[] Dendrochronology Program Library Run ACRU Program COF 07:46 Tue 15 Aug 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30179

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: ACRU\_LB2300C\_CORR2

File of DATED series: ACRU\_LB2300C\_CORR2

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 1856 to 2015 160 years

Continuous time span is 1856 to 2015 160 years

Portion with two or more series is 1863 to 2015 153 years

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

\*C\* Number of dated series 32 \*C\*

\*O\* Master series 1856 2015 160 yrs \*O\*

\*F\* Total rings in all series 2719 \*F\*

\*E\* Total dated rings checked 2712 \*E\*

\*C\* Series intercorrelation .484 \*C\*

\*H\* Average mean sensitivity .226 \*H\*

\*A\* Segments, possible problems 11 \*A\*

\*\*\* Mean length of series 85.0 \*\*\*

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

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

1374A 1 absent rings: 1936

1379A 1 absent rings: 2010

1385A 3 absent rings: 1928 1929 1936

1392A 1 absent rings: 1920

6 absent rings .221%

1900 .818 5 1950 .587 20 2000 -.722 32

1901 -.525 5 1951 1.612 21 2001 -2.402 32

1902 -1.493 5 1952 .128 22 2002 -.194 32

1903 1.192 5 1953 -.135 22 2003 -.017 32

1904 1.787 5 1954 -.640 23 2004 -.402 32

1905 -1.083 6 1955 1.130 23 2005 -.091 32

1856 .390 1 1906 -.789 6 1956 -.966 28 2006 -.704 32

1857 -1.875 1 1907 .279 6 1957 .423 28 2007 .479 32

1858 -.935 1 1908 1.051 6 1958 -.113 29 2008 1.158 32

1859 .041 1 1909 -.231 6 1959 -.357 30 2009 -.255 32

1860 -2.517 1 1910 -.142 6 1960 -.617 30 2010 -1.573 32 1

1861 2.762 1 1911 1.201 6 1961 -.171 30 2011 .390 32

1862 1.885 1 1912 .545 6 1962 -.579 30 2012 1.425 32

1863 1.949 2 1913 -.834 6 1963 -.913 30 2013 -.710 32

1864 1.307 2 1914 -.461 7 1964 -.831 30 2014 .169 32

1865 .031 2 1915 -.006 7 1965 .385 30 2015 .314 32

1866 -1.211 2 1916 -.644 8 1966 -.764 31

1867 -.562 2 1917 -.760 8 1967 .432 31

1868 -1.124 2 1918 .719 8 1968 .026 31

1869 .062 2 1919 1.304 12 1969 .413 31

1870 .150 2 1920 -.786 13 1 1970 .165 31

1871 -.407 2 1921 .479 13 1971 .205 31

1872 .325 2 1922 .803 13 1972 .183 31

1873 .041 2 1923 .877 13 1973 .516 31

1874 .212 2 1924 1.042 13 1974 .391 31

1875 -2.617 2 1925 -.867 13 1975 .956 31

1876 -1.598 2 1926 -.301 13 1976 -.816 31

1877 -1.522 2 1927 -.947 13 1977 .984 31

1878 -1.823 2 1928 -1.675 14 1 1978 .434 31

1879 -.022 2 1929 -1.536 15 1 1979 -.030 31

1880 .849 2 1930 -.119 16 1980 .977 31

1881 .541 2 1931 1.020 16 1981 .839 31

1882 .813 2 1932 .243 16 1982 -.418 32

1883 1.197 2 1933 .604 16 1983 -1.281 32

1884 2.112 2 1934 .554 16 1984 -.544 32

1885 1.891 2 1935 .619 16 1985 -.465 32

1886 1.760 2 1936 -1.643 16 2 1986 -.348 32

1887 .922 2 1937 -.677 16 1987 .448 32

1888 1.851 2 1938 -.198 16 1988 .194 32

1889 .747 2 1939 -.113 16 1989 -.927 32

1890 .856 3 1940 -.702 17 1990 -.808 32

1891 .035 3 1941 -.066 17 1991 .615 32

1892 -.904 3 1942 1.198 18 1992 -.856 32

1893 -.528 3 1943 -.108 19 1993 -1.486 32

1894 -.822 4 1944 1.180 19 1994 .029 32

1895 -.905 4 1945 -.956 19 1995 .897 32

1896 -.552 4 1946 -.634 19 1996 -.206 32

1897 -2.164 5 1947 1.421 19 1997 .759 32

1898 -.634 5 1948 -1.696 20 1998 1.033 32

1899 1.729 5 1949 .177 20 1999 1.791 32

PART 5: CORRELATION OF SERIES BY SEGMENTS: ACRU\_LB2300C\_CORR2 07:46 Tue 15 Aug 2017 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 1850 1875 1900 1925 1950 1975

1899 1924 1949 1974 1999 2024

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

1 1243A 1956 2015 .55 .55

2 1243B 1956 2015 .36 .31A

3 1242A 1954 2015 .38 .43

4 1242B 1943 2015 .63 .54 .56

5 1244A 1956 2015 .54 .47

6 1244B 1952 2015 .37 .41

7 1277A 1919 2015 .61 .55 .36 .46

8 1277B 1919 2015 .60 .54 .21A .29A

9 1291A 1897 2015 .56 .60 .43 .44 .64

10 1291B 1914 2015 .58 .57 .58 .61

11 1363A 1958 2015 .33A .39

12 1363B 1956 2015 .37B .38

13 1367A 1940 2015 .56 .57 .59

14 1367B 1948 2015 .48 .51 .56

15 1368A 1982 2015 .28A

16 1368B 1956 2015 .36 .38

17 1374A 1916 2015 .47 .44 .62 .56

18 1374B 1919 2015 .68 .64 .44 .54

19 1378A 1928 2015 .47 .59 .63

20 1378B 1905 2015 .51 .62 .45 .51

21 1379A 1929 2015 .43 .20B .31A

22 1379B 1919 2015 .45 .41 .43 .57

23 1381A 1930 2015 .38 .37 .32A

24 1381B 1920 2015 .41 .45 .43 .51

25 1383A 1951 2015 .31A .25B

26 1383B 1942 2015 .33 .50 .44

27 1384A 1959 2015 .36 .35

28 1384B 1966 2015 .46

29 1385A 1863 2015 .44 .45 .37 .53 .61 .50

30 1385B 1856 2015 .66 .61 .55 .43 .46 .49

31 1392A 1894 2015 .55 .62 .46 .54 .68

32 1392B 1890 2015 .56 .60 .37 .34 .62

Av segment correlation .55 .55 .54 .48 .44 .47

PART 6: POTENTIAL PROBLEMS: ACRU\_LB2300C\_CORR2 07:46 Tue 15 Aug 2017 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

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

1243A 1956 to 2015 60 years Series 1

[B] Entire series, effect on correlation ( .551) is:

Lower 1999< -.033 2013> -.033 1969< -.023 1992> -.019 1989> -.014 1993> -.013 Higher 2001 .089 1956 .030

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

2001 -4.6 SD

1243A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 318 386 417 386

1960 365 444 428 377 366 410 362 313 307 251

1970 230 225 238 217 235 264 200 199 190 170

1980 227 179 184 127 136 128 114 167 113 118

1990 139 149 131 109 106 112 85 96 89 64

2000 41 8 56 55 40 40 39 54 59 52

2010 36 73 83 83 77 94

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

1243B 1956 to 2015 60 years Series 2

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

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

1966 2015 0 -.17 -.06 -.09 .05 -.17 .15 -.03 -.12 -.13 .01 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .329) is:

Lower 1975< -.082 1982> -.036 1978< -.035 2007< -.030 2010> -.030 1992> -.017 Higher 2001 .135 1999 .039

1966 to 2015 segment:

Lower 1975< -.088 1982> -.043 1978< -.035 2010> -.035 2007< -.031 1992> -.020 Higher 2001 .166 1999 .045

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

1982 +3.8 SD

1243B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 197 305 306 274

1960 282 203 245 231 214 278 238 205 198 196

1970 210 260 242 197 191 132 143 176 123 147

1980 166 161 226 136 164 162 139 159 136 140

1990 153 151 150 142 140 133 134 145 130 180

2000 105 73 120 117 108 86 72 73 91 88

2010 95 80 102 72 103 95

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

1242A 1954 to 2015 62 years Series 3

[B] Entire series, effect on correlation ( .401) is:

Lower 2001> -.037 1983> -.030 1972< -.022 2006> -.020 1956> -.019 1954> -.016 Higher 2013 .035 1976 .029

1242A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 211 229 194 161 174 166

1960 160 178 194 174 277 310 244 312 289 320

1970 337 387 231 238 305 358 224 346 318 311

1980 360 318 227 282 241 227 215 200 178 176

1990 189 219 104 119 118 125 103 136 182 178

2000 132 122 146 118 84 82 132 129 101 98

2010 89 105 168 63 73 109

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1242B 1943 to 2015 73 years Series 4

[B] Entire series, effect on correlation ( .581) is:

Lower 2001> -.043 1955< -.023 1964> -.014 1962> -.013 2010> -.013 1986< -.009 Higher 1948 .065 1951 .013

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

2011 +3.1 SD

1242B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 81 97 62 62 133 52 119

1950 165 238 199 187 165 140 129 148 193 157

1960 157 257 298 238 303 313 237 256 243 232

1970 226 270 276 244 277 299 204 309 310 285

1980 339 293 228 222 220 215 162 181 162 133

1990 175 220 133 147 168 197 131 158 173 155

2000 113 131 153 115 96 108 122 120 135 121

2010 112 173 137 96 106 98

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

1244A 1956 to 2015 60 years Series 5

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

Lower 2010> -.072 1967< -.022 1975< -.018 1983> -.015 2014< -.013 1986< -.009 Higher 1956 .031 1999 .028

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1965 +3.3 SD; 2010 +3.1 SD

1244A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 190 335 312 355

1960 308 377 375 375 390 582 364 339 421 465

1970 479 455 427 382 345 317 319 333 277 235

1980 343 360 267 249 231 189 146 161 141 151

1990 139 180 141 102 133 187 174 181 152 240

2000 120 96 190 140 122 137 138 149 156 109

2010 178 160 165 76 75 90

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1244B 1952 to 2015 64 years Series 6

[B] Entire series, effect on correlation ( .380) is:

Lower 1975< -.072 2010> -.044 1959> -.016 1989> -.015 1974< -.014 1963> -.012 Higher 2000 .036 1999 .030

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

1975 -4.8 SD

1244B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 148 126 121 206 188 299 320 440

1960 353 355 414 423 401 412 352 409 429 345

1970 336 297 298 305 243 198 208 288 280 233

1980 231 261 171 188 206 220 236 244 202 198

1990 189 184 181 99 133 185 172 208 167 275

2000 134 111 190 219 161 193 181 223 194 122

2010 187 204 196 105 128 126

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1277A 1919 to 2015 97 years Series 7

[B] Entire series, effect on correlation ( .549) is:

Lower 1985< -.033 1989> -.022 2010> -.019 1966> -.015 1962< -.012 1936> -.011 Higher 1948 .043 2001 .033

1277A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 135

1920 70 49 80 83 116 59 56 47 28 21

1930 81 156 85 126 142 122 123 122 217 221

1940 209 254 311 280 292 188 143 185 120 190

1950 198 223 206 181 177 213 173 156 166 127

1960 154 127 89 128 150 200 233 216 224 288

1970 258 178 169 171 149 213 196 258 219 241

1980 239 232 179 196 277 173 219 212 258 281

1990 248 265 180 121 143 217 208 217 240 270

2000 159 94 134 157 117 132 157 184 170 122

2010 127 151 147 101 77 64

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

1277B 1919 to 2015 97 years Series 8

[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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1950 1999 0 -.04 -.11 .20 -.15 -.06 .08 -.02 .08 -.11 -.01 .21\*-.25 -.08 .00 -.02 .12 -.03 .01 -.10 -.05 .00

1966 2015 0 -.20 .15 .21 -.13 -.34 .06 -.05 .01 -.28 .16 .29\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .471) is:

Lower 2010> -.030 1945> -.024 1987< -.018 1921< -.016 1936> -.015 1971< -.014 Higher 1948 .076 2001 .053

1950 to 1999 segment:

Lower 1987< -.044 1971< -.027 1983> -.027 1977< -.025 1973< -.023 1992> -.019 Higher 1956 .048 1955 .036

1966 to 2015 segment:

Lower 2010> -.055 1987< -.038 1971< -.027 1983> -.022 1977< -.021 1973< -.019 Higher 2001 .208 2012 .023

1277B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 95

1920 46 21 61 90 122 83 77 64 46 43

1930 60 102 85 125 160 144 150 158 174 156

1940 164 185 277 240 310 279 190 300 135 236

1950 228 261 273 206 209 279 195 232 209 167

1960 216 206 124 150 173 253 252 278 341 316

1970 336 178 204 185 191 312 273 254 305 260

1980 332 308 313 325 358 315 368 274 339 303

1990 286 314 291 256 249 234 197 202 219 242

2000 178 75 102 122 120 141 147 213 197 155

2010 209 223 247 172 137 141

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1291A 1897 to 2015 119 years Series 9

[B] Entire series, effect on correlation ( .583) is:

Lower 1913> -.020 1976> -.017 1971< -.012 1952< -.012 1942< -.010 1936> -.009 Higher 2001 .026 1905 .017

1291A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1897 105 251 368

1900 246 176 136 236 202 101 103 132 163 118

1910 132 160 142 166 155 187 180 186 200 191

1920 127 187 204 216 179 84 128 133 164 170

1930 255 291 287 300 334 308 242 300 278 217

1940 168 193 202 190 264 232 239 353 234 306

1950 267 296 224 222 300 382 317 354 334 359

1960 398 386 373 339 346 394 338 396 308 258

1970 377 196 152 151 322 448 460 502 438 333

1980 318 358 244 168 159 164 184 157 172 104

1990 103 167 123 69 119 150 106 126 101 142

2000 100 43 89 116 122 176 153 124 164 139

2010 93 134 172 90 128 96

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1291B 1914 to 2015 102 years Series 10

[B] Entire series, effect on correlation ( .589) is:

Lower 1971< -.018 1969< -.014 1945> -.014 2015< -.009 1976> -.009 2006> -.008 Higher 2001 .033 2010 .018

1291B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1914 170 221 199 178 152 145

1920 104 175 195 191 148 69 112 91 131 146

1930 222 284 279 302 288 261 189 243 302 246

1940 231 228 280 231 282 265 307 416 244 231

1950 239 309 259 217 203 239 140 193 190 183

1960 222 185 194 182 198 217 185 293 262 201

1970 329 202 242 340 344 371 322 320 287 320

1980 435 402 340 239 250 257 298 244 204 128

1990 177 283 185 209 251 306 216 205 206 269

2000 160 94 148 222 210 230 223 217 175 185

2010 113 170 213 172 229 150

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1363A 1958 to 2015 58 years Series 11

[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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1958 2007 0 .23 -.26 .20 -.01 -.05 -.24 .14 .00 -.13 -.10 .33\*-.20 .00 -.07 .02 -.04 -.12 -.05 .14 - -

[B] Entire series, effect on correlation ( .351) is:

Lower 1974< -.051 1983> -.027 1991< -.025 2010> -.025 1959> -.020 2007< -.018 Higher 2001 .123 2012 .028

1958 to 2007 segment:

Lower 1974< -.056 1983> -.034 1991< -.028 1959> -.023 2007< -.021 1981< -.012 Higher 2001 .156 1993 .022

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

1988 +3.3 SD

1363A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1958 465 553

1960 454 466 475 481 490 546 444 476 475 400

1970 364 429 451 382 295 310 285 348 295 286

1980 299 257 274 287 290 275 211 307 328 215

1990 215 153 144 115 133 147 96 119 126 112

2000 99 65 97 93 81 94 93 101 133 131

2010 176 213 355 240 343 322

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1363B 1956 to 2015 60 years Series 12

[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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1956 2005 -8 .17 -.28 .56\* .01 -.07 -.22 .03 .08 -.03 -.18 .37|-.32 -.03 -.01 .00 -.03 .05 .15 .10 .09 .32

[B] Entire series, effect on correlation ( .419) is:

Lower 2010> -.048 1989> -.037 1995< -.024 1994< -.022 1997< -.018 2000> -.015 Higher 1956 .052 2013 .030

1956 to 2005 segment:

Lower 1989> -.046 1995< -.029 1994< -.027 1997< -.022 2000> -.019 1971< -.016 Higher 1956 .083 1993 .030

1363B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 260 356 355 394

1960 357 359 333 385 399 477 380 393 446 424

1970 419 358 429 411 377 464 363 463 379 294

1980 338 295 293 259 298 307 319 360 372 319

1990 212 183 160 113 110 118 99 110 128 130

2000 116 94 117 104 100 119 83 101 119 94

2010 117 117 164 88 110 117

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1367A 1940 to 2015 76 years Series 13

[B] Entire series, effect on correlation ( .584) is:

Lower 1976< -.012 1943> -.012 2000> -.010 1991< -.010 1958< -.009 2001> -.008 Higher 1948 .012 1945 .010

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

2010 -4.6 SD

1367A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1940 38 197 335 409 320 160 393 464 216 434

1950 494 561 507 459 366 593 399 456 281 445

1960 321 409 407 258 285 376 288 346 379 507

1970 492 398 421 484 447 402 63 231 266 255

1980 285 335 178 140 135 186 206 306 160 153

1990 148 125 99 86 124 139 113 194 148 124

2000 108 89 100 104 98 106 93 112 143 96

2010 25 66 89 57 87 78

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1367B 1948 to 2015 68 years Series 14

[B] Entire series, effect on correlation ( .514) is:

Lower 2001> -.039 1956> -.027 1948> -.018 1960< -.013 1994< -.012 1995< -.011 Higher 2000 .025 2010 .022

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

2010 -5.0 SD

1367B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1948 301 349

1950 364 438 380 285 224 252 281 262 272 228

1960 116 166 204 124 116 241 272 257 210 366

1970 390 493 531 453 452 454 81 280 437 431

1980 411 366 190 134 132 172 258 379 325 233

1990 200 229 138 128 101 113 126 188 157 261

2000 108 101 167 214 113 140 138 132 134 95

2010 8 52 71 49 49 74

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1368A 1982 to 2015 34 years Series 15

[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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1982 2015 0 .18 .16 -.23 .12 -.28 -.08 .12 .21 -.10 -.02 .28\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .282) is:

Lower 2000> -.061 1989> -.044 1990> -.027 1982> -.025 1995< -.024 1993> -.021 Higher 2010 .084 1983 .053

1982 to 2015 segment:

Lower 2000> -.061 1989> -.044 1990> -.027 1982> -.025 1995< -.024 1993> -.021 Higher 2010 .084 1983 .053

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

1990 +3.4 SD

1368A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1982 457 299 387 368 284 322 351 402

1990 462 337 243 293 281 255 211 268 425 277

2000 215 176 232 189 209 188 126 207 187 94

2010 33 150 170 71 65 130

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1368B 1956 to 2015 60 years Series 16

[B] Entire series, effect on correlation ( .419) is:

Lower 1999< -.055 1993> -.044 1990> -.022 1979< -.018 2000> -.008 1989> -.008 Higher 1956 .051 1976 .033

1368B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 100 197 250 269

1960 292 260 281 294 271 348 358 398 399 560

1970 557 483 438 543 503 473 315 425 424 337

1980 389 434 369 367 404 395 307 337 455 389

1990 461 364 260 380 372 292 211 257 369 241

2000 205 176 273 281 258 204 184 286 251 143

2010 93 274 341 149 106 209

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1374A 1916 to 2015 100 years Series 17

[B] Entire series, effect on correlation ( .527) is:

Lower 2010> -.028 1925> -.021 1998< -.010 1997< -.009 1940< -.009 2012< -.008 Higher 1936 .017 1951 .012

[D] 1 Absent rings: Year Master N series Absent

1936 -1.643 16 2

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

1936 -4.9 SD

1374A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 128 134 251 195

1920 155 171 146 159 149 156 150 129 116 122

1930 155 131 84 106 101 105 0 52 90 55

1940 15 81 125 77 111 108 114 184 129 225

1950 205 284 212 233 174 215 200 225 226 229

1960 214 216 214 215 233 293 329 398 398 388

1970 411 403 431 519 404 500 332 374 323 380

1980 409 383 304 291 290 261 243 226 197 177

1990 170 200 128 107 131 143 123 108 98 131

2000 93 78 140 115 124 133 114 125 148 107

2010 119 121 96 66 88 67

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1374B 1919 to 2015 97 years Series 18

[B] Entire series, effect on correlation ( .610) is:

Lower 2010> -.028 1940> -.012 1983> -.012 1976> -.010 1963< -.008 1970> -.008 Higher 1948 .051 1936 .022

1374B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 126

1920 95 138 114 117 117 101 124 99 80 72

1930 96 107 103 112 106 107 56 85 82 147

1940 159 152 185 104 115 110 117 157 71 123

1950 151 188 159 181 154 168 155 161 145 174

1960 170 169 188 150 167 194 191 247 248 277

1970 317 241 248 331 269 344 268 248 222 223

1980 219 204 173 212 219 216 188 202 213 162

1990 171 217 129 100 113 163 119 127 113 125

2000 90 79 143 102 109 118 107 137 126 86

2010 108 121 111 69 87 69

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1378A 1928 to 2015 88 years Series 19

[B] Entire series, effect on correlation ( .538) is:

Lower 1936> -.037 2013> -.022 1928> -.017 1966< -.016 1937< -.015 1984< -.011 Higher 2001 .032 1948 .029

1378A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 123 101

1930 99 120 200 189 206 192 215 138 141 144

1940 190 245 299 286 301 223 288 312 206 250

1950 282 323 257 220 189 279 233 257 236 244

1960 257 281 277 286 261 286 241 290 270 283

1970 265 303 261 278 274 284 220 230 221 213

1980 242 216 174 108 91 102 139 159 133 128

1990 100 173 160 125 167 210 213 176 171 178

2000 72 13 49 60 101 136 86 117 192 127

2010 60 76 135 144 126 143

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1378B 1905 to 2015 111 years Series 20

[B] Entire series, effect on correlation ( .503) is:

Lower 1905> -.051 1913< -.022 2013> -.013 1989> -.010 1981< -.008 1906> -.008 Higher 1948 .024 1945 .016

1378B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1905 139 148 123 150 99

1910 96 131 98 47 58 54 47 74 113 104

1920 83 81 103 108 122 87 104 86 75 109

1930 118 177 197 197 162 181 164 160 177 181

1940 190 199 302 203 260 171 142 202 156 223

1950 285 322 275 220 183 227 220 229 214 228

1960 234 233 216 243 211 248 242 260 207 239

1970 221 290 232 253 256 238 161 157 135 139

1980 152 126 129 129 102 114 118 136 98 112

1990 61 128 74 66 106 156 148 134 125 166

2000 54 26 37 39 58 92 67 88 117 61

2010 33 39 62 64 55 77

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

1379A 1929 to 2015 87 years Series 21

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

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

1950 1999 4 .05 .11 -.09 .00 .05 .02 .06 -.03 .23 -.08 .20|-.14 -.22 -.15 .34\*-.23 -.08 -.12 .15 -.22 -.11

1966 2015 0 .04 .18 -.02 -.10 .18 .10 .05 .07 -.08 .09 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .455) is:

Lower 1972< -.041 2000> -.034 1950< -.030 1976> -.019 1963> -.018 1985< -.013 Higher 1948 .042 1936 .037

1950 to 1999 segment:

Lower 1972< -.056 1950< -.051 1976> -.037 1963> -.035 1964> -.019 1983> -.015 Higher 1999 .029 1980 .024

1966 to 2015 segment:

Lower 1972< -.067 2000> -.064 1976> -.036 2013> -.020 1983> -.018 1985< -.016 Higher 2010 .081 2012 .021

[D] 1 Absent rings: Year Master N series Absent

2010 -1.573 32 1

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

1963 +3.0 SD

1379A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 309

1930 327 349 278 275 295 342 230 252 374 310

1940 314 313 379 297 370 297 290 409 283 309

1950 294 372 375 338 343 396 347 374 360 300

1960 340 412 405 492 476 269 244 356 231 285

1970 208 199 132 243 323 333 322 314 388 283

1980 340 297 263 258 235 155 217 239 152 159

1990 195 239 169 147 207 221 174 171 225 226

2000 223 130 158 196 143 155 71 102 129 77

2010 0 70 137 63 26 70

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

1379B 1919 to 2015 97 years Series 22

[B] Entire series, effect on correlation ( .501) is:

Lower 2001> -.027 1965< -.026 1934< -.019 1933< -.013 2006< -.012 1952< -.011 Higher 1948 .029 2000 .018

1379B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 454

1920 256 225 252 205 208 139 122 209 158 127

1930 171 281 148 143 131 256 186 283 223 320

1940 383 505 467 461 589 364 356 465 278 381

1950 322 350 256 304 347 355 299 356 342 293

1960 308 328 269 226 213 180 183 313 297 287

1970 326 231 183 226 205 275 198 258 280 269

1980 257 263 229 181 186 139 137 164 150 134

1990 128 126 132 99 142 139 99 137 108 167

2000 75 96 106 127 122 114 38 76 112 52

2010 42 69 120 42 74 94

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

1381A 1930 to 2015 86 years Series 23

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

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

1966 2015 0 .14 -.07 .04 .12 .05 -.17 -.01 -.19 .02 -.03 .32\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .381) is:

Lower 1970< -.077 2011< -.023 1993> -.020 2012< -.015 2013> -.015 1942< -.012 Higher 1945 .036 2001 .019

1966 to 2015 segment:

Lower 1970< -.146 2011< -.042 1993> -.034 2012< -.027 2013> -.025 1991< -.014 Higher 2001 .042 1983 .033

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

1939 +3.0 SD

1381A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1930 299 344 261 268 301 301 241 280 390 447

1940 336 319 261 268 318 146 164 280 221 210

1950 218 301 177 276 277 413 306 417 347 274

1960 261 219 183 180 220 182 200 280 279 331

1970 132 168 237 279 286 348 278 351 321 305

1980 252 250 210 155 195 213 210 239 209 157

1990 163 160 174 226 260 291 198 227 183 221

2000 133 97 105 93 131 125 112 108 163 110

2010 90 57 55 71 87 82

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1381B 1920 to 2015 96 years Series 24

[B] Entire series, effect on correlation ( .451) is:

Lower 1965< -.059 2013> -.043 1921< -.018 1936> -.013 1923< -.013 1993> -.012 Higher 2001 .038 1945 .020

[C] Year-to-year changes diverging by over 4.0 std deviations:

2012 2013 4.3 SD

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

1965 -4.5 SD

1381B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 164 168 224 193 237 155 232 245 274 278

1930 351 449 341 335 333 275 262 267 217 182

1940 181 175 211 220 309 207 253 367 275 319

1950 271 302 276 275 260 391 280 346 264 287

1960 256 244 207 207 214 137 193 265 295 388

1970 355 381 306 325 289 377 296 356 320 313

1980 293 258 218 126 156 217 235 249 214 194

1990 162 177 201 227 265 322 246 266 236 288

2000 182 111 115 98 138 148 133 121 172 124

2010 93 99 91 149 128 103

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1383A 1951 to 2015 65 years Series 25

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

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

1951 2000 0 -.06 -.22 .01 .02 .10 -.12 .18 -.10 .04 .19 .31\*-.14 -.07 .19 .17 -.07 .03 -.15 -.06 -.02 -.10

1966 2015 -3 -.21 -.31 -.04 .00 -.05 -.12 .24 .32\*-.11 -.11 .25| - - - - - - - - - -

[B] Entire series, effect on correlation ( .266) is:

Lower 2010> -.071 2001> -.029 1980< -.024 1987< -.024 2000> -.016 1955< -.016 Higher 2013 .061 1989 .041

1951 to 2000 segment:

Lower 1980< -.042 1987< -.041 1955< -.029 2000> -.026 1983> -.024 1956> -.022 Higher 1989 .060 1999 .042

1966 to 2015 segment:

Lower 2010> -.083 2001> -.034 1980< -.028 1987< -.027 2000> -.019 1983> -.017 Higher 2013 .080 1989 .054

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

2001 +3.4 SD; 2010 +4.0 SD

1383A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1951 293 223 209 138 129 132 156 112 109

1960 77 86 72 82 81 122 109 131 165 229

1970 256 285 299 276 297 297 280 280 284 228

1980 215 251 228 257 225 257 281 224 311 203

1990 215 275 231 254 262 265 240 287 287 359

2000 306 301 327 294 210 205 164 216 206 228

2010 305 235 211 111 193 150

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1383B 1942 to 2015 74 years Series 26

[B] Entire series, effect on correlation ( .364) is:

Lower 1947< -.054 2001> -.043 2010> -.033 1956> -.029 1976> -.017 1952> -.013 Higher 2013 .030 2000 .024

1383B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1942 217 131 188 150 181 116 107 153

1950 211 218 240 174 128 123 151 151 103 81

1960 58 61 46 63 63 116 113 155 199 250

1970 265 324 334 350 364 399 383 390 353 284

1980 313 367 292 262 250 306 276 232 206 156

1990 141 265 215 210 280 296 210 245 233 309

2000 200 218 181 182 160 131 121 160 159 202

2010 226 242 220 108 227 168

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1384A 1959 to 2015 57 years Series 27

[B] Entire series, effect on correlation ( .313) is:

Lower 2008< -.035 2010> -.030 1959> -.028 1981< -.027 2013> -.020 2014< -.015 Higher 2001 .039 1977 .029

[C] Year-to-year changes diverging by over 4.0 std deviations:

1982 1983 4.1 SD

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

1982 -5.2 SD

1384A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 68

1960 41 24 8 55 75 89 42 102 161 213

1970 222 224 210 364 301 248 250 343 295 253

1980 280 262 208 264 314 287 249 233 322 173

1990 171 290 250 243 348 394 327 268 316 333

2000 237 175 226 321 287 255 220 290 229 186

2010 247 279 279 240 180 178

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1384B 1966 to 2015 50 years Series 28

[B] Entire series, effect on correlation ( .458) is:

Lower 1967< -.040 2001> -.039 1971< -.028 1976> -.023 1993> -.020 1996> -.017 Higher 2013 .043 1989 .028

1384B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1966 88 99 110 135

1970 149 138 177 220 200 191 212 294 265 263

1980 319 277 255 236 208 209 260 304 387 216

1990 211 263 266 297 394 390 358 270 363 334

2000 213 205 249 242 188 202 153 256 241 166

2010 139 153 202 113 109 125

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1385A 1863 to 2015 153 years Series 29

[B] Entire series, effect on correlation ( .483) is:

Lower 2010< -.026 1905> -.025 2013> -.016 1920> -.013 1925> -.011 1976> -.009 Higher 1936 .018 1897 .013

[C] Year-to-year changes diverging by over 4.0 std deviations:

2009 2010 -4.8 SD

[D] 3 Absent rings: Year Master N series Absent

1928 -1.675 14 1

1929 -1.536 15 1

1936 -1.643 16 2

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

2010 -7.4 SD

1385A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1863 285 232 136 79 77 59 75

1870 80 70 95 110 110 68 85 80 79 119

1880 115 126 129 131 136 121 136 108 138 116

1890 114 93 74 79 82 83 80 60 82 96

1900 95 70 66 121 104 109 100 129 115 120

1910 149 135 110 82 76 78 73 64 86 70

1920 92 94 101 80 75 72 28 8 0 0

1930 26 36 40 20 10 48 0 25 18 41

1940 31 27 76 78 98 23 54 91 43 84

1950 83 103 51 71 62 115 87 100 99 44

1960 47 82 69 67 74 102 81 113 89 134

1970 107 175 197 158 200 234 230 282 200 149

1980 215 231 210 138 166 149 135 166 126 109

1990 85 110 108 79 104 98 92 121 134 148

2000 93 86 77 98 96 88 94 112 113 100

2010 45 91 99 113 105 101

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1385B 1856 to 2015 160 years Series 30

[\*] Early part of series cannot be checked from 1856 to 1862 -- not matched by another series

[B] Entire series, effect on correlation ( .506) is:

Lower 1959< -.012 1968< -.011 1976> -.010 2013> -.009 1925> -.008 1917< -.008 Higher 1905 .019 1875 .018

1385B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1856 136 96 111 130

1860 87 204 176 181 155 128 106 128 118 149

1870 145 129 130 102 106 61 70 80 74 95

1880 143 118 133 156 211 222 184 175 176 141

1890 131 125 111 91 97 102 89 66 87 107

1900 90 77 76 117 132 71 61 84 102 72

1910 65 85 72 70 50 52 65 33 40 67

1920 65 96 95 98 79 72 83 50 25 37

1930 59 48 57 56 49 59 30 33 31 53

1940 34 52 84 90 108 92 95 115 83 103

1950 114 114 75 89 95 123 85 83 86 39

1960 46 70 53 48 40 68 71 94 52 106

1970 69 116 132 97 127 113 129 141 114 151

1980 148 162 149 109 115 122 132 161 136 108

1990 104 119 106 86 117 117 127 158 149 138

2000 94 83 103 100 101 79 78 77 97 85

2010 48 74 79 85 93 105

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1392A 1894 to 2015 122 years Series 31

[B] Entire series, effect on correlation ( .547) is:

Lower 1897> -.026 1920< -.022 1969< -.015 1948> -.011 1962> -.010 1903< -.010 Higher 1936 .016 1899 .012

[D] 1 Absent rings: Year Master N series Absent

1920 -.786 13 1

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

1920 -6.6 SD

1392A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 180 131 134 177 117 403

1900 211 146 108 154 242 106 133 181 177 156

1910 119 146 178 126 176 153 117 95 135 182

1920 0 189 149 160 185 97 130 104 51 60

1930 93 125 190 238 272 129 32 124 97 119

1940 149 132 118 90 108 68 81 130 89 81

1950 115 101 83 92 60 143 121 113 101 115

1960 140 204 244 168 156 254 196 259 175 152

1970 202 277 337 310 368 415 246 364 415 364

1980 389 372 309 223 292 326 345 434 343 349

1990 337 462 361 319 376 485 465 516 535 505

2000 304 179 170 207 206 178 167 230 286 218

2010 109 216 330 154 199 170

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1392B 1890 to 2015 126 years Series 32

[B] Entire series, effect on correlation ( .536) is:

Lower 1969< -.016 1970< -.015 1925> -.014 1893> -.012 1951< -.012 1943< -.012 Higher 1936 .018 1897 .016

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

1970 -5.2 SD

1392B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1890 183 166 157 194 132 133 184 113 141 206

1900 237 216 147 192 262 101 134 143 167 156

1910 163 219 208 148 176 172 135 176 243 258

1920 97 268 197 270 314 262 176 170 97 99

1930 139 152 203 305 253 198 54 142 115 128

1940 113 95 123 65 100 80 96 132 94 104

1950 142 117 98 117 156 166 140 147 159 89

1960 155 212 210 144 134 145 126 169 134 91

1970 70 134 179 177 201 219 172 201 236 242

1980 217 258 151 104 144 179 186 241 208 202

1990 160 219 195 134 201 253 300 308 302 311

2000 143 62 91 141 142 133 127 142 224 143

2010 48 123 155 102 155 160

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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 ()

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

1 1243A 1956 2015 60 2 0 .551 1.79 4.44 1.221 .968 .193 2.45 .379 .033 1

2 1243B 1956 2015 60 2 1 .329 1.62 3.06 .617 .839 .159 2.74 .490 .053 1

3 1242A 1954 2015 62 2 0 .401 1.98 3.87 .849 .821 .189 2.62 .452 -.013 1

4 1242B 1943 2015 73 3 0 .581 1.82 3.39 .707 .820 .198 2.82 .550 -.071 1

5 1244A 1956 2015 60 2 0 .492 2.45 5.82 1.214 .871 .190 2.75 .423 .013 1

6 1244B 1952 2015 64 2 0 .380 2.35 4.40 .913 .837 .183 2.57 .432 .060 1

7 1277A 1919 2015 97 4 0 .549 1.70 3.11 .655 .782 .228 2.61 .525 .035 1

8 1277B 1919 2015 97 4 2 .471 2.04 3.68 .843 .819 .215 2.44 .391 -.041 1

9 1291A 1897 2015 119 5 0 .583 2.18 5.02 1.004 .828 .234 2.53 .422 .038 1

10 1291B 1914 2015 102 4 0 .589 2.27 4.35 .700 .668 .213 2.74 .424 .013 1

11 1363A 1958 2015 58 2 1 .351 2.74 5.53 1.419 .932 .155 2.69 .554 -.077 1

12 1363B 1956 2015 60 2 1 .419 2.59 4.77 1.313 .937 .148 2.73 .463 -.035 1

13 1367A 1940 2015 76 3 0 .584 2.55 5.93 1.530 .779 .312 2.59 .422 -.015 1

14 1367B 1948 2015 68 3 0 .514 2.29 5.31 1.278 .784 .307 2.53 .425 -.037 2

15 1368A 1982 2015 34 1 1 .282 2.46 4.62 1.117 .755 .316 2.89 .689 -.090 2

16 1368B 1956 2015 60 2 0 .419 3.21 5.60 1.124 .746 .226 2.61 .445 .001 2

17 1374A 1916 2015 100 4 0 .527 1.92 5.19 1.104 .918 .235 2.46 .315 -.019 1

18 1374B 1919 2015 97 4 0 .610 1.53 3.44 .612 .842 .183 2.61 .453 .009 1

19 1378A 1928 2015 88 3 0 .538 1.94 3.23 .743 .845 .215 2.57 .509 .041 1

20 1378B 1905 2015 111 4 0 .503 1.47 3.22 .707 .869 .215 2.75 .498 .004 1

21 1379A 1929 2015 87 3 2 .455 2.57 4.92 1.032 .812 .266 2.54 .539 -.026 3

22 1379B 1919 2015 97 4 0 .501 2.22 5.89 1.133 .829 .246 2.78 .549 -.047 1

23 1381A 1930 2015 86 3 1 .381 2.27 4.47 .875 .757 .201 2.54 .399 -.006 1

24 1381B 1920 2015 96 4 0 .451 2.39 4.49 .798 .778 .180 2.70 .426 .051 3

25 1383A 1951 2015 65 2 2 .266 2.19 3.59 .728 .825 .163 2.56 .451 .019 2

26 1383B 1942 2015 74 3 0 .364 2.08 3.99 .871 .853 .199 2.63 .470 -.094 1

27 1384A 1959 2015 57 2 0 .313 2.27 3.94 .909 .789 .267 2.72 .393 .025 3

28 1384B 1966 2015 50 1 0 .458 2.26 3.94 .789 .755 .173 2.65 .606 -.018 2

29 1385A 1863 2015 153 6 0 .483 .99 2.85 .507 .833 .292 2.35 .281 -.043 1

30 1385B 1856 2015 160 6 0 .506 .98 2.22 .384 .801 .209 2.64 .378 -.015 1

31 1392A 1894 2015 122 5 0 .547 2.06 5.35 1.160 .799 .313 2.71 .338 -.037 1

32 1392B 1890 2015 126 5 0 .536 1.66 3.14 .589 .573 .272 2.51 .454 -.063 2

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Total or mean: 2719 102 11 .484 1.99 5.93 .873 .809 .226 2.89 .440 -.011

- = [ COFECHA ACRU COF ] = -