[] Dendrochronology Program Library Run HUT Program COF 10:46 Wed 21 Jun 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30124

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: hutfinal.txt

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 1891 to 2016 126 years

Continuous time span is 1891 to 2016 126 years

Portion with two or more series is 1894 to 2016 123 years

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

\*C\* Number of dated series 18 \*C\*

\*O\* Master series 1891 2016 126 yrs \*O\*

\*F\* Total rings in all series 1825 \*F\*

\*E\* Total dated rings checked 1822 \*E\*

\*C\* Series intercorrelation .687 \*C\*

\*H\* Average mean sensitivity .417 \*H\*

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

\*\*\* Mean length of series 101.4 \*\*\*

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

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

No ring measurements of zero value

PART 2: TIME PLOT OF TREE-RING SERIES: 10:46 Wed 21 Jun 2017 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

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

. . . . . . . . . . . . . . . . . <===========> . HUT01A 1 1894 2016 123

. . . . . . . . . . . . . . . . . . <========> . HUT01B 2 1922 2016 95

. . . . . . . . . . . . . . . . . . <========> . HUT02A 3 1920 2016 97

. . . . . . . . . . . . . . . . . . <=======> . HUT02B 4 1930 2016 87

. . . . . . . . . . . . . . . . . <===========> . HUT04A 5 1896 2016 121

. . . . . . . . . . . . . . . . . <==========> . HUT04B 6 1909 2016 108

. . . . . . . . . . . . . . . . . <==========> . HUT05A 7 1902 2016 115

. . . . . . . . . . . . . . . . . <===========> . HUT05B 8 1891 2016 126

. . . . . . . . . . . . . . . . . <==========> . HUT06A 9 1903 2016 114

. . . . . . . . . . . . . . . . . . <======> . HUT06B 10 1940 2016 77

. . . . . . . . . . . . . . . . . . <=======> . HUT07A 11 1939 2016 78

. . . . . . . . . . . . . . . . . . <======> . HUT07B 12 1945 2016 72

. . . . . . . . . . . . . . . . . . <=====> . HUT08A 13 1952 2016 65

. . . . . . . . . . . . . . . . . <==========> . HUT08B 14 1907 2016 110

. . . . . . . . . . . . . . . . . <==========> . HUT09A 15 1901 2016 116

. . . . . . . . . . . . . . . . . .<=========> . HUT09B 16 1910 2016 107

. . . . . . . . . . . . . . . . . <==========> . HUT10A 17 1906 2016 111

. . . . . . . . . . . . . . . . . .<=========> . HUT10B 18 1914 2016 103

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

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: 10:46 Wed 21 Jun 2017 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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1900 1.553 3 1950 .909 17 2000 -.781 18

1901 -1.718 4 1951 .905 17 2001 .957 18

1902 .622 5 1952 -.595 18 2002 -.635 18

1903 1.062 6 1953 -.717 18 2003 .026 18

1904 .504 6 1954 -1.047 18 2004 .479 18

1905 .590 6 1955 .919 18 2005 .706 18

1906 1.060 7 1956 -.063 18 2006 .818 18

1907 .883 8 1957 .796 18 2007 -1.621 18

1908 .735 8 1958 1.526 18 2008 -.911 18

1909 -.038 9 1959 .971 18 2009 -.603 18

1910 -2.396 10 1960 -.013 18 2010 1.527 18

1911 -2.464 10 1961 .126 18 2011 .424 18

1912 .727 10 1962 -.089 18 2012 -1.289 18

1913 .240 10 1963 -1.732 18 2013 -.943 18

1914 -2.397 11 1964 -.663 18 2014 -.556 18

1915 .708 11 1965 -1.793 18 2015 .979 18

1916 .568 11 1966 -1.098 18 2016 1.015 18

1917 .225 11 1967 -.594 18

1918 -.752 11 1968 1.005 18

1919 .610 11 1969 1.152 18

1920 -.661 12 1970 .431 18

1921 -1.329 12 1971 .773 18

1922 -.662 13 1972 -.584 18

1923 .100 13 1973 .087 18

1924 1.627 13 1974 1.084 18

1925 .981 13 1975 -.009 18

1926 1.356 13 1976 .432 18

1927 1.453 13 1977 -1.302 18

1928 .419 13 1978 -.095 18

1929 -.029 13 1979 .146 18

1930 -.537 14 1980 1.689 18

1931 -.964 14 1981 -.174 18

1932 -.355 14 1982 .631 18

1933 -.543 14 1983 -.470 18

1934 -.978 14 1984 -2.101 18

1935 -.296 14 1985 -.114 18

1936 -1.914 14 1986 .496 18

1937 -.901 14 1987 .060 18

1938 1.493 14 1988 -2.998 18

1939 1.463 15 1989 -1.018 18

1940 -.230 16 1990 1.368 18

1891 -1.842 1 1941 -.289 16 1991 .387 18

1892 1.098 1 1942 .756 16 1992 .423 18

1893 .437 1 1943 .470 16 1993 .263 18

1894 .210 2 1944 -1.208 16 1994 -.425 18

1895 .563 2 1945 -.886 17 1995 .984 18

1896 -.914 3 1946 .801 17 1996 .103 18

1897 -.142 3 1947 .863 17 1997 -.869 18

1898 -.830 3 1948 .046 17 1998 1.587 18

1899 .378 3 1949 -.087 17 1999 .483 18

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PART 4: Master Bar Plot: 10:46 Wed 21 Jun 2017 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

1900----------F 1950--------D 2000--c

1901g 1951--------D 2001---------D

1902-------B 1952---b 2002--c

1903---------D 1953--c 2003-----@

1904------B 1954-d 2004------B

1905-------B 1955---------D 2005-------C

1906---------D 1956----@ 2006--------C

1907--------D 1957--------C 2007f

1908--------C 1958----------F 2008-d

1909----@ 1959---------D 2009---b

1910j 1960----@ 2010----------F

1911j 1961-----A 2011------B

1912--------C 1962----@ 2012-e

1913-----A 1963g 2013-d

1914j 1964--c 2014---b

1915-------C 1965g 2015---------D

1916-------B 1966-d 2016---------D

1917-----A 1967---b

1918--c 1968---------D

1919-------B 1969---------E

1920--c 1970------B

1921-e 1971--------C

1922--c 1972---b

1923-----@ 1973-----@

1924----------G 1974---------D

1925---------D 1975----@

1926----------E 1976------B

1927----------F 1977-e

1928------B 1978----@

1929----@ 1979-----A

1930---b 1980----------G

1931-d 1981----a

1932---a 1982-------C

1933---b 1983---b

1934-d 1984h

1935----a 1985----@

1936h 1986------B

1937-d 1987-----@

1938----------F 1988l

1939----------F 1989-d

1940----a 1990----------E

1891g 1941----a 1991------B

1892---------D 1942--------C 1992------B

1893------B 1943------B 1993-----A

1894-----A 1944-e 1994---b

1895-------B 1945-d 1995---------D

1896-d 1946--------C 1996-----@

1897----a 1947--------C 1997-c

1898--c 1948-----@ 1998----------F

1899------B 1949----@ 1999------B

PART 5: CORRELATION OF SERIES BY SEGMENTS: 10:46 Wed 21 Jun 2017 Page 5

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Correlations of 50-year dated segments, lagged 25 years

Flags: A = correlation under .3281 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1875 1900 1925 1950 1975

1924 1949 1974 1999 2024

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

1 HUT01A 1894 2016 .55 .65 .74 .84 .83

2 HUT01B 1922 2016 .45 .53 .66 .72

3 HUT02A 1920 2016 .59 .60 .72 .78

4 HUT02B 1930 2016 .60 .71 .74

5 HUT04A 1896 2016 .75 .74 .56 .67 .78

6 HUT04B 1909 2016 .68 .78 .82 .81

7 HUT05A 1902 2016 .76 .83 .76 .79

8 HUT05B 1891 2016 .55 .69 .73 .81 .77

9 HUT06A 1903 2016 .71 .71 .78 .78

10 HUT06B 1940 2016 .75 .84 .82

11 HUT07A 1939 2016 .50 .62 .65

12 HUT07B 1945 2016 .83 .85 .83

13 HUT08A 1952 2016 .36 .56

14 HUT08B 1907 2016 .66 .68 .72 .66

15 HUT09A 1901 2016 .70 .81 .39 .34

16 HUT09B 1910 2016 .61 .59 .64 .80

17 HUT10A 1906 2016 .80 .79 .82 .84

18 HUT10B 1914 2016 .71 .73 .84 .85

Av segment correlation .62 .67 .69 .71 .74

PART 6: POTENTIAL PROBLEMS: 10:46 Wed 21 Jun 2017 Page 5

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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HUT01A 1894 to 2016 123 years Series 1

[B] Entire series, effect on correlation ( .687) is:

Lower 1923< -.048 1894< -.047 1921> -.015 1940> -.009 2001< -.009 1962< -.004 Higher 2007 .014 1914 .013

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

HUT01B 1922 to 2016 95 years Series 2

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

Lower 1922< -.055 1936> -.045 1997> -.014 1992< -.010 1976< -.010 1954> -.007 Higher 1984 .021 1998 .017

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

1922 -5.6 SD

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

HUT02A 1920 to 2016 97 years Series 3

[B] Entire series, effect on correlation ( .693) is:

Lower 1928< -.020 1921> -.015 1972< -.013 1927< -.012 1946< -.011 1989> -.009 Higher 2007 .020 1936 .019

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

HUT02B 1930 to 2016 87 years Series 4

[B] Entire series, effect on correlation ( .646) is:

Lower 1956< -.033 1936> -.019 1935< -.018 1930> -.017 1951< -.012 1953> -.010 Higher 1965 .018 1988 .015

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

HUT04A 1896 to 2016 121 years Series 5

[B] Entire series, effect on correlation ( .721) is:

Lower 1956< -.017 1965> -.014 1936> -.010 1909> -.009 1949> -.007 1971< -.007 Higher 1901 .025 1988 .012

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

HUT04B 1909 to 2016 108 years Series 6

[B] Entire series, effect on correlation ( .744) is:

Lower 1914> -.027 1918< -.017 1909> -.015 1911> -.013 2006< -.010 1973< -.007 Higher 1988 .025 1998 .009

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

HUT05A 1902 to 2016 115 years Series 7

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

Lower 1906< -.015 1912< -.009 1902< -.008 1990< -.007 1981> -.007 1994> -.007 Higher 1936 .011 2007 .011

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HUT05B 1891 to 2016 126 years Series 8

[\*] Early part of series cannot be checked from 1891 to 1893 -- not matched by another series

[B] Entire series, effect on correlation ( .657) is:

Lower 1894> -.044 1896> -.020 1905< -.011 1974< -.009 1938< -.007 1914> -.006 Higher 1901 .029 1910 .012

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

1894 +4.2 SD

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HUT06A 1903 to 2016 114 years Series 9

[B] Entire series, effect on correlation ( .755) is:

Lower 1911< -.020 1972> -.015 1910> -.013 1974< -.011 1904> -.007 2016< -.007 Higher 1914 .016 1988 .015

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HUT06B 1940 to 2016 77 years Series 10

[B] Entire series, effect on correlation ( .795) is:

Lower 1984> -.024 1940> -.022 1983> -.014 1941< -.010 1978< -.009 2009> -.009 Higher 1988 .032 2007 .015

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

HUT07A 1939 to 2016 78 years Series 11

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

Lower 1944> -.028 1971< -.024 1984> -.016 1965> -.016 1947< -.012 1950< -.011 Higher 1988 .034 2007 .021

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

1945 -4.6 SD; 1975 -5.1 SD

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HUT07B 1945 to 2016 72 years Series 12

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

Lower 2013> -.014 1975> -.013 1945> -.007 2014< -.006 1994> -.005 1951< -.005 Higher 1988 .017 2007 .014

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HUT08A 1952 to 2016 65 years Series 13

[B] Entire series, effect on correlation ( .414) is:

Lower 1965> -.055 1974< -.053 1969< -.030 1972> -.027 1966> -.019 1954> -.017 Higher 1988 .115 1998 .031

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

1965 +3.7 SD; 1966 +3.2 SD

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HUT08B 1907 to 2016 110 years Series 14

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

Lower 1944> -.025 2007> -.020 1988> -.009 1935< -.009 1908< -.006 2013< -.005 Higher 1936 .011 2010 .010

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

1914 -5.5 SD; 1944 +3.2 SD

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HUT09A 1901 to 2016 116 years Series 15

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

Lower 1988> -.043 2001< -.027 1907< -.015 1989< -.014 1997< -.013 1996> -.012 Higher 1914 .025 2007 .025

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

1988 +4.6 SD

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HUT09B 1910 to 2016 107 years Series 16

[B] Entire series, effect on correlation ( .652) is:

Lower 1921< -.055 1966> -.017 1947< -.013 1965> -.013 1970< -.007 1954> -.006 Higher 1936 .018 1988 .015

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

1921 -6.1 SD; 1966 +3.1 SD

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

HUT10A 1906 to 2016 111 years Series 17

[B] Entire series, effect on correlation ( .804) is:

Lower 1965< -.015 1929< -.013 2016< -.004 1943> -.004 1992< -.004 2007> -.003 Higher 1936 .008 1988 .006

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HUT10B 1914 to 2016 103 years Series 18

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

Lower 1926< -.011 1935> -.010 1938< -.010 1967< -.009 1953> -.008 1929< -.006 Higher 1988 .021 1936 .010

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

PART 7: DESCRIPTIVE STATISTICS: 10:46 Wed 21 Jun 2017 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 HUT01A 1894 2016 123 5 0 .687 2.55 7.08 1.480 .622 .437 2.84 .547 -.025 1

2 HUT01B 1922 2016 95 4 0 .560 2.65 7.53 1.536 .561 .421 2.73 .458 -.058 1

3 HUT02A 1920 2016 97 4 0 .693 3.73 11.22 1.672 .404 .377 2.97 .593 -.010 1

4 HUT02B 1930 2016 87 3 0 .646 3.70 8.34 1.738 .453 .413 2.74 .530 -.035 2

5 HUT04A 1896 2016 121 5 0 .721 2.29 5.75 1.266 .541 .451 2.73 .496 -.057 2

6 HUT04B 1909 2016 108 4 0 .744 2.57 6.20 1.367 .413 .424 2.93 .474 .032 2

7 HUT05A 1902 2016 115 4 0 .778 2.92 6.28 1.326 .450 .417 2.68 .484 -.074 2

8 HUT05B 1891 2016 126 5 0 .657 2.12 7.48 1.398 .652 .396 2.79 .445 -.005 2

9 HUT06A 1903 2016 114 4 0 .755 3.46 9.01 2.074 .506 .466 2.73 .537 -.023 2

10 HUT06B 1940 2016 77 3 0 .795 4.02 10.82 1.811 .356 .410 2.69 .494 .051 2

11 HUT07A 1939 2016 78 3 0 .564 2.66 6.10 1.265 .356 .464 2.59 .492 -.015 2

12 HUT07B 1945 2016 72 3 0 .820 4.18 8.38 1.433 .288 .371 2.63 .405 -.017 1

13 HUT08A 1952 2016 65 2 0 .414 4.42 10.80 2.692 .533 .479 2.89 .478 .058 1

14 HUT08B 1907 2016 110 4 0 .660 2.77 5.86 1.454 .483 .435 2.58 .352 .041 1

15 HUT09A 1901 2016 116 4 0 .539 2.38 8.98 1.477 .651 .415 2.92 .510 -.103 2

16 HUT09B 1910 2016 107 4 0 .652 2.83 7.87 1.612 .578 .428 2.64 .399 .022 1

17 HUT10A 1906 2016 111 4 0 .804 2.93 5.95 1.111 .260 .372 2.61 .427 .059 1

18 HUT10B 1914 2016 103 4 0 .798 3.55 6.87 1.254 .320 .339 2.54 .479 .070 1

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Total or mean: 1825 69 0 .687 3.00 11.22 1.523 .478 .417 2.97 .478 -.008

- = [ COFECHA HUT COF ] = -