[] Dendrochronology Program Library Run ACRU\_ Program COF 13:54 Tue 25 Oct 2016 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 29885

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: ACRU\_ALC\_Corr1-50

File of DATED series: ACRU\_ALC\_Corr1

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 1916 to 2016 101 years

Continuous time span is 1916 to 2016 101 years

Portion with two or more series is 1918 to 2016 99 years

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

\*C\* Number of dated series 34 \*C\*

\*O\* Master series 1916 2016 101 yrs \*O\*

\*F\* Total rings in all series 2101 \*F\*

\*E\* Total dated rings checked 2099 \*E\*

\*C\* Series intercorrelation .574 \*C\*

\*H\* Average mean sensitivity .256 \*H\*

\*A\* Segments, possible problems 3 \*A\*

\*\*\* Mean length of series 61.8 \*\*\*

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

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

No ring measurements of zero value

1950 .232 6 2000 1.108 34

1951 -.103 7 2001 -1.332 34

1952 -.109 8 2002 .932 34

1953 -1.780 9 2003 -.768 34

1954 -1.077 11 2004 .856 34

1955 .112 14 2005 -.629 34

1956 1.134 15 2006 .113 34

1957 .457 16 2007 -.004 34

1958 .071 17 2008 -.094 34

1959 -.142 20 2009 .762 34

1960 .781 21 2010 .304 34

1961 .579 23 2011 .583 34

1962 .523 23 2012 -.253 34

1963 .485 25 2013 1.442 33

1964 -.284 26 2014 .353 33

1965 -2.139 28 2015 .404 33

1916 -1.325 1 1966 -1.788 28 2016 -1.945 33

1917 -2.001 1 1967 -.484 30

1918 2.461 2 1968 .370 30

1919 1.074 3 1969 1.143 31

1920 1.081 3 1970 -.456 32

1921 -.233 3 1971 -.006 32

1922 -1.112 3 1972 .673 32

1923 -1.548 3 1973 -.325 33

1924 .597 3 1974 -.360 33

1925 .439 3 1975 -.754 33

1926 .790 3 1976 1.060 33

1927 -1.207 3 1977 -.999 34

1928 -.259 3 1978 .397 34

1929 .323 4 1979 -.489 34

1930 -.129 4 1980 1.062 34

1931 .586 4 1981 .727 34

1932 .812 4 1982 .697 34

1933 .297 4 1983 .941 34

1934 -1.540 4 1984 -.420 34

1935 -1.433 4 1985 .595 34

1936 -2.499 4 1986 1.125 34

1937 -1.246 4 1987 -.062 34

1938 -1.589 4 1988 -.933 34

1939 .195 4 1989 .493 34

1940 1.130 4 1990 -.795 34

1941 .872 4 1991 -1.500 34

1942 1.845 4 1992 .541 34

1943 1.923 4 1993 1.686 34

1944 .244 5 1994 .389 34

1945 -.142 6 1995 -2.204 34

1946 .449 6 1996 -.408 34

1947 .639 6 1997 -.395 34

1948 .830 6 1998 .918 34

1949 .107 6 1999 -1.442 34

PART 5: CORRELATION OF SERIES BY SEGMENTS: ACRU\_ALC\_Corr1-50 13:54 Tue 25 Oct 2016 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 1A 1965 2016 .53 .60

2 1B 1977 2016 .67

3 2A 1959 2016 .72 .72

4 2B 1973 2016 .72

5 3A 1961 2016 .84 .68

6 3B 1963 2016 .72 .63

7 4A 1967 2016 .56

8 4B 1959 2016 .53 .48

9 5A 1951 2016 .64 .72

10 5B 1954 2016 .71 .73

11 6A 1958 2016 .57 .81

12 6B 1960 2016 .85 .86

13 7A 1956 2016 .64 .41

14 7B 1952 2016 .73 .66

15 8A 1919 2016 .48 .45 .44 .45

16 8B 1916 2016 .69 .57 .56 .60

17 9A 1965 2016 .47 .52

18 9B 1954 2016 .60 .54

19 10A 1955 2016 .51 .47

20 10B 1953 2016 .49 .49

21 11A 1967 2016 .67

22 11B 1959 2016 .68 .74

23 12A 1957 2016 .55 .58

24 12C 1970 2016 .32A

25 13A 1964 2016 .63 .64

26 13B 1969 2016 .57

27 14A RE 1955 2016 .39 .44

28 14B 1955 2016 .59 .62

29 15A 1961 2016 .67 .65

30 15B 1963 2016 .50 .53

31 16A 1944 2016 .37 .57 .63

32 16B 1945 2016 .44 .56 .56

33 17A RE 1918 2016 .51 .41 .34 .41

34 17B RE 1929 2012 .39 .24B .21A

Av segment correlation .56 .44 .58 .59

PART 6: POTENTIAL PROBLEMS: ACRU\_ALC\_Corr1-50 13:54 Tue 25 Oct 2016 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

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

1A 1965 to 2016 52 years Series 1

[B] Entire series, effect on correlation ( .577) is:

Lower 1977> -.045 1995> -.023 2002< -.020 1965> -.016 1967> -.010 2012> -.010 Higher 2016 .047 1999 .026

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

1977 +3.2 SD

1A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1965 283 313 531 474 443

1970 302 301 396 443 385 465 794 749 691 541

1980 566 509 476 559 543 512 665 503 436 570

1990 521 304 505 605 455 363 427 420 481 255

2000 339 228 277 297 377 331 348 371 413 514

2010 427 462 523 557 484 531 213

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

1B 1977 to 2016 40 years Series 2

[B] Entire series, effect on correlation ( .669) is:

Lower 1977> -.033 1978< -.024 2012> -.019 2002< -.018 1990> -.011 2000< -.010 Higher 2016 .061 1991 .018

1B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1977 883 723 718

1980 928 897 699 788 692 622 708 521 435 485

1990 529 329 497 585 463 277 373 468 467 285

2000 305 224 290 310 335 361 356 343 389 459

2010 419 354 420 417 380 405 171

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

2A 1959 to 2016 58 years Series 3

[B] Entire series, effect on correlation ( .754) is:

Lower 1977> -.057 2005< -.042 2001> -.012 1979> -.008 2003< -.007 1986< -.006 Higher 1995 .030 1965 .027

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

1977 +3.4 SD

2A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 142

1960 275 314 271 206 208 100 115 158 224 297

1970 201 224 295 312 287 297 495 524 504 445

1980 470 428 405 385 339 345 345 341 284 365

1990 229 220 357 512 332 180 259 224 341 192

2000 259 217 310 169 246 144 194 193 217 253

2010 226 241 171 250 240 251 139

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

2B 1973 to 2016 44 years Series 4

[B] Entire series, effect on correlation ( .718) is:

Lower 1977> -.045 1986< -.039 1991> -.028 1979> -.016 1985< -.014 2000< -.009 Higher 1995 .081 2016 .025

2B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1973 436 435 355 642 626 617 648

1980 726 624 606 558 487 449 415 468 405 530

1990 375 432 480 541 388 223 333 339 354 188

2000 300 207 320 182 376 241 209 200 223 241

2010 184 200 198 189 181 214 98

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

3A 1961 to 2016 56 years Series 5

[B] Entire series, effect on correlation ( .728) is:

Lower 2011< -.072 2016> -.044 2001> -.012 2010< -.009 1970> -.005 1973< -.005 Higher 1995 .053 1965 .037

3A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1961 350 412 392 306 172 229 372 467 452

1970 317 306 345 194 203 178 293 224 268 235

1980 427 301 336 394 267 282 323 215 190 290

1990 202 171 240 310 165 72 227 166 295 94

2000 238 146 214 117 200 91 163 140 138 135

2010 85 44 68 199 138 142 101

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3B 1963 to 2016 54 years Series 6

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

Lower 2016> -.049 2014< -.044 2010< -.017 1975< -.015 1965> -.013 1974< -.013 Higher 1995 .079 1999 .023

3B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1963 460 408 283 243 430 503 414

1970 230 244 301 189 146 123 254 180 279 210

1980 296 195 197 269 188 227 224 150 174 245

1990 193 134 239 286 192 96 203 162 186 104

2000 201 141 205 145 218 142 196 210 195 206

2010 106 126 123 158 84 170 133

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

4A 1967 to 2016 50 years Series 7

[B] Entire series, effect on correlation ( .560) is:

Lower 1979< -.076 2006< -.036 1977> -.030 1991> -.021 1988> -.018 1968< -.012 Higher 1995 .052 2016 .033

4A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1967 283 259 390

1970 280 382 346 287 271 240 309 289 283 170

1980 276 248 229 301 193 241 275 217 250 310

1990 130 222 255 358 238 105 160 210 205 142

2000 228 103 156 173 195 118 100 150 162 167

2010 147 182 176 231 223 163 96

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4B 1959 to 2016 58 years Series 8

[B] Entire series, effect on correlation ( .511) is:

Lower 2004< -.091 1991> -.042 1999> -.019 1996< -.016 1959< -.015 2012> -.013 Higher 1995 .058 1977 .024

4B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 112

1960 419 398 422 353 304 209 162 271 277 341

1970 246 319 298 226 260 232 253 200 259 220

1980 330 291 259 367 224 343 294 249 219 339

1990 186 278 271 241 155 91 79 172 243 155

2000 148 83 120 88 55 99 76 99 106 92

2010 81 129 149 169 175 109 89

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5A 1951 to 2016 66 years Series 9

[B] Entire series, effect on correlation ( .659) is:

Lower 1951< -.032 1953> -.023 1954> -.016 2006< -.012 1999> -.012 1994< -.011 Higher 1965 .039 1995 .029

5A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1951 64 155 137 181 253 233 181 170 145

1960 194 198 232 266 234 136 134 205 259 278

1970 252 349 344 324 338 277 387 319 301 296

1980 322 380 344 388 261 273 318 255 208 213

1990 193 185 241 255 168 114 180 187 314 217

2000 334 198 243 154 246 210 151 294 170 239

2010 259 208 233 317 277 227 121

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5B 1954 to 2016 63 years Series 10

[B] Entire series, effect on correlation ( .748) is:

Lower 1995> -.052 2001> -.026 1989< -.015 1973> -.008 1994< -.005 1970> -.005 Higher 2016 .028 1965 .025

5B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 173 245 261 206 191 156

1960 188 184 205 217 199 106 106 169 215 271

1970 229 277 314 277 263 208 292 190 231 210

1980 260 271 285 286 251 243 319 217 179 180

1990 198 154 254 260 199 194 241 190 273 190

2000 275 239 314 169 251 206 194 205 171 236

2010 223 210 164 241 175 172 98

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6A 1958 to 2016 59 years Series 11

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

Lower 1965> -.142 1960< -.028 1969< -.021 1976< -.015 2000< -.008 1964> -.006 Higher 1995 .092 2016 .036

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

1965 +4.9 SD

6A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1958 381 319

1960 259 430 467 519 407 596 237 280 330 247

1970 230 279 312 186 270 173 217 171 224 173

1980 279 236 286 326 253 320 326 259 249 273

1990 238 219 288 369 316 124 240 241 295 168

2000 230 207 298 211 261 176 217 200 187 251

2010 181 189 134 193 159 126 75

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6B 1960 to 2016 57 years Series 12

[B] Entire series, effect on correlation ( .851) is:

Lower 1973< -.018 2011< -.014 1990> -.011 1965> -.010 1984> -.007 1976< -.005 Higher 1995 .031 2016 .010

6B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1960 486 469 388 369 294 264 247 258 382 368

1970 256 281 291 198 216 197 246 203 259 237

1980 278 253 285 323 254 235 256 213 176 213

1990 229 157 299 319 238 110 181 173 258 146

2000 252 174 230 195 262 177 202 228 191 244

2010 200 167 168 286 191 229 127

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7A 1956 to 2016 61 years Series 13

[B] Entire series, effect on correlation ( .511) is:

Lower 2011< -.076 2016> -.020 1995> -.016 1983< -.015 1980< -.013 1989< -.013 Higher 1965 .071 1991 .026

7A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 328 234 193 229

1960 372 319 396 294 283 161 188 236 315 352

1970 312 299 289 312 348 316 470 234 318 301

1980 250 252 241 222 220 331 339 230 265 203

1990 212 140 271 336 306 209 241 266 286 216

2000 240 161 214 164 237 192 232 161 173 138

2010 134 100 103 118 121 100 85

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7B 1952 to 2016 65 years Series 14

[B] Entire series, effect on correlation ( .671) is:

Lower 2011< -.027 1977> -.025 1958< -.014 1999> -.012 2016> -.011 1972< -.010 Higher 1995 .062 1965 .024

7B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 195 161 180 223 242 194 158 259

1960 371 289 391 289 250 150 189 298 393 441

1970 370 299 308 330 280 342 510 440 479 396

1980 544 435 425 380 294 342 404 297 302 340

1990 278 224 292 284 273 155 235 237 242 207

2000 234 146 223 147 224 200 232 203 159 155

2010 159 106 176 186 126 186 112

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8A 1919 to 2016 98 years Series 15

[B] Entire series, effect on correlation ( .459) is:

Lower 1935> -.031 1998< -.014 1988< -.014 1945> -.012 1982< -.011 1937> -.009 Higher 1965 .017 1953 .014

8A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1919 319

1920 300 196 181 182 302 296 293 241 290 297

1930 287 342 374 342 246 390 315 417 350 398

1940 392 443 850 558 310 478 348 363 348 201

1950 177 144 122 85 96 137 264 368 372 345

1960 308 287 229 250 314 201 228 279 358 408

1970 295 293 329 340 377 304 350 170 252 252

1980 282 329 189 236 280 235 175 265 68 132

1990 110 76 108 143 121 76 83 78 52 71

2000 132 64 160 84 56 58 39 44 73 70

2010 60 102 67 119 107 66 50

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8B 1916 to 2016 101 years Series 16

[\*] Early part of series cannot be checked from 1916 to 1917 -- not matched by another series

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

Lower 1973> -.016 2005> -.011 1974> -.011 1989< -.011 1998< -.010 1963< -.009 Higher 2016 .021 1965 .014

8B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 73 47 442 270

1920 371 236 214 202 371 322 362 276 292 362

1930 375 391 310 327 228 174 163 208 83 415

1940 445 435 514 628 466 546 434 501 359 266

1950 234 146 123 79 77 123 262 306 326 296

1960 334 318 306 246 337 219 264 292 320 419

1970 360 359 425 518 532 378 456 257 380 227

1980 333 411 285 347 282 226 208 256 117 128

1990 102 99 137 181 190 92 140 100 88 91

2000 175 57 192 106 164 154 112 113 106 98

2010 80 108 63 86 100 78 56

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9A 1965 to 2016 52 years Series 17

[B] Entire series, effect on correlation ( .495) is:

Lower 1973< -.048 2009< -.028 2008> -.019 1983< -.018 1977> -.017 1970< -.013 Higher 1995 .072 2016 .032

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

2008 +3.2 SD

9A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1965 308 325 331 410 379

1970 248 283 307 223 327 307 463 318 288 305

1980 354 266 247 225 218 229 265 218 189 234

1990 182 178 268 302 312 140 175 183 320 187

2000 319 193 199 184 227 207 257 282 378 165

2010 171 154 200 206 253 143 95

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9B 1954 to 2016 63 years Series 18

[B] Entire series, effect on correlation ( .521) is:

Lower 2016> -.032 1965> -.028 2009< -.024 1977> -.017 1971< -.014 1999> -.011 Higher 1995 .042 1966 .018

9B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 225 454 478 490 493 434

1960 482 349 400 402 331 344 276 334 322 357

1970 293 292 355 326 310 351 503 380 330 367

1980 441 423 436 383 267 420 448 387 280 381

1990 189 215 322 377 290 167 232 227 358 252

2000 526 189 257 262 391 250 193 179 253 132

2010 158 150 125 226 307 110 134

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10A 1955 to 2016 62 years Series 19

[B] Entire series, effect on correlation ( .496) is:

Lower 1967< -.025 1990> -.021 1977> -.021 1983< -.020 1975> -.018 1984< -.018 Higher 1995 .071 1993 .018

10A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 375 404 362 313 306

1960 465 410 331 312 212 202 192 158 227 297

1970 228 281 283 296 216 276 311 270 321 214

1980 246 185 177 143 115 196 189 157 165 139

1990 197 142 181 229 152 84 59 66 116 105

2000 192 122 228 102 188 110 217 125 90 160

2010 138 180 63 138 91 90 56

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10B 1953 to 2016 64 years Series 20

[B] Entire series, effect on correlation ( .488) is:

Lower 1964< -.045 2016> -.021 1996< -.016 1976< -.014 1983< -.014 1991> -.014 Higher 1995 .052 1965 .020

10B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1953 241 302 380 427 332 248 300

1960 441 353 265 261 189 225 268 293 239 292

1970 311 307 344 326 249 209 219 209 281 177

1980 286 239 243 178 166 242 200 149 170 137

1990 171 149 164 202 107 77 74 130 93 104

2000 127 64 166 67 102 62 120 94 75 143

2010 114 171 66 160 144 80 102

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11A 1967 to 2016 50 years Series 21

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

Lower 1971< -.034 1993< -.032 1988> -.024 2016> -.017 2001> -.015 1969< -.013 Higher 1995 .104 1999 .023

11A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1967 174 223 191

1970 163 151 206 205 202 195 255 213 269 275

1980 312 267 256 273 226 329 341 319 294 267

1990 247 189 268 206 203 100 165 184 229 138

2000 263 202 197 138 203 163 217 201 245 280

2010 292 320 205 281 152 155 127

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11B 1959 to 2016 58 years Series 22

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

Lower 1965> -.039 2012< -.025 1988> -.015 1959< -.013 2003> -.012 2014< -.012 Higher 1995 .063 2016 .022

11B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 167

1960 183 207 230 260 221 196 182 218 219 240

1970 179 184 169 151 150 138 199 148 317 316

1980 382 326 255 295 173 335 324 266 273 228

1990 199 121 217 379 280 132 244 195 290 147

2000 289 240 333 325 396 363 381 292 280 358

2010 356 359 177 272 182 252 146

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12A 1957 to 2016 60 years Series 23

[B] Entire series, effect on correlation ( .535) is:

Lower 1973< -.033 1966> -.032 1975> -.032 1960< -.031 2014< -.024 1969< -.018 Higher 1995 .089 1965 .041

12A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 336 351 405

1960 236 331 275 275 196 164 328 429 366 242

1970 303 300 293 149 159 437 342 248 350 278

1980 286 321 458 447 318 433 478 329 285 465

1990 295 290 416 530 498 211 320 264 338 240

2000 407 284 299 255 301 246 276 272 253 262

2010 253 215 191 188 84 86 64

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12C 1970 to 2016 47 years Series 24

[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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1970 2016 0 -.11 .05 .20 -.05 .01 -.32 .24 -.04 .16 -.04 .32\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .319) is:

Lower 2007< -.077 1988> -.023 1977> -.019 1975> -.019 1970> -.017 1984> -.015 Higher 1991 .056 1999 .033

1970 to 2016 segment:

Lower 2007< -.077 1988> -.023 1977> -.019 1975> -.019 1970> -.017 1984> -.015 Higher 1991 .056 1999 .033

12C Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1970 285 294 282 282 227 347 317 351 280 233

1980 320 522 527 475 554 542 333 282 456 280

1990 208 52 391 503 464 247 441 300 281 171

2000 282 206 230 183 197 177 210 118 131 179

2010 149 153 182 175 151 216 128

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13A 1964 to 2016 53 years Series 25

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

Lower 1988< -.048 1997< -.026 1995> -.019 1991> -.018 2008< -.008 1976< -.008 Higher 2016 .036 1999 .020

13A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1964 197 145 148 242 270 278

1970 217 242 260 228 213 181 229 209 252 240

1980 295 309 332 320 291 315 336 223 152 244

1990 215 247 240 276 262 221 263 197 362 218

2000 295 256 319 277 361 294 348 285 238 287

2010 378 422 355 456 365 329 154

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13B 1969 to 2016 48 years Series 26

[B] Entire series, effect on correlation ( .567) is:

Lower 1995> -.088 1975< -.057 2002< -.017 2009< -.012 1991> -.012 1976< -.010 Higher 1999 .034 1993 .018

13B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1969 291

1970 211 211 264 193 190 151 231 234 269 268

1980 321 308 355 358 320 374 396 307 273 393

1990 314 308 301 388 343 312 256 239 307 210

2000 364 232 243 226 355 229 308 278 207 206

2010 269 353 282 388 262 149 94

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14A RE 1955 to 2016 62 years Series 27

[B] Entire series, effect on correlation ( .429) is:

Lower 1956< -.032 1999> -.030 1995> -.027 1964> -.020 1975> -.018 1993< -.016 Higher 1965 .053 2016 .022

14A RE Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 121 109 180 231 259

1960 205 227 233 277 329 141 163 200 226 223

1970 206 193 195 174 197 220 281 93 146 153

1980 174 165 223 163 128 172 193 170 144 200

1990 126 100 261 214 238 219 414 354 514 388

2000 455 319 322 207 227 119 201 196 173 197

2010 228 257 118 210 204 223 103

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14B 1955 to 2016 62 years Series 28

[B] Entire series, effect on correlation ( .635) is:

Lower 1995> -.042 1955< -.031 1998< -.026 2003> -.019 1996> -.009 1976< -.009 Higher 2016 .047 1965 .040

14B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 218 299 248 241 237

1960 215 216 237 234 222 136 135 196 221 230

1970 167 167 184 137 150 161 160 83 142 172

1980 237 244 336 263 138 231 273 182 169 245

1990 149 93 296 293 262 224 364 294 212 231

2000 375 302 302 382 421 313 380 407 349 407

2010 384 329 240 315 220 288 100

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15A 1961 to 2016 56 years Series 29

[B] Entire series, effect on correlation ( .664) is:

Lower 1976< -.028 1991> -.025 1966> -.024 1980< -.010 2014< -.008 1967> -.008 Higher 1965 .041 1999 .016

15A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1961 221 213 232 222 149 215 269 348 305

1970 214 230 238 238 210 202 191 179 256 226

1980 245 310 391 476 339 349 379 342 244 375

1990 203 286 279 345 276 207 270 218 357 213

2000 325 242 397 215 250 194 285 342 314 433

2010 444 318 308 354 201 208 124

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15B 1963 to 2016 54 years Series 30

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

Lower 1995> -.055 1994< -.027 1991> -.025 1980< -.025 1976< -.015 1973> -.011 Higher 2016 .059 1965 .040

15B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1963 284 266 203 244 240 422 344

1970 288 317 310 340 315 244 257 223 252 201

1980 238 336 394 437 292 346 293 278 271 440

1990 291 324 297 370 199 268 233 188 411 220

2000 328 199 480 317 325 236 220 220 226 313

2010 330 300 257 331 243 270 132

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16A 1944 to 2016 73 years Series 31

[B] Entire series, effect on correlation ( .539) is:

Lower 1967< -.054 1945< -.033 1992< -.015 2008< -.015 1951> -.014 1957< -.012 Higher 1995 .092 2016 .027

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

1967 -6.2 SD

16A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 185 59 207 111 300 289

1950 313 408 403 273 290 368 285 223 212 186

1960 234 217 238 217 210 157 166 96 224 249

1970 265 289 397 348 387 281 511 324 498 416

1980 595 414 451 437 411 447 479 447 355 487

1990 380 415 285 481 270 223 351 321 485 264

2000 475 245 433 188 401 220 349 314 216 314

2010 330 428 358 453 324 356 169

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16B 1945 to 2016 72 years Series 32

[B] Entire series, effect on correlation ( .488) is:

Lower 2014< -.040 1954> -.027 1992< -.018 1945< -.014 2016> -.013 1974> -.009 Higher 1995 .081 1953 .024

16B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1945 73 205 322 320 273

1950 423 377 225 49 322 338 273 196 205 147

1960 128 129 100 94 103 80 92 58 111 148

1970 154 214 318 280 385 329 495 301 383 307

1980 384 303 374 333 325 301 397 336 254 369

1990 231 233 194 335 252 157 219 232 380 245

2000 329 252 427 262 370 216 360 316 200 413

2010 292 314 261 242 90 164 113

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17A RE 1918 to 2016 99 years Series 33

[B] Entire series, effect on correlation ( .443) is:

Lower 1968< -.029 1995> -.024 1988> -.013 1998< -.013 1982< -.013 1965> -.012 Higher 1918 .027 2001 .019

17A RE Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 438 252

1920 208 192 137 119 131 138 158 95 117 111

1930 91 154 186 185 162 119 47 101 127 165

1940 467 432 441 568 416 477 437 486 366 301

1950 312 317 209 171 124 153 274 260 194 244

1960 246 169 124 162 89 120 124 166 102 209

1970 146 181 233 245 253 248 261 162 246 258

1980 257 338 247 268 254 270 369 306 358 439

1990 314 242 348 399 371 279 187 248 149 76

2000 131 40 137 137 103 97 69 67 91 102

2010 77 107 79 83 78 78 51

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

17B RE 1929 to 2012 84 years Series 34

[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 -1 -.05 .04 .05 -.17 -.21 -.08 .04 .18 -.01 .26\* .24|-.15 -.01 .11 -.13 .01 .00 .15 -.24 -.02 -.02

1963 2012 0 -.05 .01 -.15 -.06 -.07 .01 .01 .18 .09 .17 .21\*-.26 .11 .04 -.12 - - - - - -

[B] Entire series, effect on correlation ( .348) is:

Lower 1968< -.142 1995> -.044 1998< -.018 1985< -.015 1990> -.009 2006< -.009 Higher 1953 .025 1936 .023

1950 to 1999 segment:

Lower 1968< -.206 1995> -.059 1998< -.025 1985< -.022 1990> -.013 1975> -.011 Higher 1953 .042 1965 .033

1963 to 2012 segment:

Lower 1968< -.177 1995> -.058 1998< -.023 1985< -.020 1990> -.013 1975> -.011 Higher 2001 .036 1965 .032

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

1967 1968 -4.7 SD 1968 1969 4.7 SD

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

1968 -8.3 SD; 1995 +3.0 SD

17B RE Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 164

1930 167 128 209 160 124 25 24 59 191 293

1940 409 314 378 471 304 350 391 423 427 387

1950 349 407 378 288 306 361 464 389 366 342

1960 392 301 255 247 236 202 222 214 115 306

1970 226 231 282 279 274 291 299 248 285 303

1980 298 342 300 348 322 238 368 358 241 250

1990 308 217 295 310 328 273 132 255 145 110

2000 165 91 197 175 140 130 81 101 103 111

2010 100 174 92

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PART 7: DESCRIPTIVE STATISTICS: ACRU\_ALC\_Corr1-50 13:54 Tue 25 Oct 2016 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 ()

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1 1A 1965 2016 52 2 0 .577 4.51 7.94 1.271 .571 .200 2.61 .522 -.058 1

2 1B 1977 2016 40 1 0 .669 4.83 9.28 1.909 .831 .187 2.41 .566 -.022 2

3 2A 1959 2016 58 2 0 .754 2.79 5.24 1.026 .687 .241 2.77 .617 -.074 1

4 2B 1973 2016 44 1 0 .718 3.74 7.26 1.649 .828 .218 2.64 .558 -.066 1

5 3A 1961 2016 56 2 0 .728 2.33 4.67 1.043 .611 .366 2.60 .589 .074 1

6 3B 1963 2016 54 2 0 .621 2.15 5.03 .907 .608 .325 2.62 .574 -.027 1

7 4A 1967 2016 50 1 0 .560 2.22 3.90 .737 .520 .272 2.62 .495 -.056 1

8 4B 1959 2016 58 2 0 .511 2.14 4.22 .980 .696 .281 2.65 .665 .012 1

9 5A 1951 2016 66 2 0 .659 2.38 3.88 .723 .570 .235 2.52 .468 .130 1

10 5B 1954 2016 63 2 0 .748 2.19 3.19 .493 .357 .205 2.50 .464 .118 1

11 6A 1958 2016 59 2 0 .625 2.59 5.96 .942 .547 .263 2.57 .433 -.053 1

12 6B 1960 2016 57 2 0 .851 2.46 4.86 .746 .596 .229 2.59 .505 -.026 1

13 7A 1956 2016 61 2 0 .511 2.43 4.70 .812 .639 .206 2.81 .562 .039 1

14 7B 1952 2016 65 2 0 .671 2.71 5.43 1.030 .775 .225 2.44 .390 -.028 1

15 8A 1919 2016 98 4 0 .459 2.35 8.50 1.362 .796 .270 2.81 .422 -.056 1

16 8B 1916 2016 101 4 0 .623 2.54 6.28 1.376 .771 .288 2.56 .418 .012 2

17 9A 1965 2016 52 2 0 .495 2.53 4.63 .754 .454 .224 2.90 .556 -.031 1

18 9B 1954 2016 63 2 0 .521 3.18 5.26 1.065 .534 .252 2.84 .576 .013 1

19 10A 1955 2016 62 2 0 .496 2.03 4.65 .950 .774 .296 2.80 .624 .014 3

20 10B 1953 2016 64 2 0 .488 2.00 4.41 .947 .803 .290 2.63 .544 .047 1

21 11A 1967 2016 50 1 0 .667 2.23 3.41 .574 .530 .207 2.46 .434 -.032 1

22 11B 1959 2016 58 2 0 .667 2.47 3.96 .760 .466 .253 2.56 .571 -.121 1

23 12A 1957 2016 60 2 0 .535 2.99 5.30 1.004 .482 .250 2.55 .586 .033 1

24 12C 1970 2016 47 1 1 .319 2.83 5.54 1.269 .647 .290 2.69 .532 .008 1

25 13A 1964 2016 53 2 0 .665 2.70 4.56 .677 .525 .196 2.62 .506 -.018 1

26 13B 1969 2016 48 1 0 .567 2.78 3.96 .697 .442 .210 2.47 .481 .055 1

27 14A RE 1955 2016 62 2 0 .429 2.15 5.14 .832 .596 .255 2.51 .372 -.063 1

28 14B 1955 2016 62 2 0 .635 2.43 4.21 .836 .629 .242 2.56 .488 .041 2

29 15A 1961 2016 56 2 0 .664 2.75 4.76 .769 .429 .231 2.60 .452 -.104 1

30 15B 1963 2016 54 2 0 .574 2.89 4.80 .707 .067 .237 2.70 .485 -.001 1

31 16A 1944 2016 73 3 0 .539 3.21 5.95 1.116 .431 .313 2.48 .458 .027 3

32 16B 1945 2016 72 3 0 .488 2.56 4.95 1.054 .536 .328 2.55 .456 .010 2

33 17A RE 1918 2016 99 4 0 .443 2.13 5.68 1.193 .833 .264 2.67 .434 -.109 1

34 17B RE 1929 2012 84 3 2 .348 2.54 4.71 1.068 .795 .251 2.63 .356 .000 1

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Total or mean: 2101 71 3 .574 2.62 9.28 .990 .612 .256 2.90 .496 -.009

- = [ COFECHA ACRU\_COF ] = -