[] Dendrochronology Program Library Run SUG Program COF 14:11 Wed 21 Feb 2012 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 28178

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: SUG002\_ACSA\_1

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 N

8 Parts printed 1234567

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

Time span of Master dating series is 1918 to 2011 94 years

Continuous time span is 1918 to 2011 94 years

Portion with two or more series is 1923 to 2011 89 years

>> 9a 2005 absent in 1 of 12 series, but is not usually narrow: master index is .616

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

\*C\* Number of dated series 12 \*C\*

\*O\* Master series 1918 2011 94 yrs \*O\*

\*F\* Total rings in all series 805 \*F\*

\*E\* Total dated rings checked 800 \*E\*

\*C\* Series intercorrelation .494 \*C\*

\*H\* Average mean sensitivity .366 \*H\*

\*A\* Segments, possible problems 8 \*A\*

\*\*\* Mean length of series 67.1 \*\*\*

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

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

9a 2 absent rings: 2005 2011

9b 2 absent rings: 2000 2011

12a 4 absent rings: 1953 1966 1968 2011

13a 1 absent rings: 1981

9 absent rings 1.118%

PART 2: TIME PLOT OF TREE-RING SERIES: 14:11 Wed 21 Feb 2012 Page 2

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

: : : : : : : : : : : : : : : : : : : : : -------- --- ---- ---- ----

. . . . . . . . . . . . . . . . . . . <===> . 8a 1 1970 2011 42

. . . . . . . . . . . . . . . . . . <=======> . 8b 2 1939 2011 73

. . . . . . . . . . . . . . . . . . <========> . 9a 3 1924 2011 88

. . . . . . . . . . . . . . . . . . .<====> . 9b 4 1963 2011 49

. . . . . . . . . . . . . . . . . . <=====> . 10a 5 1956 2011 56

. . . . . . . . . . . . . . . . . . . <===> . 10b 6 1974 2011 38

. . . . . . . . . . . . . . . . . . <=======> . 11a 7 1939 2011 73

. . . . . . . . . . . . . . . . . . <========> . 11b 8 1923 2011 89

. . . . . . . . . . . . . . . . . .<=========> . 12a 9 1918 2011 94

. . . . . . . . . . . . . . . . . . <=====> . 12b 10 1957 2011 55

. . . . . . . . . . . . . . . . . . <=======> . 13a 11 1932 2011 80

. . . . . . . . . . . . . . . . . . <======> . 13b 12 1944 2011 68

: : : : : : : : : : : : : : : : : : : : :

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

PART 3: Master Dating Series: 14:11 Wed 21 Feb 2012 Page 3

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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1950 -.528 7 2000 -.651 12 1

1951 -.458 7 2001 -.257 12

1952 -.730 7 2002 -.198 12

1953 -1.974 7 1 2003 -.210 12

1954 .028 7 2004 1.204 12

1955 1.359 7 2005 .616 12 1<<

1956 1.518 8 2006 -.290 12

1957 .555 9 2007 -.063 12

1958 .280 9 2008 .770 12

1959 .028 9 2009 1.130 12

1960 -.455 9 2010 .281 12

1961 .211 9 2011 -1.816 12 3

1962 .275 9

1963 .067 10

1964 -.383 10

1965 -.383 10

1966 -.823 10 1

1967 .365 10

1918 .336 1 1968 -.545 10 1

1919 -.490 1 1969 .675 10

1920 1.968 1 1970 .947 11

1921 -.499 1 1971 .712 11

1922 -3.936 1 1972 .768 11

1923 -.400 2 1973 .569 11

1924 1.327 3 1974 -.344 12

1925 1.243 3 1975 .581 12

1926 1.216 3 1976 -.236 12

1927 -.972 3 1977 .641 12

1928 -.838 3 1978 .966 12

1929 -.492 3 1979 -.238 12

1930 .507 3 1980 .133 12

1931 -.634 3 1981 -4.520 12 1

1932 -1.929 4 1982 -.626 12

1933 -.388 4 1983 .344 12

1934 -.512 4 1984 1.217 12

1935 .931 4 1985 1.210 12

1936 .755 4 1986 -.418 12

1937 -1.285 4 1987 -1.014 12

1938 .522 4 1988 -.746 12

1939 1.389 6 1989 -.189 12

1940 .565 6 1990 .392 12

1941 1.384 6 1991 .213 12

1942 1.089 6 1992 .415 12

1943 .037 6 1993 -.785 12

1944 .130 7 1994 .780 12

1945 .148 7 1995 .386 12

1946 -.343 7 1996 .309 12

1947 -.400 7 1997 .275 12

1948 -.888 7 1998 .140 12

1949 -1.151 7 1999 .131 12

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PART 4: Master Bar Plot: 14:11 Wed 21 Feb 2012 Page 4

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Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value

1950--b 2000-c

1951--b 2001----a

1952-c 2002----a

1953h 2003----a

1954-----@ 2004---------E

1955----------E 2005--------B

1956----------F 2006----a

1957-------B 2007----@

1958------A 2008--------C

1959-----@ 2009---------E

1960--b 2010------A

1961------A 2011g

1962------A

1963-----@

1964---b

1965---b

1966-c

1967------A

1918------A 1968--b

1919--b 1969--------C

1920----------H 1970---------D

1921--b 1971--------C

1922p 1972--------C

1923---b 1973-------B

1924----------E 1974---a

1925----------E 1975-------B

1926---------E 1976----a

1927-d 1977--------C

1928-c 1978---------D

1929--b 1979----a

1930-------B 1980-----A

1931-c 1981r

1932h 1982-c

1933---b 1983------A

1934--b 1984---------E

1935---------D 1985---------E

1936--------C 1986---b

1937e 1987-d

1938-------B 1988-c

1939----------F 1989----a

1940-------B 1990------B

1941----------F 1991------A

1942---------D 1992-------B

1943-----@ 1993-c

1944-----A 1994--------C

1945-----A 1995------B

1946---a 1996------A

1947---b 1997------A

1948-d 1998-----A

1949-e 1999-----A

PART 5: CORRELATION OF SERIES BY SEGMENTS: 14:11 Wed 21 Feb 2012 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 8a 1970 2011 .68

2 8b 1939 2011 .74 .70 .64

3 9a 1924 2011 .40 .33 .19B .13B

4 9b 1963 2011 .48

5 10a 1956 2011 .72 .76

6 10b 1974 2011 .72

7 11a 1939 2011 .36 .36 .35

8 11b 1923 2011 .27B .24B .53 .54

9 12a 1918 2011 .05B .03B .43 .57

10 12b 1957 2011 .42 .49

11 13a 1932 2011 .42 .20B .28A

12 13b 1944 2011 .52 .52 .58

Av segment correlation .24 .38 .50 .48

PART 6: POTENTIAL PROBLEMS: 14:11 Wed 21 Feb 2012 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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8a 1970 to 2011 42 years Series 1

[B] Entire series, effect on correlation ( .680) is:

Lower 2009< -.032 1977< -.028 1987> -.025 1991< -.023 1999< -.017 1993> -.016 Higher 1981 .213 2011 .022

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

8b 1939 to 2011 73 years Series 2

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

Lower 1998< -.028 1964> -.019 1985< -.013 2004< -.013 2009< -.012 1996< -.012 Higher 1981 .244 1939 .010

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

9a 1924 to 2011 88 years Series 3

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

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

1950 1999 -6 -.17 -.21 .08 .25 .35\* .01 -.17 -.08 -.01 .28 .19| .13 -.02 .01 -.17 -.01 .04 -.28 .05 .00 -.15

1962 2011 -6 -.12 -.18 .11 .20 .39\* .02 -.21 -.05 -.02 .21 .13| - - - - - - - - - -

[B] Entire series, effect on correlation ( .255) is:

Lower 2005< -.020 1974> -.017 1993> -.016 1981> -.013 2010> -.012 1955< -.011 Higher 2011 .043 1953 .015

1950 to 1999 segment:

Lower 1974> -.030 1993> -.029 1967< -.017 1955< -.016 1998< -.015 1978< -.015 Higher 1953 .030 1969 .023

1962 to 2011 segment:

Lower 2005< -.028 1974> -.024 1993> -.023 2010> -.017 1967< -.016 1978< -.014 Higher 2011 .078 1969 .022

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

1981 1982 -4.5 SD

[D] 2 Absent rings: Year Master N series Absent

2005 .616 12 1 >> WARNING: Ring is not usually narrow

2011 -1.816 12 3

>> WARNING: Last ring in series is ABSENT

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

1981 +3.3 SD

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9b 1963 to 2011 49 years Series 4

[B] Entire series, effect on correlation ( .497) is:

Lower 1981> -.045 1973< -.019 2002> -.017 1994< -.010 2000< -.009 2005< -.007 Higher 2011 .019 1984 .014

[D] 2 Absent rings: Year Master N series Absent

2000 -.651 12 1

2011 -1.816 12 3

>> WARNING: Last ring in series is ABSENT

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

10a 1956 to 2011 56 years Series 5

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

Lower 1991< -.042 1967< -.025 1969< -.019 1960> -.013 1968> -.012 1998> -.011 Higher 1981 .222 2011 .015

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10b 1974 to 2011 38 years Series 6

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

Lower 1993< -.055 2011> -.021 1986> -.016 2007< -.015 1977< -.014 1978< -.011 Higher 1981 .309 2004 .010

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11a 1939 to 2011 73 years Series 7

[B] Entire series, effect on correlation ( .376) is:

Lower 1981> -.034 1978< -.026 1966< -.019 2007< -.016 1974> -.015 1987> -.015 Higher 1953 .021 1955 .019

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

1980 1981 5.0 SD

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11b 1923 to 2011 89 years Series 8

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

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1923 1972 5 - - - - - .09 -.29 -.08 -.18 .07 .27|-.02 -.08 .11 .03 .27\* .08 -.23 -.08 .05 -.16

1925 1974 5 - - - .06 .05 .10 -.32 -.06 -.13 .09 .24|-.03 -.09 .16 .04 .27\* .06 -.19 -.06 .07 -.15

[B] Entire series, effect on correlation ( .399) is:

Lower 1940< -.053 1937> -.030 1984< -.019 1972< -.017 1932< -.014 1947> -.013 Higher 1981 .099 1953 .020

1923 to 1972 segment:

Lower 1940< -.083 1937> -.057 1972< -.026 1947> -.024 1952> -.021 1933> -.021 Higher 1953 .049 1955 .036

1925 to 1974 segment:

Lower 1940< -.085 1937> -.055 1972< -.027 1947> -.023 1952> -.021 1933> -.020 Higher 1953 .051 1955 .040

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

1932 -5.1 SD

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12a 1918 to 2011 94 years Series 9

[\*] Early part of series cannot be checked from 1918 to 1922 -- not matched by another series

[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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1923 1972 -5 - - - - - .26\*-.03 .00 .01 -.02 .05| .11 -.17 .06 -.20 .04 .00 .02 -.08 -.10 -.07

1925 1974 -5 - - - -.20 .10 .26\*-.07 .01 .05 -.04 .03| .11 -.18 .08 -.21 .03 -.01 .05 -.02 -.13 -.07

[B] Entire series, effect on correlation ( .358) is:

Lower 1955< -.072 1928> -.031 1932> -.023 1949> -.017 2002< -.015 1960> -.013 Higher 1981 .129 1953 .023

1923 to 1972 segment:

Lower 1955< -.114 1928> -.051 1932> -.037 1949> -.029 1960> -.022 1934> -.008 Higher 1968 .053 1953 .047

1925 to 1974 segment:

Lower 1955< -.119 1928> -.051 1932> -.037 1949> -.029 1960> -.021 1933< -.008 Higher 1968 .055 1953 .048

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

1954 1955 -4.0 SD

[D] 4 Absent rings: Year Master N series Absent

1953 -1.974 7 1

1966 -.823 10 1

1968 -.545 10 1

2011 -1.816 12 3

>> WARNING: Last ring in series is ABSENT

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

1928 +3.8 SD; 1968 -4.7 SD

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12b 1957 to 2011 55 years Series 10

[B] Entire series, effect on correlation ( .388) is:

Lower 1959< -.084 2011> -.050 1988> -.017 1966> -.016 1987> -.015 1964> -.014 Higher 1981 .274 1984 .010

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

2011 +3.4 SD

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13a 1932 to 2011 80 years Series 11

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

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

1950 1999 7 -.14 -.02 .13 .06 .03 -.04 -.23 .06 -.02 -.05 .20|-.01 .18 -.11 -.13 .14 .00 .28\*-.25 -.14 .08

1962 2011 0 -.11 -.03 .11 .09 .09 .05 -.27 .00 -.03 -.09 .28\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .649) is:

Lower 1966> -.021 1984< -.020 1961< -.017 1964< -.013 1971< -.012 2008< -.012 Higher 1981 .254 2011 .009

1950 to 1999 segment:

Lower 1984< -.031 1966> -.029 1961< -.025 1971< -.018 1964< -.017 1968> -.016 Higher 1981 .465 1955 .012

1962 to 2011 segment:

Lower 1966> -.032 1984< -.029 1968> -.019 2008< -.017 1971< -.017 1993> -.016 Higher 1981 .422 2004 .010

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

1981 -4.520 12 1

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13b 1944 to 2011 68 years Series 12

[B] Entire series, effect on correlation ( .543) is:

Lower 1968> -.053 1987> -.029 1960> -.029 1976< -.028 1964< -.026 1990< -.023 Higher 1981 .304 2011 .019

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

1987 +3.1 SD

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PART 7: DESCRIPTIVE STATISTICS: 14:11 Wed 21 Feb 2012 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 8a 1970 2011 42 1 0 .680 3.30 6.25 1.564 .806 .251 2.57 .518 -.014 3

2 8b 1939 2011 73 3 0 .635 2.24 5.01 1.439 .898 .290 2.47 .355 -.026 1

3 9a 1924 2011 88 4 2 .255 1.14 7.68 1.284 .734 .541 3.02 .529 .051 1

4 9b 1963 2011 49 1 0 .497 1.23 3.67 1.032 .684 .596 2.64 .577 .016 1

5 10a 1956 2011 56 2 0 .743 2.04 5.22 1.129 .730 .345 2.54 .398 -.051 1

6 10b 1974 2011 38 1 0 .718 3.06 6.60 1.540 .797 .257 2.53 .459 -.072 1

7 11a 1939 2011 73 3 0 .376 1.35 3.61 .694 .724 .329 3.04 .538 -.014 2

8 11b 1923 2011 89 4 2 .399 1.19 3.08 .702 .848 .298 2.73 .466 -.032 1

9 12a 1918 2011 94 4 2 .358 1.10 2.44 .598 .612 .450 2.46 .494 -.024 1

10 12b 1957 2011 55 2 0 .388 1.66 4.04 .949 .776 .344 2.57 .509 .014 1

11 13a 1932 2011 80 3 2 .649 1.27 2.91 .529 .676 .308 2.43 .299 -.039 1

12 13b 1944 2011 68 3 0 .543 2.08 4.09 .936 .736 .300 2.42 .377 -.031 1

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Total or mean: 805 31 8 .494 1.66 7.68 .973 .747 .366 3.04 .456 -.017

- = [ COFECHA SUG COF ] = -