[] Dendrochronology Program Library Run QURU Program COF 08:02 Thu 01 Mar 2018 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30377

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 QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

 Title of run: QURU\_HHSC12F02\_EWLW\_ORIGINAL-50

 File of DATED series: QURU\_HHSC12F02\_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 1877 to 2015 139 years

 Continuous time span is 1877 to 2015 139 years

 Portion with two or more series is 1882 to 2015 134 years

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

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

 \*O\* Master series 1877 2015 139 yrs \*O\*

 \*F\* Total rings in all series 3117 \*F\*

 \*E\* Total dated rings checked 3112 \*E\*

 \*C\* Series intercorrelation .726 \*C\*

 \*H\* Average mean sensitivity .222 \*H\*

 \*A\* Segments, possible problems 0 \*A\*

 \*\*\* Mean length of series 100.5 \*\*\*

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

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

 No ring measurements of zero value

 1900 -1.458 3 1950 -.767 31 2000 1.048 31

 1901 -.884 4 1951 .370 31 2001 .581 31

 1902 .979 6 1952 -.167 31 2002 .048 31

 1903 .489 6 1953 -1.823 31 2003 -.896 31

 1904 .823 6 1954 -2.384 31 2004 .636 31

 1905 .833 7 1955 .479 31 2005 -1.277 31

 1906 1.619 8 1956 .735 31 2006 -1.623 31

 1907 -.217 8 1957 1.152 31 2007 -1.007 31

 1908 -.556 10 1958 .639 31 2008 .311 31

 1909 -1.443 11 1959 .441 31 2009 .709 31

 1910 -.294 11 1960 .417 31 2010 -.542 31

 1911 .156 13 1961 1.330 31 2011 .262 31

 1912 .040 13 1962 -.407 31 2012 .622 31

 1913 .072 13 1963 .060 31 2013 1.384 31

 1914 -1.807 14 1964 .383 31 2014 .792 31

 1915 -.431 15 1965 -1.598 31 2015 -1.488 31

 1916 .500 16 1966 -.583 31

 1917 .661 17 1967 -.116 31

 1918 .488 20 1968 .860 31

 1919 -.464 21 1969 -.158 31

 1920 .849 22 1970 -.818 31

 1921 -2.097 24 1971 -1.114 31

 1922 .255 24 1972 1.578 31

 1923 -.680 24 1973 1.361 31

 1924 -.261 24 1974 .445 31

 1925 1.032 24 1975 .766 31

 1926 -.057 24 1976 .658 31

 1877 .669 1 1927 .862 24 1977 -1.307 31

 1878 .059 1 1928 .284 24 1978 -.980 31

 1879 .240 1 1929 .527 24 1979 -.410 31

 1880 -2.019 1 1930 .178 25 1980 -.183 31

 1881 -1.279 1 1931 .637 25 1981 -.252 31

 1882 -.068 2 1932 1.660 25 1982 .777 31

 1883 -.179 2 1933 -1.476 25 1983 -.513 31

 1884 -3.974 2 1934 -.237 26 1984 -.650 31

 1885 .145 2 1935 1.060 26 1985 .169 31

 1886 .840 2 1936 -1.482 27 1986 .922 31

 1887 1.947 2 1937 -.419 28 1987 1.254 31

 1888 .609 2 1938 -.493 28 1988 .007 31

 1889 1.573 2 1939 .469 28 1989 .572 31

 1890 .012 2 1940 -.135 28 1990 -1.051 31

 1891 .928 3 1941 -.960 28 1991 -2.092 31

 1892 .697 3 1942 .151 28 1992 -.585 31

 1893 -.958 3 1943 .727 30 1993 -.036 31

 1894 .786 3 1944 1.356 30 1994 .475 31

 1895 -1.505 3 1945 .254 30 1995 -.204 31

 1896 .274 3 1946 .110 31 1996 1.817 31

 1897 .763 3 1947 1.667 31 1997 .449 31

 1898 -.327 3 1948 .529 31 1998 1.482 31

 1899 -1.616 3 1949 -1.838 31 1999 -.153 31

PART 5: CORRELATION OF SERIES BY SEGMENTS: QURU\_HHSC12F02\_EWLW\_ORIGINAL-50 08:02 Thu 01 Mar 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 1875 1900 1925 1950 1975

 1924 1949 1974 1999 2024

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

 1 4A 1919 2015 .76 .76 .66 .55

 2 4B 1905 2015 .83 .90 .84 .68

 3 114A 1877 2015 .76 .57 .67 .59 .51

 4 114B 1882 2015 .83 .65 .71 .80 .75

 5 115A 1909 2015 .68 .82 .79 .78

 6 115B 1936 2015 .82 .77 .75

 7 116A 1901 2015 .74 .88 .83 .78

 8 116B 1891 2015 .71 .74 .86 .84 .71

 9 117A 1911 2015 .82 .89 .86 .83

 10 117B 1908 2015 .77 .88 .85 .85

 11 118A 1918 2015 .82 .86 .81 .71

 12 118B 1921 2015 .66 .88 .80 .67

 13 140A 1908 2015 .53 .43 .42 .63

 14 140B 1902 2015 .52 .53 .58 .68

 15 198A 1906 2015 .82 .70 .71 .73

 16 198B 1916 2015 .77 .75 .63 .63

 17 199A 1943 2015 .81 .80 .76

 18 199B 1921 2015 .78 .77 .76 .66

 19 200A 1915 2015 .69 .73 .67 .57

 20 200B 1934 2015 .81 .75 .64

 21 402A 1920 2015 .84 .85 .86 .83

 22 402B 1918 2015 .76 .80 .76 .71

 23 403A 1946 2015 .71 .71 .71

 24 403B 1902 2015 .60 .60 .67 .66

 25 404A 1918 2015 .74 .68 .64 .65

 26 404B 1930 2015 .65 .69 .64

 27 404C 1943 2015 .77 .76 .72

 28 410A 1911 2015 .82 .90 .88 .86

 29 410B 1914 2015 .87 .88 .70 .67

 30 412A 1937 2015 .42 .60 .72

 31 412B 1917 2015 .74 .68 .64 .67

 Av segment correlation .77 .73 .75 .73 .70

PART 6: POTENTIAL PROBLEMS: QURU\_HHSC12F02\_EWLW\_ORIGINAL-50 08:02 Thu 01 Mar 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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 4A 1919 to 2015 97 years Series 1

 [B] Entire series, effect on correlation ( .679) is:

 Lower 2003> -.035 2005> -.015 1998< -.011 1990> -.009 1954> -.008 1951< -.007 Higher 1991 .015 2015 .011

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

 1955 +3.0 SD; 2003 +4.5 SD

 4A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1919 191

 1920 267 174 277 214 214 340 240 286 273 329

 1930 309 277 336 150 204 218 174 211 193 216

 1940 189 143 165 160 173 171 136 212 131 56

 1950 66 59 72 51 66 249 189 131 101 115

 1960 115 133 76 80 94 59 60 71 74 69

 1970 56 64 98 90 81 81 83 61 67 65

 1980 56 51 59 53 50 55 57 67 57 50

 1990 51 40 48 43 56 58 62 48 45 44

 2000 48 43 39 69 66 50 30 42 35 34

 2010 37 36 42 56 49 22

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 4B 1905 to 2015 111 years Series 2

 [B] Entire series, effect on correlation ( .778) is:

 Lower 2015> -.035 1914< -.011 2011< -.008 1921> -.006 2000< -.006 1908> -.005 Higher 1933 .015 1949 .010

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

 2015 +3.6 SD

 4B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1905 166 185 145 191 133

 1910 214 291 229 237 86 154 283 426 343 299

 1920 378 207 359 274 253 444 274 329 267 312

 1930 256 244 318 153 220 256 142 189 146 199

 1940 197 169 204 211 216 211 177 285 171 73

 1950 101 111 109 74 59 124 125 127 111 131

 1960 123 151 98 111 109 87 121 113 156 93

 1970 87 71 132 120 109 117 143 89 94 102

 1980 83 72 80 74 73 92 92 105 79 83

 1990 64 54 61 70 70 72 120 72 80 60

 2000 58 63 60 52 59 42 33 43 40 50

 2010 35 33 47 58 50 54

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 114A 1877 to 2015 139 years Series 3

 [\*] Early part of series cannot be checked from 1877 to 1881 -- not matched by another series

 [B] Entire series, effect on correlation ( .642) is:

 Lower 1977> -.023 1921> -.020 1998< -.016 1990< -.012 1948< -.011 2015> -.009 Higher 1884 .037 1933 .012

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

 1921 +3.2 SD; 1977 +4.5 SD

 114A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1877 392 380 386

 1880 318 332 374 361 239 414 464 512 413 515

 1890 384 390 347 262 381 204 230 311 248 172

 1900 123 161 239 233 293 269 267 173 157 84

 1910 101 119 131 128 99 100 132 130 159 125

 1920 165 145 160 139 134 165 169 190 152 184

 1930 198 182 212 151 187 169 165 162 169 180

 1940 147 149 170 170 201 142 117 156 107 113

 1950 126 128 109 89 77 121 131 145 136 113

 1960 131 172 114 132 128 104 115 124 126 102

 1970 82 82 105 156 100 123 121 140 105 95

 1980 103 111 110 79 107 98 100 115 101 104

 1990 70 75 86 87 92 85 97 87 69 68

 2000 87 86 72 59 79 64 47 58 58 71

 2010 53 55 68 75 71 64

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 114B 1882 to 2015 134 years Series 4

 [B] Entire series, effect on correlation ( .774) is:

 Lower 1933> -.014 1928< -.010 1940< -.009 1982< -.008 1921> -.008 1934> -.008 Higher 1884 .038 1954 .007

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

 1934 +3.4 SD

 114B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1882 457 462 283 449 497 650 520 585

 1890 435 539 561 375 555 310 593 634 439 267

 1900 271 370 477 461 556 549 559 283 278 138

 1910 209 248 252 266 187 297 307 288 255 238

 1920 264 214 231 223 236 255 227 262 203 214

 1930 223 261 236 208 259 221 172 198 189 196

 1940 146 156 176 191 226 145 148 208 169 139

 1950 162 179 171 113 96 133 145 160 145 142

 1960 153 195 146 151 154 116 158 169 172 166

 1970 163 143 236 259 198 192 229 172 155 184

 1980 159 165 143 126 144 153 136 169 126 160

 1990 119 82 130 121 178 122 171 144 144 112

 2000 131 140 118 94 107 89 81 71 79 102

 2010 90 101 108 139 107 78

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 115A 1909 to 2015 107 years Series 5

 [B] Entire series, effect on correlation ( .726) is:

 Lower 1921> -.032 1931< -.015 1995< -.013 1918< -.007 1909> -.007 1938< -.006 Higher 1933 .017 1936 .014

 115A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1909 24

 1910 32 40 64 73 12 12 29 33 25 23

 1920 41 41 82 57 47 110 79 98 63 72

 1930 55 44 93 46 74 138 52 104 65 127

 1940 94 63 102 137 169 177 133 246 167 70

 1950 116 238 160 99 76 185 171 228 160 129

 1960 162 209 92 132 123 84 90 90 152 106

 1970 74 67 191 163 143 150 172 86 102 119

 1980 121 86 117 120 83 99 133 170 106 122

 1990 82 68 110 117 91 67 179 113 119 106

 2000 174 130 106 88 119 86 67 80 146 116

 2010 92 134 132 225 156 96

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 115B 1936 to 2015 80 years Series 6

 [B] Entire series, effect on correlation ( .779) is:

 Lower 1995< -.023 1936< -.020 2005> -.009 1945> -.007 2004< -.007 1990> -.006 Higher 1949 .015 1996 .010

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

 1936 -4.8 SD

 115B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1936 58 113 118 137

 1940 124 105 159 172 196 214 168 279 158 70

 1950 110 242 160 107 107 189 185 264 206 217

 1960 209 286 142 182 188 122 144 124 172 134

 1970 84 71 212 212 162 162 182 91 106 137

 1980 112 103 122 107 90 97 113 135 93 120

 1990 91 72 86 118 95 52 164 95 98 86

 2000 136 102 81 77 82 79 64 69 102 106

 2010 83 109 116 156 114 91

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 116A 1901 to 2015 115 years Series 7

 [B] Entire series, effect on correlation ( .778) is:

 Lower 1997< -.015 2005> -.012 1908> -.011 1916< -.008 1901< -.007 1917< -.007 Higher 1954 .009 1949 .008

 116A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1901 17 128 122 141 153 187 107 121 32

 1910 45 36 37 55 25 19 26 31 35 41

 1920 59 39 71 73 92 147 126 153 158 221

 1930 132 159 214 129 184 250 143 203 146 218

 1940 201 157 221 258 228 180 183 275 193 95

 1950 139 200 153 103 89 158 169 188 179 195

 1960 216 243 144 188 183 133 139 133 195 161

 1970 117 135 315 294 188 218 218 107 141 136

 1980 127 119 162 123 100 101 115 148 111 137

 1990 102 85 105 120 116 120 154 102 111 111

 2000 120 120 107 105 106 106 90 95 128 126

 2010 98 122 142 153 130 88

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 116B 1891 to 2015 125 years Series 8

 [B] Entire series, effect on correlation ( .749) is:

 Lower 2005> -.019 2006< -.016 2003> -.011 1930< -.008 1921> -.008 1917< -.007 Higher 1949 .013 1991 .009

 116B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1891 110 106 72 101 59 107 98 66 35

 1900 66 91 211 148 151 213 231 135 125 36

 1910 42 42 67 79 41 37 71 59 65 69

 1920 127 83 136 124 137 208 165 226 195 248

 1930 145 218 279 153 208 270 148 261 157 222

 1940 155 153 194 239 227 177 160 247 166 94

 1950 128 172 122 98 87 167 141 166 135 160

 1960 160 206 102 156 148 109 115 120 177 136

 1970 123 124 250 228 150 173 151 101 120 111

 1980 115 111 138 100 93 104 128 152 116 158

 1990 123 94 110 131 131 122 161 119 119 115

 2000 135 148 123 134 140 130 81 89 111 115

 2010 90 112 126 157 133 86

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 117A 1911 to 2015 105 years Series 9

 [B] Entire series, effect on correlation ( .827) is:

 Lower 1914< -.021 2006> -.009 1921> -.008 1936> -.006 2004< -.006 1938< -.005 Higher 1933 .010 1949 .009

 117A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1911 165 143 137 59 156 188 271 210 137

 1920 203 126 202 149 160 228 180 213 189 206

 1930 216 210 253 100 150 223 123 137 87 119

 1940 105 86 112 143 133 112 95 138 85 47

 1950 53 90 82 51 45 90 78 85 69 68

 1960 66 87 54 70 70 53 71 67 125 78

 1970 55 58 145 136 78 76 104 63 77 79

 1980 73 73 94 74 60 92 109 98 85 73

 1990 69 54 73 97 89 74 110 82 126 78

 2000 102 94 90 61 75 60 82 64 94 115

 2010 84 119 109 153 104 69

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 117B 1908 to 2015 108 years Series 10

 [B] Entire series, effect on correlation ( .796) is:

 Lower 1908< -.040 1909> -.009 1977> -.006 2007< -.006 1921> -.005 1989< -.004 Higher 1933 .014 1949 .008

 117B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1908 57 137

 1910 210 209 210 207 107 271 332 447 420 292

 1920 333 208 331 241 250 310 234 287 244 233

 1930 254 279 330 158 189 301 164 201 146 159

 1940 159 144 181 222 190 149 125 234 174 83

 1950 104 189 123 88 69 146 123 198 132 111

 1960 95 144 90 100 125 89 104 102 157 98

 1970 101 102 227 228 139 155 189 139 144 151

 1980 142 146 167 120 111 155 198 192 139 127

 1990 106 87 108 158 173 148 209 140 205 125

 2000 149 152 129 100 135 97 91 73 109 145

 2010 127 153 148 239 184 86

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 118A 1918 to 2015 98 years Series 11

 [B] Entire series, effect on correlation ( .770) is:

 Lower 2006> -.018 1992< -.009 1921> -.008 2011< -.008 2005> -.008 2010> -.007 Higher 1949 .015 1954 .012

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

 2006 +3.0 SD

 118A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1918 226 168

 1920 190 119 202 115 129 170 118 163 117 146

 1930 180 173 228 103 116 204 103 149 140 181

 1940 172 138 155 152 205 167 147 238 146 85

 1950 108 166 165 111 92 180 195 214 194 171

 1960 165 241 106 137 164 122 152 163 192 153

 1970 134 141 223 248 177 179 229 157 166 181

 1980 160 167 172 151 144 140 178 172 139 168

 1990 119 120 118 131 188 142 215 156 217 150

 2000 187 198 160 131 182 135 154 112 140 143

 2010 134 109 115 140 117 79

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 118B 1921 to 2015 95 years Series 12

 [B] Entire series, effect on correlation ( .656) is:

 Lower 1921> -.092 1922< -.021 2013< -.019 2006> -.012 1998< -.011 1928< -.009 Higher 1933 .028 1991 .016

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

 1921 +5.2 SD

 118B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1921 161 91 84 108 129 90 123 82 132

 1930 157 118 158 78 91 124 78 90 83 95

 1940 85 81 105 126 142 145 122 194 134 79

 1950 83 104 107 82 68 127 150 174 147 137

 1960 137 147 107 131 127 97 92 107 132 110

 1970 104 113 190 214 159 145 180 127 114 88

 1980 84 102 110 91 88 98 105 125 94 92

 1990 73 64 71 85 92 77 101 92 81 85

 2000 90 90 92 75 78 75 77 66 90 88

 2010 73 71 83 69 75 60

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 140A 1908 to 2015 108 years Series 13

 [B] Entire series, effect on correlation ( .564) is:

 Lower 1936> -.023 1990> -.020 1937< -.016 1925< -.014 1966> -.011 1929< -.010 Higher 1921 .052 1933 .029

 [E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

 1951 +3.5 SD; 1966 +3.9 SD; 1990 +3.1 SD

 140A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1908 122 145

 1910 176 180 180 177 131 126 169 158 127 114

 1920 170 44 52 32 35 33 56 45 48 27

 1930 28 23 23 13 20 17 18 11 13 15

 1940 16 16 22 28 32 31 36 45 33 19

 1950 32 96 64 49 48 94 66 55 65 69

 1960 64 76 85 80 131 90 185 170 141 111

 1970 95 119 189 178 173 179 181 176 178 164

 1980 235 317 376 287 287 255 367 313 289 335

 1990 370 298 348 329 311 334 436 390 458 303

 2000 366 347 310 253 324 195 164 263 291 376

 2010 337 389 334 312 260 117

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 140B 1902 to 2015 114 years Series 14

 [B] Entire series, effect on correlation ( .593) is:

 Lower 1983< -.031 1990> -.023 1933> -.022 1925< -.016 1903< -.012 1910> -.011 Higher 1921 .044 2015 .014

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

 1910 +3.9 SD; 1990 +3.0 SD

 140B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1902 181 117 114 109 176 119 116 100

 1910 175 121 111 96 74 97 100 93 65 54

 1920 99 30 32 30 26 22 32 45 31 19

 1930 20 15 19 15 13 17 11 12 11 15

 1940 13 15 18 35 33 36 35 36 23 22

 1950 26 65 54 46 52 78 84 83 100 148

 1960 173 210 191 142 184 113 177 177 212 151

 1970 151 171 290 258 212 258 235 181 180 193

 1980 219 239 283 188 249 324 378 356 333 305

 1990 391 322 379 387 389 370 487 423 532 340

 2000 402 377 320 253 330 206 192 254 353 398

 2010 329 385 379 328 252 116

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 198A 1906 to 2015 110 years Series 15

 [B] Entire series, effect on correlation ( .767) is:

 Lower 1933> -.014 1974< -.013 1956< -.011 2006> -.008 1962> -.008 2004< -.005 Higher 1921 .016 1914 .010

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

 1933 +3.1 SD

 198A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1906 258 117 98 50

 1910 67 118 110 108 67 86 119 120 143 120

 1920 146 95 131 128 135 170 187 181 200 226

 1930 190 254 305 216 192 220 177 206 153 188

 1940 176 144 146 195 203 145 128 224 205 88

 1950 97 116 96 61 48 87 68 84 99 123

 1960 119 140 128 112 140 83 115 112 114 99

 1970 103 90 123 113 81 89 88 77 71 73

 1980 87 98 111 85 99 118 100 128 95 113

 1990 80 75 96 93 88 87 147 111 158 108

 2000 123 96 85 64 73 61 77 66 81 88

 2010 75 99 116 120 111 62

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 198B 1916 to 2015 100 years Series 16

 [B] Entire series, effect on correlation ( .713) is:

 Lower 1986< -.024 1956< -.016 1987< -.014 1923< -.012 1938> -.008 1970> -.007 Higher 1921 .037 1953 .013

 198B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1916 169 187 168 166

 1920 191 108 161 122 181 255 212 248 236 279

 1930 290 332 349 228 224 260 203 239 278 273

 1940 249 180 175 200 199 165 136 212 198 94

 1950 91 114 110 57 60 83 69 94 99 120

 1960 126 138 105 119 131 93 123 117 146 126

 1970 127 109 159 131 125 117 129 90 81 115

 1980 98 89 97 83 80 113 75 72 77 81

 1990 69 71 81 100 80 70 120 95 138 96

 2000 93 90 90 63 79 63 74 74 91 90

 2010 63 100 89 92 95 74

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 199A 1943 to 2015 73 years Series 17

 [B] Entire series, effect on correlation ( .807) is:

 Lower 1977< -.025 2006> -.022 1970> -.009 2004< -.006 2012< -.006 1980> -.005 Higher 1949 .018 1965 .012

 199A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1943 315 377 333 293 382 333 170

 1950 223 305 218 174 150 278 325 344 289 260

 1960 239 245 177 186 207 143 192 200 234 210

 1970 217 194 253 277 231 210 208 151 175 181

 1980 220 206 210 199 199 222 208 280 192 209

 1990 151 137 170 182 216 183 243 207 269 212

 2000 296 205 189 141 162 118 175 158 201 229

 2010 151 231 176 265 218 124

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 199B 1921 to 2015 95 years Series 18

 [B] Entire series, effect on correlation ( .734) is:

 Lower 2006> -.022 1921> -.019 1973< -.013 1993< -.012 1941> -.012 1930< -.011 Higher 1949 .017 1933 .014

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

 2006 +3.2 SD

 199B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1921 146 158 149 156 189 184 189 207 204

 1930 148 168 208 141 197 252 131 194 200 184

 1940 191 223 211 237 248 217 207 245 238 113

 1950 132 182 177 121 117 235 257 262 255 229

 1960 214 250 194 216 221 175 211 215 241 250

 1970 219 218 232 209 205 228 256 198 194 194

 1980 255 251 264 235 237 237 250 312 243 249

 1990 204 194 223 193 248 224 324 258 341 244

 2000 305 280 244 195 268 180 253 216 222 213

 2010 226 229 183 277 225 139

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 200A 1915 to 2015 101 years Series 19

 [B] Entire series, effect on correlation ( .621) is:

 Lower 2010< -.047 1915< -.029 1935< -.012 1983> -.009 2006> -.007 2000< -.007 Higher 1921 .023 1936 .017

 200A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1915 257 323 338 324 291

 1920 362 260 297 265 297 278 243 241 241 227

 1930 254 304 312 206 199 166 115 127 160 193

 1940 148 146 199 184 207 148 198 189 175 115

 1950 126 116 148 94 70 136 157 178 225 191

 1960 180 175 167 185 170 132 109 113 152 109

 1970 105 89 141 149 116 121 96 74 72 77

 1980 77 133 191 173 165 198 172 127 124 113

 1990 84 80 125 136 118 101 115 123 127 99

 2000 96 94 106 92 131 77 84 94 91 91

 2010 47 76 80 93 105 57

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 200B 1934 to 2015 82 years Series 20

 [B] Entire series, effect on correlation ( .717) is:

 Lower 2005< -.027 1991> -.021 2006> -.010 1989< -.009 1938> -.008 2000< -.007 Higher 1936 .018 1954 .016

 200B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1934 210 223 168 158 209 215

 1940 202 183 255 236 246 182 222 231 224 155

 1950 181 204 193 119 89 175 213 245 247 207

 1960 191 210 160 189 163 131 121 142 172 163

 1970 153 140 160 190 176 178 140 115 100 110

 1980 113 115 158 150 160 177 204 183 139 126

 1990 106 131 146 158 180 173 176 172 194 163

 2000 152 144 170 137 163 99 115 118 129 130

 2010 93 118 118 130 132 85

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 402A 1920 to 2015 96 years Series 21

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

 Lower 1954> -.019 2005> -.012 1945> -.008 2006> -.007 2010> -.006 2012< -.005 Higher 2015 .007 1965 .007

 402A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1920 167 89 137 122 182 221 117 174 150 140

 1930 138 155 190 99 110 160 101 125 117 133

 1940 145 112 161 166 227 228 152 239 168 75

 1950 116 167 185 106 157 209 247 254 232 169

 1960 199 220 166 172 184 109 174 189 214 135

 1970 135 107 319 228 179 229 227 116 165 192

 1980 231 259 267 142 179 240 300 260 206 255

 1990 169 135 202 187 252 189 326 228 317 188

 2000 285 240 197 180 292 221 214 200 277 320

 2010 241 236 184 284 196 94

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 402B 1918 to 2015 98 years Series 22

 [B] Entire series, effect on correlation ( .740) is:

 Lower 1954> -.020 2006> -.019 2010> -.011 2012< -.009 1920< -.008 1961< -.007 Higher 1921 .014 2015 .012

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

 1921 -5.6 SD; 2006 +3.1 SD

 402B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1918 203 196

 1920 172 103 187 186 205 207 176 231 195 187

 1930 159 175 210 124 138 166 115 131 146 145

 1940 137 110 152 151 227 209 196 284 204 97

 1950 115 205 189 98 148 226 216 212 200 138

 1960 128 130 100 105 137 97 131 117 143 93

 1970 92 85 214 169 155 182 195 115 144 179

 1980 199 208 218 124 143 200 229 201 187 178

 1990 140 107 134 151 214 149 244 191 267 156

 2000 256 203 167 178 198 169 202 151 241 204

 2010 202 178 134 162 142 85

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 403A 1946 to 2015 70 years Series 23

 [B] Entire series, effect on correlation ( .766) is:

 Lower 1977< -.017 1985< -.015 1983> -.014 1951< -.012 1971> -.010 1988> -.009 Higher 1965 .015 1954 .013

 403A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1946 113 154 143 69

 1950 129 138 139 111 86 228 340 286 234 208

 1960 255 344 239 288 256 161 190 257 272 285

 1970 244 250 318 299 282 271 249 176 183 269

 1980 304 271 254 267 221 182 263 299 308 292

 1990 214 153 176 246 264 180 280 257 273 187

 2000 214 206 142 109 182 122 76 121 175 168

 2010 87 96 144 147 155 69

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 403B 1902 to 2015 114 years Series 24

 [B] Entire series, effect on correlation ( .656) is:

 Lower 1936> -.019 1945< -.018 1914> -.018 1976< -.016 1927< -.009 1973< -.009 Higher 1921 .034 1949 .015

 403B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1902 231 233 190 145 143 77 73 61

 1910 67 78 71 62 71 111 95 84 73 67

 1920 85 52 111 88 99 119 89 80 105 95

 1930 104 113 157 102 102 121 109 103 99 95

 1940 126 84 108 136 144 86 117 138 133 82

 1950 146 138 192 150 92 326 391 399 307 301

 1960 251 323 281 268 250 163 163 218 241 248

 1970 241 230 244 194 191 255 168 126 135 177

 1980 186 166 222 197 142 163 228 267 276 263

 1990 208 145 140 239 220 196 297 234 270 200

 2000 211 172 137 134 195 125 63 145 206 191

 2010 115 138 183 179 180 77

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 404A 1918 to 2015 98 years Series 25

 [B] Entire series, effect on correlation ( .709) is:

 Lower 1976< -.020 1949> -.017 1950> -.012 1963< -.009 2011< -.007 1951< -.006 Higher 1921 .039 1933 .023

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

 1950 +3.5 SD

 404A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1918 191 149

 1920 162 85 123 127 124 135 119 120 132 116

 1930 112 137 158 97 96 152 124 128 157 200

 1940 163 133 144 165 153 147 198 211 181 136

 1950 223 140 121 82 54 134 184 206 163 198

 1960 168 199 180 133 178 131 174 228 225 206

 1970 180 164 223 194 210 249 151 135 166 232

 1980 224 158 185 162 194 187 234 204 159 189

 1990 139 130 133 148 187 196 183 198 187 159

 2000 197 148 148 116 176 116 91 123 139 128

 2010 125 99 152 158 173 77

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 404B 1930 to 2015 86 years Series 26

 [B] Entire series, effect on correlation ( .665) is:

 Lower 1933> -.019 1996< -.017 1945< -.017 1994< -.011 1934< -.011 1938> -.011 Higher 1954 .021 1953 .018

 404B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1930 203 209 268 234 197 306 239 269 321 334

 1940 289 228 231 272 352 203 235 318 299 211

 1950 224 280 213 137 112 211 259 297 283 298

 1960 304 377 273 284 330 216 188 257 369 346

 1970 273 238 262 254 302 291 231 195 200 264

 1980 246 221 329 302 292 346 409 391 307 370

 1990 254 250 271 247 225 304 260 253 344 252

 2000 298 247 217 193 274 173 128 168 172 177

 2010 151 161 253 227 208 102

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 404C 1943 to 2015 73 years Series 27

 [B] Entire series, effect on correlation ( .781) is:

 Lower 1976< -.015 1995> -.014 1945< -.014 1969> -.013 1990< -.008 1991> -.008 Higher 2015 .014 1954 .014

 404C Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1943 295 363 233 268 306 298 212

 1950 215 274 212 138 128 243 285 338 304 333

 1960 334 402 280 280 316 213 243 335 408 407

 1970 279 241 303 272 318 292 217 187 191 206

 1980 230 211 297 263 234 260 385 360 259 298

 1990 167 178 213 203 227 321 297 251 332 231

 2000 298 256 244 204 302 197 141 171 167 189

 2010 153 160 232 220 194 89

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 410A 1911 to 2015 105 years Series 28

 [B] Entire series, effect on correlation ( .842) is:

 Lower 1914> -.018 1915> -.013 1918< -.004 2005> -.003 1990< -.003 1919< -.003 Higher 1921 .018 1933 .011

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

 1915 +3.4 SD

 410A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1911 165 140 144 145 224 184 182 150 114

 1920 169 89 223 170 206 268 171 259 204 181

 1930 180 263 222 102 136 198 86 140 148 178

 1940 156 104 135 155 192 186 151 232 202 90

 1950 95 120 151 104 73 194 216 240 180 145

 1960 152 169 130 133 133 91 103 123 132 110

 1970 88 93 167 165 127 127 135 83 100 101

 1980 108 109 135 98 88 99 120 122 86 91

 1990 56 61 85 95 97 90 144 111 147 98

 2000 113 93 75 67 85 67 48 63 71 89

 2010 80 92 90 105 85 64

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 410B 1914 to 2015 102 years Series 29

 [B] Entire series, effect on correlation ( .786) is:

 Lower 1987< -.041 2003> -.015 1915> -.009 1917< -.008 1914> -.007 1968< -.007 Higher 1921 .024 1949 .010

 410B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1914 140 249 212 149 166 151

 1920 210 97 220 200 206 293 186 228 187 207

 1930 214 232 269 134 169 213 109 155 157 195

 1940 170 143 144 186 230 174 145 299 207 101

 1950 154 204 179 125 121 274 254 271 195 179

 1960 175 228 155 180 169 121 165 124 130 103

 1970 106 111 201 234 162 169 190 120 129 142

 1980 126 132 133 112 113 130 150 97 99 134

 1990 100 107 117 137 156 120 160 125 172 100

 2000 148 165 156 166 145 83 69 84 121 182

 2010 123 139 112 145 122 75

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 412A 1937 to 2015 79 years Series 30

 [B] Entire series, effect on correlation ( .594) is:

 Lower 1937< -.040 1949> -.021 1983> -.017 1961< -.010 1971> -.010 1951< -.010 Higher 1991 .030 2015 .024

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

 1949 +3.1 SD

 412A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1937 220 237 281

 1940 264 220 244 220 299 198 232 295 285 187

 1950 219 118 86 62 49 69 156 155 131 108

 1960 75 84 78 66 112 95 115 138 198 215

 1970 231 254 337 322 399 391 298 236 287 274

 1980 318 342 443 474 397 392 419 452 416 520

 1990 452 328 464 454 617 518 693 480 625 417

 2000 513 440 471 291 423 207 275 396 552 494

 2010 448 505 553 494 468 212

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 412B 1917 to 2015 99 years Series 31

 [B] Entire series, effect on correlation ( .710) is:

 Lower 1932< -.022 1977> -.015 1988> -.010 1923> -.009 1949> -.009 1986< -.007 Higher 1921 .035 1933 .012

 412B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1917 276 278 239

 1920 251 191 241 253 236 235 225 236 270 256

 1930 223 231 198 164 236 272 200 173 186 227

 1940 203 178 224 214 313 224 245 251 238 170

 1950 209 248 182 90 75 230 246 222 221 153

 1960 157 151 150 186 124 89 85 121 111 93

 1970 91 73 129 118 129 127 120 137 142 138

 1980 149 149 200 176 165 202 195 245 296 328

 1990 256 191 272 240 263 267 360 263 361 314

 2000 326 272 273 174 283 124 166 238 291 275

 2010 224 247 272 251 229 122

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 [\*] All segments correlate highest as dated with correlation with master series over .3281

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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 4A 1919 2015 97 4 0 .679 1.14 3.40 .835 .862 .206 2.62 .361 -.054 1

 2 4B 1905 2015 111 4 0 .778 1.45 4.44 .927 .802 .237 2.85 .423 .027 1

 3 114A 1877 2015 139 5 0 .642 1.62 5.15 1.009 .910 .168 2.60 .460 .017 1

 4 114B 1882 2015 134 5 0 .774 2.29 6.50 1.365 .863 .187 2.49 .358 .012 1

 5 115A 1909 2015 107 4 0 .726 1.07 2.46 .503 .541 .354 2.83 .636 .004 2

 6 115B 1936 2015 80 3 0 .779 1.32 2.86 .524 .531 .271 2.67 .396 .030 1

 7 116A 1901 2015 115 4 0 .778 1.36 3.15 .598 .695 .251 2.81 .471 .011 1

 8 116B 1891 2015 125 5 0 .749 1.36 2.79 .529 .597 .266 2.71 .455 .005 1

 9 117A 1911 2015 105 4 0 .827 1.09 2.71 .506 .684 .275 2.60 .412 .015 1

 10 117B 1908 2015 108 4 0 .796 1.71 4.47 .738 .674 .267 2.73 .546 -.002 1

 11 118A 1918 2015 98 4 0 .770 1.58 2.48 .366 .143 .235 2.71 .554 .053 1

 12 118B 1921 2015 95 4 0 .656 1.07 2.14 .321 .617 .185 2.76 .591 .015 1

 13 140A 1908 2015 108 4 0 .564 1.62 4.58 1.247 .930 .222 2.85 .483 .019 1

 14 140B 1902 2015 114 4 0 .593 1.68 5.32 1.332 .932 .220 2.63 .433 .008 1

 15 198A 1906 2015 110 4 0 .767 1.21 3.05 .491 .750 .208 2.61 .361 -.064 1

 16 198B 1916 2015 100 4 0 .713 1.36 3.49 .668 .876 .184 2.63 .414 -.007 1

 17 199A 1943 2015 73 3 0 .807 2.20 3.82 .585 .562 .203 2.65 .461 -.006 1

 18 199B 1921 2015 95 4 0 .734 2.16 3.41 .437 .444 .159 2.58 .480 -.010 1

 19 200A 1915 2015 101 4 0 .621 1.58 3.62 .720 .889 .177 2.62 .416 -.032 1

 20 200B 1934 2015 82 3 0 .717 1.64 2.55 .411 .724 .148 2.42 .389 .026 1

 21 402A 1920 2015 96 4 0 .834 1.89 3.26 .586 .406 .277 2.68 .496 .010 1

 22 402B 1918 2015 98 4 0 .740 1.68 2.84 .441 .393 .227 2.44 .336 -.001 1

 23 403A 1946 2015 70 3 0 .766 2.08 3.44 .724 .705 .239 2.56 .478 .074 2

 24 403B 1902 2015 114 4 0 .656 1.63 3.99 .752 .801 .223 2.90 .546 .033 1

 25 404A 1918 2015 98 4 0 .709 1.58 2.49 .394 .517 .203 2.47 .452 .033 2

 26 404B 1930 2015 86 3 0 .665 2.56 4.09 .630 .546 .192 2.66 .552 .167 1

 27 404C 1943 2015 73 3 0 .781 2.55 4.08 .687 .571 .200 2.66 .557 .112 1

 28 410A 1911 2015 105 4 0 .842 1.33 2.68 .502 .620 .234 2.61 .515 -.013 1

 29 410B 1914 2015 102 4 0 .786 1.60 2.99 .494 .430 .243 2.60 .445 -.011 1

 30 412A 1937 2015 79 3 0 .594 3.10 6.93 1.573 .848 .219 2.61 .490 -.047 1

 31 412B 1917 2015 99 4 0 .710 2.08 3.61 .657 .706 .184 2.46 .382 .003 1

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 Total or mean: 3117 120 0 .726 1.67 6.93 .708 .674 .222 2.90 .461 .012

 - = [ COFECHA QURU COF ] = -