[] Dendrochronology Program Library Run QURU Program COF 13:18 Tue 13 Feb 2018 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30361

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 QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

 Title of run: QURU\_LEMP13\_EWLW\_ORIGINAL-50

 File of DATED series: QURU\_LEMP13\_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 1903 to 2015 113 years

 Continuous time span is 1903 to 2015 113 years

 Portion with two or more series is 1903 to 2015 113 years

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

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

 \*O\* Master series 1903 2015 113 yrs \*O\*

 \*F\* Total rings in all series 2685 \*F\*

 \*E\* Total dated rings checked 2685 \*E\*

 \*C\* Series intercorrelation .722 \*C\*

 \*H\* Average mean sensitivity .193 \*H\*

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

 \*\*\* Mean length of series 86.6 \*\*\*

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

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

 No ring measurements of zero value

 1950 -.414 30 2000 1.662 31

 1951 .538 30 2001 1.212 31

 1952 -.710 30 2002 -.325 31

 1903 -.284 2 1953 -.495 31 2003 -.940 31

 1904 .583 2 1954 -2.107 31 2004 1.216 31

 1905 .586 3 1955 .880 31 2005 .004 31

 1906 1.674 4 1956 -.452 31 2006 .535 31

 1907 .121 5 1957 -.740 31 2007 .336 31

 1908 -.280 5 1958 1.302 31 2008 -.183 31

 1909 .657 6 1959 .299 31 2009 -.986 31

 1910 1.271 8 1960 -1.446 31 2010 -1.842 31

 1911 -.441 8 1961 .599 31 2011 -.480 31

 1912 .196 8 1962 -.785 31 2012 .060 31

 1913 -1.408 8 1963 -.236 31 2013 1.133 31

 1914 -1.371 8 1964 .903 31 2014 1.634 31

 1915 .223 8 1965 -.861 31 2015 -1.732 31

 1916 .038 8 1966 -1.031 31

 1917 .922 8 1967 .121 31

 1918 .579 8 1968 -1.481 31

 1919 .297 8 1969 .873 31

 1920 1.092 8 1970 1.077 31

 1921 -.804 9 1971 .949 31

 1922 -.557 9 1972 1.103 31

 1923 -1.792 9 1973 .846 31

 1924 -.735 9 1974 1.011 31

 1925 -.298 9 1975 1.449 31

 1926 -1.391 9 1976 1.134 31

 1927 -.729 9 1977 -.392 31

 1928 .028 9 1978 -.567 31

 1929 .692 9 1979 -.517 31

 1930 .081 9 1980 -1.155 31

 1931 1.699 9 1981 -2.465 31

 1932 1.084 12 1982 -.658 31

 1933 -.222 12 1983 -.657 31

 1934 .083 16 1984 .115 31

 1935 .410 19 1985 1.188 31

 1936 -1.124 21 1986 1.057 31

 1937 .249 21 1987 1.475 31

 1938 .627 22 1988 .783 31

 1939 .917 23 1989 -.763 31

 1940 -.366 26 1990 -2.254 31

 1941 -1.890 27 1991 -2.552 31

 1942 -.602 27 1992 -.413 31

 1943 .117 28 1993 -.575 31

 1944 1.157 28 1994 -.426 31

 1945 .354 28 1995 -.073 31

 1946 .951 28 1996 .723 31

 1947 1.468 30 1997 .066 31

 1948 .363 30 1998 .964 31

 1949 -1.728 30 1999 .966 31

PART 5: CORRELATION OF SERIES BY SEGMENTS: QURU\_LEMP13\_EWLW\_ORIGINAL-50 13:18 Tue 13 Feb 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 126A 1939 2015 .70 .74 .80

 2 126B 1947 2015 .73 .75 .84

 3 127A 1932 2015 .77 .82 .86

 4 127B 1940 2015 .74 .75 .73

 5 129A 1934 2015 .68 .74 .76

 6 129B 1932 2015 .76 .78 .86

 7 188A 1940 2015 .75 .81 .78

 8 188B 1934 2015 .55 .70 .73

 9 190A 1935 2015 .74 .74 .73

 10 190B 1941 2015 .77 .76 .71

 11 191A 1943 2015 .78 .76 .82

 12 191B 1934 2015 .62 .79 .84

 13 191C 1936 2015 .87 .86 .80

 14 194A 1910 2015 .71 .73 .76 .80

 15 194B 1903 2015 .52 .62 .71 .80

 16 195A 1938 2015 .58 .48 .69

 17 195B 1907 2015 .39 .60 .60 .73

 18 196A 1910 2015 .74 .72 .72 .80

 19 196B 1903 2015 .53 .70 .57 .57

 20 197A 1953 2015 .75 .80

 21 197B 1947 2015 .73 .72 .77

 22 133A 1905 2015 .69 .77 .64 .61

 23 133B 1906 2015 .63 .70 .72 .73

 24 230A 1935 2015 .77 .76 .85

 25 230B 1935 2015 .62 .68 .80

 26 237A 1936 2015 .71 .72 .82

 27 237B 1934 2015 .75 .79 .81

 28 349A 1932 2015 .81 .85 .87

 29 349B 1940 2015 .72 .79 .79

 30 366A 1921 2015 .51 .64 .77 .81

 31 366B 1909 2015 .66 .62 .74 .76

 Av segment correlation .60 .71 .73 .78

PART 6: POTENTIAL PROBLEMS: QURU\_LEMP13\_EWLW\_ORIGINAL-50 13:18 Tue 13 Feb 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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 126A 1939 to 2015 77 years Series 1

 [B] Entire series, effect on correlation ( .741) is:

 Lower 1948< -.025 1952> -.020 1958< -.011 1957< -.008 2015> -.005 1965> -.005 Higher 1941 .013 2010 .007

 126A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1939 418

 1940 350 235 246 302 340 272 237 221 144 123

 1950 125 213 224 191 136 218 171 116 116 117

 1960 94 127 107 111 139 128 112 162 103 163

 1970 206 185 178 204 189 193 221 152 120 112

 1980 107 92 101 91 108 118 157 172 134 97

 1990 76 79 113 122 166 163 222 205 241 242

 2000 221 215 166 112 140 111 124 117 98 68

 2010 43 75 89 130 126 73

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 126B 1947 to 2015 69 years Series 2

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

 Lower 1952> -.017 1954> -.013 1950< -.011 2002> -.011 2008< -.009 1973< -.007 Higher 2015 .034 1990 .012

 126B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1947 265 139 107

 1950 86 136 183 211 148 287 196 133 172 141

 1960 122 165 111 119 173 135 104 161 117 223

 1970 214 170 141 113 163 173 143 88 100 96

 1980 86 67 85 94 100 129 102 148 105 77

 1990 59 58 87 100 118 116 131 137 219 224

 2000 187 213 190 116 169 150 189 203 108 71

 2010 48 102 128 139 146 58

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 127A 1932 to 2015 84 years Series 3

 [B] Entire series, effect on correlation ( .814) is:

 Lower 1949< -.017 1952> -.011 1968> -.010 1936> -.010 1940< -.006 1992< -.005 Higher 2015 .021 1941 .008

 127A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1932 281 235 306 312 283 354 348 307

 1940 196 143 181 207 233 237 222 243 198 115

 1950 164 199 195 156 127 221 175 154 189 174

 1960 122 203 140 140 169 136 130 193 175 244

 1970 305 282 313 346 296 276 277 204 136 153

 1980 146 94 127 145 191 268 291 319 206 129

 1990 105 89 112 139 196 197 293 214 234 243

 2000 264 222 191 185 265 219 251 215 201 147

 2010 112 151 173 198 190 103

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 127B 1940 to 2015 76 years Series 4

 [B] Entire series, effect on correlation ( .743) is:

 Lower 2010< -.023 1968> -.022 1948< -.017 1940> -.011 1960> -.009 1962< -.006 Higher 1949 .015 1941 .009

 127B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1940 369 242 284 349 355 334 317 379 209 135

 1950 198 242 224 194 164 276 249 224 344 257

 1960 234 313 194 230 269 198 190 320 284 319

 1970 333 263 257 317 279 276 304 217 160 178

 1980 158 115 148 121 165 317 263 269 211 142

 1990 115 102 122 134 187 223 303 233 237 237

 2000 234 235 207 176 241 195 192 197 195 148

 2010 99 141 165 187 250 140

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 129A 1934 to 2015 82 years Series 5

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

 Lower 1936> -.028 2003< -.025 1952> -.012 1959< -.009 1968> -.008 1938< -.005 Higher 2015 .025 1941 .014

 129A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1934 332 286 355 348 283 274

 1940 263 152 206 293 410 401 408 479 305 238

 1950 307 420 398 336 259 387 301 228 301 220

 1960 221 293 234 325 348 268 287 322 276 403

 1970 389 366 354 335 325 288 266 171 202 190

 1980 158 117 170 170 205 215 182 177 198 146

 1990 111 88 166 151 138 152 144 167 146 175

 2000 183 216 139 93 125 133 129 139 141 127

 2010 82 128 156 160 226 109

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 129B 1932 to 2015 84 years Series 6

 [B] Entire series, effect on correlation ( .820) is:

 Lower 1970< -.016 1952> -.013 1966> -.011 1933< -.008 1936> -.006 1954> -.006 Higher 2015 .034 1981 .008

 129B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1932 307 177 182 233 228 343 366 331

 1940 302 177 216 302 376 375 379 369 261 201

 1950 249 337 346 326 270 408 340 282 315 278

 1960 235 277 233 292 336 280 337 324 273 362

 1970 285 323 371 391 420 436 360 273 207 228

 1980 190 127 206 245 294 262 313 284 250 187

 1990 125 133 199 194 174 197 292 242 296 294

 2000 320 287 229 163 248 235 261 223 209 159

 2010 133 168 216 225 259 112

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 188A 1940 to 2015 76 years Series 7

 [B] Entire series, effect on correlation ( .735) is:

 Lower 1941> -.041 2015> -.030 1952< -.012 1976< -.007 1977> -.007 1948> -.007 Higher 1981 .016 1949 .013

 188A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1940 371 391 374 347 440 329 354 301 324 191

 1950 233 222 141 151 136 258 166 187 249 231

 1960 139 207 167 170 207 163 151 185 122 197

 1970 218 223 179 151 149 203 146 151 124 112

 1980 102 58 115 114 127 259 190 218 160 111

 1990 85 62 95 110 94 112 154 151 167 165

 2000 217 223 159 137 222 167 144 133 98 73

 2010 70 83 90 123 114 75

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 188B 1934 to 2015 82 years Series 8

 [B] Entire series, effect on correlation ( .623) is:

 Lower 1954> -.024 1949> -.017 1937< -.015 1941> -.015 1946< -.013 1968< -.008 Higher 1960 .013 1955 .009

 188B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1934 184 155 68 52 253 337

 1940 149 151 132 147 154 120 128 185 174 191

 1950 253 279 162 224 237 339 239 255 338 345

 1960 202 256 251 295 296 238 241 304 144 240

 1970 288 268 257 187 218 321 235 198 151 128

 1980 94 78 120 108 108 233 184 205 136 89

 1990 60 61 99 106 126 109 167 162 196 183

 2000 207 235 174 138 208 161 163 160 104 83

 2010 81 95 138 146 167 87

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 190A 1935 to 2015 81 years Series 9

 [B] Entire series, effect on correlation ( .731) is:

 Lower 2015> -.022 1954< -.021 1968> -.017 1970< -.009 1942> -.007 1959< -.007 Higher 1949 .016 1955 .006

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

 1954 -5.5 SD

 190A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1935 440 385 380 410 506

 1940 393 307 392 375 332 273 275 267 229 143

 1950 182 227 149 120 57 146 119 116 166 126

 1960 115 158 138 151 197 182 191 247 230 306

 1970 244 272 309 298 330 272 269 223 179 162

 1980 132 116 188 159 240 320 266 269 231 156

 1990 113 100 186 151 237 298 356 366 443 419

 2000 453 410 317 272 331 287 282 200 120 85

 2010 75 98 121 179 160 82

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 190B 1941 to 2015 75 years Series 10

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

 Lower 2015> -.052 1954< -.040 1973< -.012 1968> -.012 2011< -.008 1953> -.005 Higher 1941 .010 1960 .010

 190B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1941 349 390 411 425 386 451 432 327 271

 1950 349 347 302 344 161 330 232 255 327 279

 1960 187 267 212 293 273 204 205 245 217 315

 1970 261 245 226 176 180 211 198 168 173 133

 1980 121 110 152 137 166 212 170 176 159 124

 1990 89 74 122 124 111 134 181 187 205 175

 2000 214 216 154 133 215 157 180 135 92 72

 2010 68 62 89 120 121 80

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 191A 1943 to 2015 73 years Series 11

 [B] Entire series, effect on correlation ( .798) is:

 Lower 1954> -.035 1943< -.012 2008> -.010 1983> -.008 1968< -.006 1995> -.006 Higher 2015 .020 1949 .009

 191A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1943 321 395 359 384 421 339 252

 1950 254 263 223 247 246 308 228 224 251 210

 1960 166 246 183 169 180 145 149 155 111 180

 1970 189 213 202 199 188 202 184 139 138 144

 1980 148 119 185 195 179 160 168 212 191 121

 1990 107 110 136 131 128 185 183 152 144 160

 2000 176 161 111 107 145 121 123 106 135 104

 2010 82 107 101 111 148 73

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 191B 1934 to 2015 82 years Series 12

 [B] Entire series, effect on correlation ( .711) is:

 Lower 1936< -.074 1981> -.016 1935< -.012 1963< -.012 1941> -.011 1949> -.009 Higher 2015 .041 1968 .010

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

 1936 -5.1 SD

 191B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1934 241 221 174 255 272 297

 1940 265 256 292 309 361 340 346 382 316 253

 1950 252 294 236 218 194 329 301 259 254 217

 1960 161 214 176 135 173 152 149 206 154 221

 1970 240 241 234 220 216 261 236 167 178 188

 1980 148 167 201 198 244 225 264 294 249 190

 1990 133 130 220 180 184 239 304 228 218 233

 2000 249 241 146 136 213 204 230 218 204 160

 2010 143 151 172 183 203 95

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 191C 1936 to 2015 80 years Series 13

 [B] Entire series, effect on correlation ( .814) is:

 Lower 2002< -.045 1956> -.006 1959< -.005 2010> -.005 1994> -.005 1991> -.004 Higher 1981 .009 2015 .009

 191C Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1936 291 417 340 328

 1940 319 212 294 363 431 331 357 362 279 221

 1950 290 311 230 238 177 253 223 196 215 159

 1960 123 165 147 155 182 147 132 161 104 148

 1970 182 186 218 187 188 184 156 108 126 122

 1980 107 85 126 123 128 146 135 162 136 108

 1990 101 109 143 141 153 147 140 130 139 155

 2000 158 158 101 100 144 110 127 131 128 108

 2010 103 132 111 160 157 68

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 194A 1910 to 2015 106 years Series 14

 [B] Entire series, effect on correlation ( .759) is:

 Lower 1911> -.032 1968> -.031 1928< -.013 1921> -.006 1941> -.006 1939< -.005 Higher 2015 .037 1949 .010

 194A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1910 397 410 366 274 273 344 321 325 339 305

 1920 321 278 259 233 261 267 198 255 212 319

 1930 292 465 480 293 312 340 236 261 359 300

 1940 291 255 278 261 406 324 320 347 310 180

 1950 233 264 190 176 126 196 130 151 261 229

 1960 145 193 175 175 197 177 170 194 223 263

 1970 222 204 231 252 241 251 217 174 171 143

 1980 136 114 130 104 119 129 158 161 152 133

 1990 89 86 124 116 117 119 165 162 173 197

 2000 196 170 129 138 178 139 146 127 130 121

 2010 91 136 129 140 141 74

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 194B 1903 to 2015 113 years Series 15

 [B] Entire series, effect on correlation ( .685) is:

 Lower 1903< -.041 1943< -.012 1945< -.011 1929< -.009 1967< -.009 1960> -.008 Higher 2015 .031 1981 .015

 194B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1903 219 339 347 356 278 241 248

 1910 270 246 280 207 219 255 264 232 239 238

 1920 224 173 178 148 157 157 132 155 155 137

 1930 141 194 233 155 147 229 162 194 245 262

 1940 202 127 174 112 143 98 145 186 134 101

 1950 121 147 119 131 102 118 98 95 139 136

 1960 120 159 119 112 151 112 108 98 107 130

 1970 134 121 194 158 149 156 131 110 116 112

 1980 80 67 92 80 100 95 86 93 118 95

 1990 68 62 96 93 87 98 110 107 134 119

 2000 159 126 84 90 164 104 129 121 100 106

 2010 70 116 118 119 140 61

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 195A 1938 to 2015 78 years Series 16

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

 Lower 1954> -.067 1997< -.038 1955< -.017 2003> -.016 1953< -.015 1960> -.012 Higher 2015 .044 1981 .019

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

 1953 1954 4.1 SD

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

 1954 +3.5 SD

 195A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1938 478 420

 1940 319 277 316 411 474 400 446 430 308 218

 1950 323 354 293 207 327 293 216 226 331 273

 1960 255 307 260 281 274 176 221 280 260 371

 1970 389 395 374 438 458 388 316 203 214 233

 1980 191 115 173 178 207 230 327 341 300 196

 1990 132 141 213 169 159 178 209 130 238 228

 2000 205 160 171 224 313 187 156 167 172 145

 2010 135 166 164 245 278 101

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 195B 1907 to 2015 109 years Series 17

 [B] Entire series, effect on correlation ( .596) is:

 Lower 1954> -.030 1914> -.022 1913> -.014 1911> -.013 2005< -.013 1968> -.011 Higher 2015 .055 1949 .014

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

 1914 +4.1 SD

 195B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1907 80 81 107

 1910 106 88 68 65 96 68 60 55 42 30

 1920 55 46 46 28 47 25 17 14 182 179

 1930 246 214 173 149 198 219 154 233 206 208

 1940 149 111 180 226 269 242 252 320 210 146

 1950 254 225 193 136 188 188 126 146 242 181

 1960 139 203 168 217 197 130 160 227 225 369

 1970 326 283 260 339 399 327 256 167 162 190

 1980 129 100 188 228 259 242 327 272 250 143

 1990 125 141 207 167 207 254 318 205 290 251

 2000 242 200 192 227 264 153 158 172 140 125

 2010 111 120 141 142 225 91

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 196A 1910 to 2015 106 years Series 18

 [B] Entire series, effect on correlation ( .773) is:

 Lower 1968> -.025 1916< -.009 1974< -.009 1913> -.008 1956> -.008 1926< -.008 Higher 2015 .034 1941 .009

 196A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1910 250 185 220 179 155 159 140 157 152 165

 1920 176 136 172 140 164 171 132 146 170 197

 1930 215 310 297 225 219 265 211 281 311 307

 1940 236 164 175 249 290 284 277 317 275 200

 1950 185 253 192 142 123 229 218 163 219 211

 1960 127 162 137 158 200 141 131 128 147 160

 1970 152 162 160 140 111 158 158 104 100 105

 1980 73 63 77 84 137 144 148 149 131 81

 1990 79 60 88 98 100 91 128 128 187 175

 2000 209 175 147 152 209 191 197 224 185 156

 2010 131 168 168 239 231 88

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 196B 1903 to 2015 113 years Series 19

 [B] Entire series, effect on correlation ( .574) is:

 Lower 1903> -.042 1982< -.026 1911< -.021 1908< -.013 2003> -.012 1969< -.009 Higher 2015 .023 1921 .012

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

 1903 +3.9 SD

 196B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1903 296 247 272 242 220 167 177

 1910 211 141 140 117 108 123 125 135 123 118

 1920 136 98 116 101 107 94 77 90 93 110

 1930 143 212 163 128 122 135 109 112 113 108

 1940 91 72 86 105 121 130 128 158 117 81

 1950 79 93 89 73 71 131 109 85 132 120

 1960 83 110 103 114 124 96 93 85 62 64

 1970 76 97 97 69 61 98 109 83 76 62

 1980 45 42 26 46 61 65 55 67 59 43

 1990 38 30 53 50 58 50 48 48 52 74

 2000 83 70 75 96 142 91 103 90 61 62

 2010 54 80 90 126 123 56

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 197A 1953 to 2015 63 years Series 20

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

 Lower 1953> -.023 1960> -.019 2003< -.016 2010> -.014 2012< -.008 1955< -.008 Higher 2015 .062 1954 .019

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

 1953 +3.4 SD

 197A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1953 126 110 118 111 129 145 151

 1960 148 167 141 139 192 140 117 137 113 182

 1970 245 233 238 248 277 270 244 189 160 142

 1980 148 106 162 178 160 219 177 192 153 133

 1990 94 90 147 187 158 213 246 202 214 282

 2000 260 247 223 145 193 186 210 220 181 183

 2010 178 176 149 186 197 103

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 197B 1947 to 2015 69 years Series 21

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

 Lower 2010> -.021 1962> -.020 1977> -.018 2002> -.018 1951< -.017 1960> -.009 Higher 2015 .061 1954 .020

 197B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1947 341 283 183

 1950 218 159 126 171 112 145 137 122 178 137

 1960 127 130 149 120 152 111 105 135 91 120

 1970 179 179 227 224 241 274 269 281 240 173

 1980 147 97 154 144 156 217 209 183 132 101

 1990 71 82 143 173 162 192 230 222 281 291

 2000 276 252 273 177 225 244 252 215 181 143

 2010 185 208 188 248 252 118

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 133A 1905 to 2015 111 years Series 22

 [B] Entire series, effect on correlation ( .666) is:

 Lower 1912< -.022 1905< -.020 1996< -.019 1911> -.014 1926> -.013 1968> -.012 Higher 2015 .028 1954 .018

 133A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1905 389 492 417 426 422

 1910 450 396 283 248 235 313 282 316 315 266

 1920 326 202 213 162 179 234 229 223 228 242

 1930 194 219 242 181 181 191 141 162 157 147

 1940 116 89 137 177 201 173 190 224 232 143

 1950 168 213 156 128 84 143 150 139 160 169

 1960 131 191 147 167 198 162 171 175 181 244

 1970 257 220 222 218 261 242 192 130 132 160

 1980 160 120 179 141 174 202 207 212 157 158

 1990 111 124 160 145 120 89 72 75 80 89

 2000 139 112 113 127 154 153 128 112 113 118

 2010 71 106 116 169 190 76

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 133B 1906 to 2015 110 years Series 23

 [B] Entire series, effect on correlation ( .667) is:

 Lower 1991> -.015 1910< -.009 1949> -.009 1996< -.009 1994< -.008 1956> -.008 Higher 1954 .014 1960 .010

 133B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1906 426 330 327 324

 1910 278 201 250 227 191 196 210 254 209 181

 1920 211 135 133 127 137 151 139 145 137 133

 1930 124 151 263 213 164 170 120 105 100 126

 1940 83 75 90 121 154 125 154 230 224 159

 1950 139 204 154 158 92 152 183 172 192 175

 1960 120 156 137 139 202 160 136 169 154 196

 1970 221 231 221 194 218 214 180 136 125 150

 1980 143 113 175 144 148 163 187 213 199 137

 1990 103 126 153 138 92 91 94 97 120 113

 2000 150 152 117 115 182 173 144 126 122 94

 2010 78 110 135 172 162 73

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 230A 1935 to 2015 81 years Series 24

 [B] Entire series, effect on correlation ( .808) is:

 Lower 2009> -.021 1954> -.014 1962> -.013 1952< -.012 1998< -.008 1951< -.006 Higher 2015 .038 1968 .008

 230A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1935 261 162 316 329 308

 1940 224 169 246 247 286 269 325 266 241 155

 1950 172 169 109 161 152 187 168 159 239 186

 1960 144 180 176 175 184 127 119 133 103 157

 1970 177 153 170 143 134 153 162 130 106 121

 1980 99 79 83 95 97 163 134 155 124 100

 1990 77 66 96 99 109 128 130 113 108 113

 2000 169 147 119 109 138 105 102 103 97 122

 2010 92 95 97 103 114 55

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 230B 1935 to 2015 81 years Series 25

 [B] Entire series, effect on correlation ( .706) is:

 Lower 2004< -.019 1947< -.017 1954> -.013 1965> -.011 1957> -.010 1962< -.010 Higher 2015 .062 1968 .013

 230B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1935 301 255 468 432 363

 1940 284 173 195 173 162 147 166 130 159 111

 1950 104 106 89 97 94 123 94 134 203 155

 1960 110 169 84 116 134 134 99 134 94 171

 1970 200 171 141 142 136 154 163 140 122 119

 1980 114 100 114 106 100 155 116 122 111 89

 1990 72 49 63 63 78 87 75 73 81 83

 2000 115 102 82 70 66 68 72 72 79 72

 2010 57 71 72 72 79 48

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 237A 1936 to 2015 80 years Series 26

 [B] Entire series, effect on correlation ( .737) is:

 Lower 2010> -.022 1951< -.018 1957< -.012 1962> -.011 1965> -.010 1991> -.008 Higher 2015 .034 1949 .015

 237A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1936 251 369 433 388

 1940 341 268 269 243 244 260 243 220 228 146

 1950 186 151 132 175 107 198 207 139 216 201

 1960 186 294 264 261 296 261 249 282 163 263

 1970 262 285 286 310 313 291 287 242 206 166

 1980 135 110 181 182 220 264 285 283 237 180

 1990 139 203 335 313 403 355 414 341 446 380

 2000 401 350 246 250 357 266 341 330 267 273

 2010 318 287 267 376 352 157

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 237B 1934 to 2015 82 years Series 27

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

 Lower 2010> -.016 2009> -.009 1960> -.008 1951< -.008 1937< -.007 1965> -.007 Higher 2015 .035 1981 .009

 237B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1934 427 432 221 210 215 291

 1940 257 193 196 197 186 209 205 225 178 97

 1950 164 139 105 125 105 171 156 139 239 229

 1960 198 284 234 244 282 241 257 317 185 282

 1970 263 266 266 244 257 282 245 200 216 196

 1980 142 117 168 155 166 240 252 233 193 155

 1990 118 140 219 208 225 255 294 204 274 246

 2000 256 225 152 151 222 189 203 221 180 217

 2010 221 242 221 291 259 109

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 349A 1932 to 2015 84 years Series 28

 [B] Entire series, effect on correlation ( .840) is:

 Lower 1932< -.015 1968> -.010 1999< -.010 1957> -.010 1947< -.008 2003> -.006 Higher 2015 .017 1949 .009

 349A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1932 278 303 380 406 302 340 281 339

 1940 245 185 279 322 356 275 249 230 195 160

 1950 219 257 189 229 171 241 190 225 276 221

 1960 173 202 179 204 218 167 167 191 179 226

 1970 242 225 206 224 270 233 225 154 169 163

 1980 147 94 169 181 186 258 257 278 262 182

 1990 134 110 167 150 179 186 201 179 180 160

 2000 196 217 172 170 192 153 193 175 158 119

 2010 103 135 147 170 201 88

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 349B 1940 to 2015 76 years Series 29

 [B] Entire series, effect on correlation ( .741) is:

 Lower 1941> -.026 1945< -.012 1980> -.010 2010> -.010 1952> -.009 1950< -.007 Higher 1990 .012 1981 .012

 349B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1940 521 542 558 609 590 406 504 529 404 303

 1950 297 385 384 391 222 340 244 289 412 364

 1960 293 333 287 326 320 235 263 316 246 305

 1970 332 294 297 267 277 282 266 174 175 180

 1980 225 127 218 196 201 248 291 236 228 189

 1990 118 120 182 162 181 166 220 210 258 243

 2000 288 266 220 171 226 181 235 197 147 91

 2010 128 122 141 184 200 88

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 366A 1921 to 2015 95 years Series 30

 [B] Entire series, effect on correlation ( .660) is:

 Lower 1921> -.048 1930< -.014 1932< -.011 1949> -.010 2008> -.010 1961< -.009 Higher 2015 .056 1981 .017

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

 1921 +3.1 SD

 366A Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1921 343 296 284 305 312 267 273 328 307

 1930 222 270 216 244 206 209 168 179 188 230

 1940 194 156 173 203 301 207 289 351 355 250

 1950 262 325 214 202 157 257 180 213 243 185

 1960 140 149 135 137 211 172 136 159 113 139

 1970 140 144 168 162 156 149 193 143 126 141

 1980 129 86 97 93 126 121 107 128 127 103

 1990 66 64 90 88 75 86 92 117 184 156

 2000 155 151 108 102 146 133 149 150 198 155

 2010 148 137 180 209 206 102

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 366B 1909 to 2015 107 years Series 31

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

 Lower 1970< -.023 1926> -.017 1934< -.014 1936> -.010 1949> -.010 1932< -.009 Higher 2015 .017 1954 .014

 366B Ring measurements

 Annual values

 Date 0 1 2 3 4 5 6 7 8 9

 1909 239

 1910 233 200 234 196 204 273 249 311 279 295

 1920 258 232 229 188 206 237 255 249 255 337

 1930 242 270 210 189 157 199 223 231 241 296

 1940 227 121 182 223 345 266 394 377 334 235

 1950 229 267 187 170 113 176 141 108 154 123

 1960 125 145 122 127 159 121 116 104 86 117

 1970 95 109 114 117 118 133 136 109 125 142

 1980 119 77 89 96 100 123 103 129 127 91

 1990 80 62 91 101 99 109 148 139 165 143

 2000 167 154 121 112 162 126 145 157 200 181

 2010 120 123 152 170 229 128

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

PART 7: DESCRIPTIVE STATISTICS: QURU\_LEMP13\_EWLW\_ORIGINAL-50 13:18 Tue 13 Feb 2018 Page 6

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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 126A 1939 2015 77 3 0 .741 1.59 4.18 .695 .837 .201 2.73 .528 .033 1

 2 126B 1947 2015 69 3 0 .770 1.38 2.87 .506 .542 .268 2.90 .644 .081 1

 3 127A 1932 2015 84 3 0 .814 2.05 3.54 .660 .735 .205 2.61 .435 .082 1

 4 127B 1940 2015 76 3 0 .743 2.27 3.79 .699 .626 .209 2.61 .486 .104 1

 5 129A 1934 2015 82 3 0 .709 2.38 4.79 .968 .820 .197 2.66 .567 .077 1

 6 129B 1932 2015 84 3 0 .820 2.67 4.36 .744 .688 .193 2.67 .496 .047 1

 7 188A 1940 2015 76 3 0 .735 1.78 4.40 .832 .817 .223 2.75 .565 -.054 1

 8 188B 1934 2015 82 3 0 .623 1.82 3.45 .739 .651 .248 2.51 .396 -.039 1

 9 190A 1935 2015 81 3 0 .731 2.37 5.06 1.062 .876 .216 2.58 .375 .029 1

 10 190B 1941 2015 75 3 0 .729 2.11 4.51 .964 .848 .198 2.52 .359 -.061 1

 11 191A 1943 2015 73 3 0 .798 1.84 4.21 .741 .875 .157 2.60 .510 .011 1

 12 191B 1934 2015 82 3 0 .711 2.23 3.82 .582 .710 .162 2.48 .383 .008 2

 13 191C 1936 2015 80 3 0 .814 1.82 4.31 .822 .865 .172 2.52 .519 .018 1

 14 194A 1910 2015 106 4 0 .759 2.18 4.80 .879 .834 .163 2.67 .456 -.021 1

 15 194B 1903 2015 113 4 0 .685 1.50 3.56 .629 .837 .189 2.78 .550 .080 1

 16 195A 1938 2015 78 3 0 .593 2.63 4.78 .956 .762 .211 2.73 .511 -.030 2

 17 195B 1907 2015 109 4 0 .596 1.77 3.99 .825 .782 .253 2.67 .506 .022 1

 18 196A 1910 2015 106 4 0 .773 1.73 3.17 .595 .768 .179 2.65 .478 .005 1

 19 196B 1903 2015 113 4 0 .574 1.02 2.96 .484 .870 .185 2.80 .439 -.030 2

 20 197A 1953 2015 63 2 0 .766 1.76 2.82 .485 .726 .167 2.54 .418 -.046 1

 21 197B 1947 2015 69 3 0 .740 1.83 3.41 .606 .747 .202 2.59 .456 -.063 1

 22 133A 1905 2015 111 4 0 .666 1.90 4.92 .836 .882 .174 2.49 .493 .004 1

 23 133B 1906 2015 110 4 0 .667 1.63 4.26 .577 .780 .181 2.73 .437 -.036 2

 24 230A 1935 2015 81 3 0 .808 1.53 3.29 .626 .801 .182 2.68 .417 .007 1

 25 230B 1935 2015 81 3 0 .706 1.30 4.68 .760 .857 .185 2.69 .438 -.065 1

 26 237A 1936 2015 80 3 0 .737 2.63 4.46 .789 .708 .190 2.52 .477 -.078 1

 27 237B 1934 2015 82 3 0 .769 2.15 4.32 .613 .598 .188 2.49 .517 -.020 1

 28 349A 1932 2015 84 3 0 .840 2.10 4.06 .626 .741 .181 2.69 .633 .013 1

 29 349B 1940 2015 76 3 0 .741 2.72 6.09 1.178 .861 .191 2.50 .472 -.043 1

 30 366A 1921 2015 95 4 0 .660 1.80 3.55 .709 .820 .175 2.68 .475 .000 1

 31 366B 1909 2015 107 4 0 .710 1.76 3.94 .718 .833 .179 2.69 .557 -.004 1

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 Total or mean: 2685 101 0 .722 1.92 6.09 .736 .782 .193 2.90 .484 .002

 - = [ COFECHA QURU COF ] = -