196 180

1970 149 137 176 185 159 153 159 150 165 143

1980 157 114 121 127 109 131 152 161 184 152

1990 153 132 158 103 117 99 137 89 127 114

2000 107 116 151 105 138 128 123 98 142 123

2010 89 101 125 99 73 95 79

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

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1 1302A 1927 2016 90 3 0 .687 4.09 7.07 1.027 .710 .144 2.63 .552 .120 1

2 1302B 1908 2016 109 4 0 .611 3.23 5.35 .784 .741 .130 2.56 .406 -.008 2

3 1303A 1897 2016 120 4 0 .724 1.87 2.98 .407 .632 .147 2.58 .417 -.023 2

4 1303B 1909 2016 108 4 0 .619 1.44 2.49 .347 .711 .139 2.67 .444 -.014 2

5 1304A 1944 2016 73 3 0 .834 3.02 5.48 .797 .509 .198 2.74 .509 -.005 2

6 1304B 1937 2016 80 3 0 .729 3.01 4.82 .831 .540 .231 2.65 .512 -.009 1

7 1305A 1950 2016 67 2 0 .768 2.97 4.60 .673 .440 .188 2.66 .491 .068 3

8 1305B 1921 2016 96 4 0 .625 2.34 4.11 .917 .817 .186 2.49 .413 -.012 2

9 1306A 1977 2016 40 1 0 .352 3.19 4.83 .648 .573 .155 2.72 .586 .059 2

10 1306B 1973 2016 44 1 1 .239 2.70 3.70 .523 .473 .162 2.51 .499 .015 2

11 1307A 1936 2016 81 3 0 .479 3.41 7.39 1.191 .608 .217 2.76 .425 -.007 3

12 1307B 1932 2016 85 3 0 .492 2.72 5.36 .940 .589 .244 2.60 .466 .053 1

13 1308A 1950 2016 67 2 0 .409 2.40 4.11 .829 .771 .191 2.63 .570 .050 1

14 1308B 1935 2016 82 3 0 .481 2.10 4.71 .997 .848 .199 2.63 .419 -.004 1

15 1309A 1945 2016 72 3 0 .769 3.37 5.70 .779 .584 .175 2.62 .497 .027 1

16 1309B 1940 2016 77 3 0 .712 3.92 5.93 .848 .545 .161 2.55 .427 .016 1

17 1310A 1933 2016 84 3 0 .517 1.86 4.11 .643 .748 .162 2.96 .560 -.014 1

18 1310B 1933 2016 84 3 1 .402 2.70 4.95 .943 .817 .177 2.75 .569 .034 4

19 1311A 1923 2016 94 4 0 .653 2.39 5.79 1.443 .888 .227 2.64 .423 -.020 1

20 1311B 1921 2016 96 4 0 .675 1.93 3.92 1.111 .874 .239 2.78 .455 -.012 1

21 1312A 1911 2016 106 4 0 .747 1.35 2.70 .514 .504 .271 2.51 .330 -.007 1

22 1312B 1910 2016 107 4 0 .738 1.55 3.70 .688 .620 .255 2.59 .397 -.009 1

23 1313B 1927 2016 90 3 0 .582 1.65 3.82 .721 .714 .246 2.67 .451 -.047 1

24 1314A 1945 2016 72 3 0 .787 2.50 5.30 .921 .471 .306 2.67 .622 .007 2

25 1314B 1951 2016 66 2 0 .688 2.08 4.48 .800 .591 .254 2.62 .453 -.108 2

26 1315A 1952 2016 65 2 0 .662 2.27 4.33 .681 .601 .207 2.64 .498 .055 1

27 1315B 1945 2016 72 3 0 .688 2.09 4.89 .719 .665 .201 2.67 .590 .068 1

28 1316A 1933 2016 84 3 0 .486 2.49 5.49 .945 .763 .178 2.51 .441 -.084 3

29 1316B 1939 2016 78 3 0 .657 2.83 6.17 1.084 .821 .175 2.74 .471 -.055 2

30 1317A 1933 2016 84 3 0 .690 2.68 6.23 1.300 .919 .175 2.51 .487 -.036 1

31 1317B 1929 2016 88 3 0 .597 2.06 5.22 1.136 .920 .178 2.61 .573 -.014 1

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Total or mean: 2561 93 2 .627 2.47 7.39 .845 .688 .197 2.96 .474 .000

- = [ COFECHA QURU COF ] = -