[] Dendrochronology Program Library Run FINAL Program COF 13:32 Tue 02 Jul 2013 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 28674

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: Final

File of DATED series: SNCLow\_PCRU\_Final

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 30 years lagged successively by 15 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 .4226

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 1737 to 2012 276 years

Continuous time span is 1737 to 2012 276 years

Portion with two or more series is 1750 to 2012 263 years

>> 501A 1878 absent in 2 of 10 series, but is not usually narrow: master index is .063

>> 501A 1883 absent in 1 of 10 series, but is not usually narrow: master index is -.185

>> 501A 1890 absent in 1 of 10 series, but is not usually narrow: master index is -.271

>> 501A 1892 absent in 1 of 10 series, but is not usually narrow: master index is -.371

>> 501B 1878 absent in 2 of 10 series, but is not usually narrow: master index is .063

>> 503A 1870 absent in 1 of 10 series, but is not usually narrow: master index is .101

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

\*C\* Number of dated series 21 \*C\*

\*O\* Master series 1737 2012 276 yrs \*O\*

\*F\* Total rings in all series 3036 \*F\*

\*E\* Total dated rings checked 3023 \*E\*

\*C\* Series intercorrelation .538 \*C\*

\*H\* Average mean sensitivity .269 \*H\*

\*A\* Segments, possible problems 33 \*A\*

\*\*\* Mean length of series 144.6 \*\*\*

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

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

516B 1 absent rings: 1877

501A 9 absent rings: 1877 1878 1879 1881 1883 1890 1892 1893 1895

501B 5 absent rings: 1877 1878 1879 1881 1893

503A 1 absent rings: 1870

503B 2 absent rings: 1812 1829

504A 1 absent rings: 1877

504B 1 absent rings: 1814

511A 3 absent rings: 1901 1902 1919

513A 1 absent rings: 1964

24 absent rings .791%

PART 2: TIME PLOT OF TREE-RING SERIES: Final 13:32 Tue 02 Jul 2013 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

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

. . . . . . . . . . . . . . . <=======================> . 516A 1 1779 2012 234

. . . . . . . . . . . . . . . . . . <=======> . 529B 2 1934 2012 79

. . . . . . . . . . . . . . . . . . <=======> . 529A 3 1930 2012 83

. . . . . . . . . . . . . . . . . . <=======> . 528B 4 1930 2012 83

. . . . . . . . . . . . . . . . . . <=======> . 528A 5 1937 2012 76

. . . . . . . . . . . . . . . . . . <=======> . 521B 6 1939 2012 74

. . . . . . . . . . . . . . . . . . <=====> . 521A 7 1956 2012 57

. . . . . . . . . . . . . . . . . <===========> . 517B 8 1893 2012 120

. . . . . . . . . . . . . . . . . <===========> . 517A 9 1893 2012 120

. . . . . . . . . . . . . . . . <=================> . 516B 10 1839 2012 174

. . . . . . . . . . . . . . . . <==================> . 501A 11 1825 2012 188

. . . . . . . . . . . . . . . . <================> . 501B 12 1846 2012 167

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. . . . . . . . . . . . . . .<========================> . 503B 14 1766 2012 247

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. . . . . . . . . . . . . . . . <==================> . 511B 18 1820 2012 193

. . . . . . . . . . . . . . . . . . <=======> . 512A 19 1934 2012 79

. . . . . . . . . . . . . . . . . . <=======> . 513A 20 1937 2012 76

. . . . . . . . . . . . . . . . . . <======> . 513B 21 1946 2012 67

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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

PART 3: Master Dating Series: Final 13:32 Tue 02 Jul 2013 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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1750 -2.590 2 1800 1.470 4 1850 .645 10 1900 -.483 12 1950 -.491 20

1751 -.466 2 1801 1.210 4 1851 1.488 10 1901 -.869 12 1 1951 .437 20

1752 .099 2 1802 .407 4 1852 -.337 10 1902 -.511 12 1 1952 .814 20

1753 .423 2 1803 .827 4 1853 .167 10 1903 .305 12 1953 .405 20

1754 .209 2 1804 .589 4 1854 -.700 10 1904 -.390 12 1954 .533 20

1755 -1.186 2 1805 1.036 4 1855 .400 10 1905 .098 12 1955 1.005 20

1756 1.270 2 1806 -1.451 4 1856 .291 10 1906 -.108 12 1956 -.705 21

1757 -.863 2 1807 .731 4 1857 .920 10 1907 .349 12 1957 .904 21

1758 -1.053 2 1808 -.230 4 1858 .968 10 1908 .694 12 1958 1.345 21

1759 2.245 2 1809 -.338 4 1859 -.447 10 1909 .247 12 1959 .245 21

1760 .446 2 1810 1.075 4 1860 2.348 10 1910 1.223 12 1960 -1.151 21

1761 1.645 2 1811 -.839 5 1861 .525 10 1911 .061 12 1961 -.124 21

1762 .781 2 1812 -2.132 5 1 1862 1.585 10 1912 1.364 12 1962 -1.434 21

1763 -.970 2 1813 -.508 5 1863 .670 10 1913 1.604 12 1963 -1.097 21

1764 1.333 2 1814 -1.978 5 1 1864 -.152 10 1914 .836 12 1964 -1.182 21 1

1765 .275 2 1815 .412 5 1865 -.764 10 1915 1.243 12 1965 -.282 21

1766 .207 3 1816 1.079 5 1866 -.045 10 1916 1.362 12 1966 -.058 21

1767 -.759 3 1817 .787 5 1867 .214 10 1917 -.350 12 1967 -.294 21

1768 -.761 3 1818 .944 5 1868 -.044 10 1918 -1.761 12 1968 .402 21

1769 1.596 3 1819 .877 5 1869 -1.438 10 1919 -.982 12 1 1969 .973 21

1770 -1.702 3 1820 .766 6 1870 .101 10 1<< 1920 -.659 12 1970 1.191 21

1771 .608 3 1821 .319 6 1871 -.210 10 1921 -.201 12 1971 .798 21

1772 1.239 3 1822 .085 6 1872 -1.062 10 1922 -.938 12 1972 -.344 21

1773 1.205 3 1823 .263 6 1873 -1.126 10 1923 -1.937 12 1973 -.017 21

1774 .652 3 1824 .913 6 1874 -1.036 10 1924 -.691 12 1974 -1.592 21

1775 2.124 3 1825 1.526 7 1875 -.658 10 1925 -1.021 12 1975 -1.458 21

1776 .396 3 1826 .152 7 1876 -.829 10 1926 -1.561 12 1976 -1.596 21

1777 .461 3 1827 .408 7 1877 -.927 10 4 1927 -.991 12 1977 -1.478 21

1778 1.079 3 1828 -.145 7 1878 .063 10 2<< 1928 -.728 12 1978 -.304 21

1779 -.319 4 1829 -2.752 7 1 1879 -.626 10 2 1929 -.568 12 1979 .022 21

1780 -.722 4 1830 1.729 7 1880 -.163 10 1930 -1.912 14 1980 .696 21

1781 -1.799 4 1831 .527 7 1881 -.836 10 2 1931 -.113 14 1981 -.225 21

1782 -.105 4 1832 -.221 7 1882 .271 10 1932 .537 14 1982 .799 21

1783 .935 4 1833 -.913 7 1883 -.185 10 1<< 1933 .713 14 1983 .889 21

1784 .255 4 1834 -.275 7 1884 1.249 10 1934 .768 16 1984 -.209 21

1785 -2.191 4 1835 -.579 8 1885 .679 10 1935 -.103 16 1985 .716 21

1786 .443 4 1836 -.095 8 1886 1.749 10 1936 .445 16 1986 -.039 21

1737 -.947 1 1787 .449 4 1837 -.615 8 1887 .255 10 1937 .440 18 1987 1.025 21

1738 1.070 1 1788 .568 4 1838 -.982 8 1888 .212 10 1938 1.331 18 1988 .621 21

1739 1.325 1 1789 .445 4 1839 -.778 9 1889 .150 10 1939 .112 19 1989 .730 21

1740 1.626 1 1790 -.290 4 1840 -.166 9 1890 -.271 10 1<< 1940 .209 19 1990 -.079 21

1741 -.753 1 1791 -1.581 4 1841 -1.033 9 1891 .250 10 1941 1.690 19 1991 .021 21

1742 -1.198 1 1792 -3.180 4 1842 -.332 9 1892 -.371 10 1<< 1942 1.019 19 1992 .710 21

1743 -1.262 1 1793 -.561 4 1843 -.339 9 1893 -1.062 12 2 1943 -.365 19 1993 1.534 21

1744 .749 1 1794 -2.018 4 1844 -2.481 9 1894 -.065 12 1944 -.407 19 1994 -.692 21

1745 -.351 1 1795 -.630 4 1845 .554 9 1895 -.517 12 1 1945 .443 19 1995 -.728 21

1746 2.566 1 1796 .182 4 1846 .561 10 1896 1.047 12 1946 -.173 20 1996 -1.657 21

1747 -.278 1 1797 .884 4 1847 -.961 10 1897 .852 12 1947 .047 20 1997 -.986 21

1748 -2.091 1 1798 .518 4 1848 1.047 10 1898 1.353 12 1948 -2.879 20 1998 -.009 21

1749 -1.599 1 1799 .978 4 1849 .795 10 1899 -.465 12 1949 .177 20 1999 1.511 21

PART 3: Master Dating Series: Final 13:32 Tue 02 Jul 2013 Page 4

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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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2000 -.286 21

2001 .318 21

2002 .912 21

2003 -1.030 21

2004 -.335 21

2005 -.318 21

2006 -1.690 21

2007 -.348 21

2008 -.911 21

2009 .309 21

2010 .816 21

2011 .245 21

2012 1.487 21

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PART 4: Master Bar Plot: Final 13:32 Tue 02 Jul 2013 Page 5

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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

1750j 1800----------F 1850-------C 1900---b 1950---b 2000---a

1751---b 1801---------E 1851----------F 1901--c 1951-------B 2001------A

1752-----@ 1802------B 1852---a 1902---b 1952--------C 2002--------D

1753-------B 1803--------C 1853-----A 1903------A 1953------B 2003-d

1754------A 1804-------B 1854--c 1904---b 1954-------B 2004---a

1755-e 1805---------D 1855------B 1905-----@ 1955---------D 2005---a

1756---------E 1806f 1856------A 1906----@ 1956--c 2006g

1757--c 1807--------C 1857--------D 1907------A 1957--------D 2007---a

1758-d 1808----a 1858---------D 1908--------C 1958----------E 2008-d

1759----------I 1809---a 1859---b 1909------A 1959------A 2009------A

1760-------B 1810---------D 1860----------I 1910---------E 1960-e 2010--------C

1761----------G 1811--c 1861-------B 1911-----@ 1961----@ 2011------A

1762--------C 1812i 1862----------F 1912----------E 1962f 2012----------F

1763-d 1813---b 1863--------C 1913----------F 1963-d

1764----------E 1814h 1864----a 1914--------C 1964-e

1765------A 1815-------B 1865--c 1915---------E 1965----a

1766------A 1816---------D 1866-----@ 1916----------E 1966-----@

1767--c 1817--------C 1867------A 1917---a 1967---a

1768--c 1818---------D 1868-----@ 1918g 1968------B

1769----------F 1819--------D 1869f 1919-d 1969---------D

1770g 1820--------C 1870-----@ 1920--c 1970---------E

1771-------B 1821------A 1871----a 1921----a 1971--------C

1772---------E 1822-----@ 1872-d 1922-d 1972---a

1773---------E 1823------A 1873-e 1923h 1973-----@

1774-------C 1824--------D 1874-d 1924--c 1974f

1775----------H 1825----------F 1875--c 1925-d 1975f

1776------B 1826-----A 1876--c 1926f 1976f

1777-------B 1827------B 1877-d 1927-d 1977f

1778---------D 1828----a 1878-----@ 1928--c 1978---a

1779---a 1829k 1879--c 1929--b 1979-----@

1780--c 1830----------G 1880----a 1930h 1980--------C

1781g 1831-------B 1881--c 1931----@ 1981----a

1782----@ 1832----a 1882------A 1932-------B 1982--------C

1783---------D 1833-d 1883----a 1933--------C 1983--------D

1784------A 1834----a 1884---------E 1934--------C 1984----a

1785i 1835--b 1885--------C 1935----@ 1985--------C

1786-------B 1836----@ 1886----------G 1936-------B 1986-----@

1737-d 1787-------B 1837--b 1887------A 1937-------B 1987---------D

1738---------D 1788-------B 1838-d 1888------A 1938----------E 1988-------B

1739----------E 1789-------B 1839--c 1889-----A 1939-----@ 1989--------C

1740----------G 1790---a 1840----a 1890----a 1940------A 1990----@

1741--c 1791f 1841-d 1891------A 1941----------G 1991-----@

1742-e 1792m 1842---a 1892---a 1942---------D 1992--------C

1743-e 1793--b 1843---a 1893-d 1943---a 1993----------F

1744--------C 1794h 1844j 1894-----@ 1944---b 1994--c

1745---a 1795--c 1845-------B 1895---b 1945-------B 1995--c

1746----------J 1796------A 1846-------B 1896---------D 1946----a 1996g

1747----a 1797--------D 1847-d 1897--------C 1947-----@ 1997-d

1748h 1798-------B 1848---------D 1898----------E 1948l 1998-----@

1749f 1799---------D 1849--------C 1899---b 1949------A 1999----------F

PART 5: CORRELATION OF SERIES BY SEGMENTS: Final 13:32 Tue 02 Jul 2013 Page 5

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Correlations of 30-year dated segments, lagged 15 years

Flags: A = correlation under .4226 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1740 1755 1770 1785 1800 1815 1830 1845 1860 1875 1890 1905 1920 1935 1950 1965 1980 1995

1769 1784 1799 1814 1829 1844 1859 1874 1889 1904 1919 1934 1949 1964 1979 1994 2009 2024

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1 516A 1779 2012 .34A .52 .65 .74 .64 .73 .65 .30A .55 .74 .62 .62 .55 .52B .65 .71

2 529B 1934 2012 .44 .44 .34B .30B .58 .57

3 529A 1930 2012 .46 .57 .55 .33B .53 .53

4 528B 1930 2012 .33A .59 .76 .69 .52 .48

5 528A 1937 2012 .53 .55 .58 .48 .33A

6 521B 1939 2012 .48 .24B .58 .75 .84

7 521A 1956 2012 .55 .57 .60 .61

8 517B 1893 2012 .74 .55 .29B .49 .72 .79 .70 .69

9 517A 1893 2012 .50 .48 .44B .46 .53 .61 .68 .62

10 516B 1839 2012 .55 .55 .64 .49 .46 .47B .68 .71 .68 .62 .50 .58

11 501A 1825 2012 .53 .54 .80 .56 .42B .60 .55 .31B .34B .60 .65 .65 .69

12 501B 1846 2012 .78 .68 .37A .54 .59 .77 .67 .58 .76 .65 .66

13 503A 1750 2012 .51 .62 .75 .74 .46 .34B .58 .54 .56 .62 .65 .72 .64 .69 .64 .32B .27B .33B

14 503B 1766 2012 .42 .42 .54 .13B .13B .50 .75 .67 .64 .74 .73 .73 .79 .65 .50 .61 .64

15 504A 1835 2012 .61 .72 .44 .42 .69 .64 .46B .53 .58 .43 .48 .49

16 504B 1737 2012 .32B .44B .43 .44 .56 .68 .66 .66 .44 .37A .45 .60 .70 .49 .44 .79 .75 .78

17 511A 1811 2012 .75 .78 .61 .48 .50 .51 .68 .63 .74 .85 .79 .43 .41A .41A

18 511B 1820 2012 .52 .50 .59 .57 .53 .69 .68 .61 .71 .64 .45 .58 .62

19 512A 1934 2012 .68 .69 .51 .27B .25B .20B

20 513A 1937 2012 .28A .29B .63 .64 .67

21 513B 1946 2012 .65 .63 .56 .60 .62

Av segment correlation .41 .49 .49 .56 .51 .53 .58 .66 .57 .47 .61 .62 .56 .58 .56 .54 .57 .57

PART 6: POTENTIAL PROBLEMS: Final 13:32 Tue 02 Jul 2013 Page 6

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

[A] Correlations with master dating series of flagged 30-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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516A 1779 to 2012 234 years Series 1

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

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

1779 1808 0 .25 -.13 -.07 .09 .19 -.41 .06 -.14 -.13 .14 .34\* .03 .00 .11 .02 .03 -.09 -.04 -.25 -.14 .14

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

1875 1904 0 -.32 -.10 -.30 -.02 .15 .00 .13 .00 -.06 -.09 .30\* .02 .29 -.18 -.17 .03 -.07 .12 .03 .03 .01

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

1965 1994 -10 .62\* .00 .09 -.14 -.34 -.30 -.24 -.05 -.10 -.02 .52| .14 .25 .07 -.02 .03 .06 -.12 -.35 -.02 .01

[B] Entire series, effect on correlation ( .554) is:

Lower 1781> -.025 1780< -.008 1802< -.008 1784> -.007 1970< -.007 1945< -.006 Higher 1948 .018 1844 .015

1779 to 1808 segment:

Lower 1781> -.127 1780< -.041 1802< -.038 1784> -.034 1794> -.017 1791< -.015 Higher 1785 .072 1806 .071

1875 to 1904 segment:

Lower 1898< -.071 1894< -.057 1887> -.055 1889> -.042 1896< -.032 1891< -.031 Higher 1899 .117 1884 .095

1965 to 1994 segment:

Lower 1970< -.096 1981> -.048 1985< -.041 1969< -.035 1978< -.018 1990> -.014 Higher 1994 .120 1974 .043

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

1780 1781 5.0 SD

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

1781 +3.4 SD; 1844 -6.9 SD

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529B 1934 to 2012 79 years Series 2

[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 1979 3 -.11 -.09 .11 -.04 -.13 -.11 -.07 -.07 -.08 -.16 .34| .00 .10 .35\* .19 -.03 -.09 -.29 -.36 -.22 .06

1965 1994 3 .02 .30 -.10 -.03 -.03 -.03 -.03 -.18 -.24 -.51 .30| .29 .13 .30\* .18 .10 -.01 -.05 -.38 -.11 .21

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

Lower 1935< -.052 1971< -.025 1993< -.019 1948> -.016 1976> -.015 1975> -.015 Higher 1994 .036 1960 .021

1950 to 1979 segment:

Lower 1971< -.120 1976> -.058 1975> -.057 1974> -.041 1951< -.040 1961< -.029 Higher 1960 .101 1962 .054

1965 to 1994 segment:

Lower 1971< -.095 1993< -.072 1975> -.049 1976> -.048 1974> -.028 1983< -.025 Higher 1994 .224 1982 .038

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

1976 +3.1 SD

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529A 1930 to 2012 83 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

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

1965 1994 3 -.22 -.14 -.34 .06 -.16 .05 .12 -.09 .05 -.01 .33| .19 .01 .41\* .07 -.02 .09 -.25 -.43 -.05 .07

[B] Entire series, effect on correlation ( .471) is:

Lower 1930< -.029 1947> -.017 1951< -.016 1984> -.016 2008> -.015 1991< -.011 Higher 2003 .024 1960 .013

1965 to 1994 segment:

Lower 1991< -.060 1984> -.060 1971< -.059 1986> -.036 1977> -.031 1980< -.015 Higher 1994 .068 1974 .065

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

1930 -5.5 SD; 1948 +3.5 SD

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528B 1930 to 2012 83 years Series 4

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

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

1930 1959 0 .08 .12 .10 -.08 .18 -.04 -.05 -.16 .14 -.26 .33\*-.17 -.13 .23 .31 -.11 .02 -.04 -.05 -.08 -.28

[B] Entire series, effect on correlation ( .473) is:

Lower 1932< -.088 2006> -.040 1948> -.033 2009< -.014 2003> -.011 1983< -.010 Higher 1962 .022 1956 .019

1930 to 1959 segment:

Lower 1932< -.174 1948> -.071 1958< -.011 1930> -.007 1947> -.007 1934< -.006 Higher 1956 .071 1938 .045

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

2006 +3.1 SD

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528A 1937 to 2012 76 years Series 5

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

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

1983 2012 0 .25 -.31 -.35 .19 .01 -.05 .03 -.24 .09 .21 .33\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .482) is:

Lower 2010< -.043 2006> -.026 2003> -.017 1960> -.017 1975> -.014 1942< -.012 Higher 1948 .030 1996 .019

1983 to 2012 segment:

Lower 2010< -.128 2006> -.067 2003> -.040 1991< -.019 1985< -.019 2007< -.017 Higher 1996 .088 1999 .061

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521B 1939 to 2012 74 years Series 6

[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 1979 10 -.14 -.10 .08 -.18 -.11 .12 .34 -.07 .23 .15 .24|-.01 -.24 -.11 -.29 -.25 -.26 .09 .38 .06 .52\*

[B] Entire series, effect on correlation ( .605) is:

Lower 1960> -.030 1962> -.024 1981< -.019 1956> -.018 1977> -.015 1950> -.011 Higher 1948 .070 1994 .031

1950 to 1979 segment:

Lower 1960> -.058 1962> -.039 1977> -.028 1950> -.023 1956> -.023 1959> -.020 Higher 1976 .052 1958 .050

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521A 1956 to 2012 57 years Series 7

[B] Entire series, effect on correlation ( .566) is:

Lower 1995> -.042 1962> -.026 1977> -.019 1967< -.017 1988< -.016 1960> -.011 Higher 2006 .029 1974 .023

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

1995 +3.4 SD

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517B 1893 to 2012 120 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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1920 1949 9 -.21 .11 -.01 -.26 -.37 .02 .15 -.14 -.33 -.18 .29|-.21 -.29 .02 .31 .28 .09 -.02 .24 .37\*-.03

[B] Entire series, effect on correlation ( .598) is:

Lower 1948> -.019 1930> -.016 2008> -.012 1958< -.012 1996> -.012 1935> -.011 Higher 1994 .019 2006 .013

1920 to 1949 segment:

Lower 1939< -.041 1930> -.034 1938< -.031 1935> -.031 1946> -.026 1940< -.025 Higher 1941 .084 1948 .065

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

1930 +3.2 SD

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517A 1893 to 2012 120 years Series 9

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

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

1920 1949 4 -.23 .19 .06 -.07 -.36 .20 .10 -.23 -.43 -.18 .44|-.30 -.10 .00 .53\* .15 .17 -.06 .33 .14 -.09

[B] Entire series, effect on correlation ( .516) is:

Lower 1948> -.022 1911< -.019 2012< -.017 1984> -.011 1930> -.010 1929> -.010 Higher 1994 .023 2003 .016

1920 to 1949 segment:

Lower 1940< -.044 1948> -.039 1929> -.035 1942< -.032 1930> -.023 1944< -.023 Higher 1941 .063 1923 .041

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

1930 +3.0 SD

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516B 1839 to 2012 174 years Series 10

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

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

1905 1934 4 -.27 .12 -.06 .06 -.01 .15 -.06 .23 .15 .12 .47|-.10 .00 .18 .51\* .17 -.32 .24 .21 -.14 -.21

[B] Entire series, effect on correlation ( .559) is:

Lower 1852> -.026 1946> -.012 1930> -.008 1982< -.007 1917> -.006 1937< -.006 Higher 1948 .030 1860 .012

1905 to 1934 segment:

Lower 1930> -.048 1913< -.043 1917> -.039 1932< -.033 1914< -.029 1907< -.025 Higher 1918 .077 1912 .057

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

1877 -.927 10 4

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501A 1825 to 2012 188 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

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1875 1904 -7 .03 .06 -.20 .48\* .10 .08 -.41 -.21 .04 .03 .42| .26 .13 -.39 .04 .19 -.03 .38 -.61 -.15 -.14

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1920 1949 1 -.26 -.21 .15 -.11 -.42 .05 .32 .05 -.23 .04 .31| .54\*-.17 .02 -.03 -.03 -.08 -.09 -.08 .25 -.23

1935 1964 1 -.21 -.18 .16 -.11 -.11 -.02 .24 .00 -.07 .01 .34| .45\*-.24 -.08 -.12 -.12 -.11 -.13 -.10 .11 -.25

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

Lower 1947< -.054 1837< -.026 1886< -.013 1960> -.009 1833> -.009 1998< -.009 Higher 1860 .013 1847 .010

1875 to 1904 segment:

Lower 1886< -.092 1899> -.039 1878< -.037 1887> -.027 1892< -.013 1900> -.012 Higher 1896 .058 1884 .039

1920 to 1949 segment:

Lower 1947< -.353 1930> -.033 1946> -.011 1949< -.008 1923> -.005 1939> -.005 Higher 1948 .089 1941 .037

1935 to 1964 segment:

Lower 1947< -.338 1960> -.041 1950> -.012 1946> -.011 1949< -.009 1959> -.006 Higher 1948 .086 1962 .040

[D] 9 Absent rings: Year Master N series Absent

1877 -.927 10 4

1878 .063 10 2 >> WARNING: Ring is not usually narrow

1879 -.626 10 2

1881 -.836 10 2

1883 -.185 10 1 >> WARNING: Ring is not usually narrow

1890 -.271 10 1 >> WARNING: Ring is not usually narrow

1892 -.371 10 1 >> WARNING: Ring is not usually narrow

1893 -1.062 12 2

1895 -.517 12 1

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501B 1846 to 2012 167 years Series 12

[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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1875 1904 0 -.01 -.13 -.12 -.18 -.18 -.08 .03 -.24 .32 -.19 .37\*-.20 .05 -.10 -.12 .19 -.09 .00 .07 -.05 .21

[B] Entire series, effect on correlation ( .637) is:

Lower 1959< -.028 1899> -.014 1878< -.011 2003> -.008 1865> -.006 1928> -.006 Higher 1860 .016 1948 .012

1875 to 1904 segment:

Lower 1899> -.097 1878< -.050 1883> -.021 1900> -.020 1884< -.020 1891< -.013 Higher 1896 .044 1881 .043

[D] 5 Absent rings: Year Master N series Absent

1877 -.927 10 4

1878 .063 10 2 >> WARNING: Ring is not usually narrow

1879 -.626 10 2

1881 -.836 10 2

1893 -1.062 12 2

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

1878 -4.8 SD

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

503A 1750 to 2012 263 years Series 13

[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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1815 1844 -6 .16 .15 -.24 -.09 .35\* .10 .15 .28 -.03 -.16 .34| .18 .05 -.10 -.05 .20 -.01 -.05 .03 .17 -.16

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1965 1994 -2 -.05 -.12 -.12 .03 -.24 -.06 .06 .03 .42\* .08 .32|-.01 -.08 -.30 -.10 .13 -.03 .17 .09 -.12 .37

1980 2009 -1 -.14 .02 -.32 -.08 -.03 -.13 .12 .03 .07 .32\* .27|-.19 .02 -.22 - - - - - - -

1983 2012 -1 -.10 -.06 -.19 -.05 -.03 -.03 .06 .07 .04 .34\* .33| - - - - - - - - - -

[B] Entire series, effect on correlation ( .534) is:

Lower 1994> -.022 1829> -.017 1750< -.014 1998< -.012 1758> -.010 1847> -.008 Higher 1948 .022 1785 .012

1815 to 1844 segment:

Lower 1829> -.117 1815< -.041 1841> -.033 1824< -.027 1843< -.026 1831< -.019 Higher 1830 .141 1825 .044

1965 to 1994 segment:

Lower 1994> -.271 1981> -.035 1968< -.020 1985< -.013 1967< -.013 1991> -.009 Higher 1974 .167 1976 .051

1980 to 2009 segment:

Lower 1994> -.209 1998< -.089 1981> -.029 2001< -.012 2009< -.009 1985< -.007 Higher 1999 .041 1982 .040

1983 to 2012 segment:

Lower 1994> -.222 1998< -.089 2001< -.011 1991> -.009 2009< -.008 1985< -.007 Higher 2012 .068 1999 .036

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

1870 .101 10 1 >> WARNING: Ring is not usually narrow

[E] Outliers 5 3.0 SD above or -4.5 SD below mean for year

1814 -5.0 SD; 1829 +4.1 SD; 1870 -5.1 SD; 1994 +3.3 SD; 1998 -5.1 SD

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

503B 1766 to 2012 247 years Series 14

[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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1800 1829 1 -.39 -.18 .02 -.19 -.07 .20 .03 .05 .24 -.30 .13| .28\* .05 .19 -.09 -.16 .23 -.30 -.01 .09 -.17

1815 1844 6 -.21 -.05 .00 -.10 .27 .23 -.12 -.05 .10 -.18 .13| .02 .01 .08 .06 .13 .40\*-.26 .11 .37 -.14

[B] Entire series, effect on correlation ( .569) is:

Lower 1844> -.020 1776> -.020 1810< -.011 1780> -.011 1789< -.009 1773< -.007 Higher 1829 .015 1948 .014

1800 to 1829 segment:

Lower 1810< -.054 1814> -.032 1822> -.026 1820< -.021 1825< -.021 1823< -.021 Higher 1829 .193 1812 .050

1815 to 1844 segment:

Lower 1844> -.132 1820< -.025 1823< -.025 1825< -.025 1822> -.022 1821> -.014 Higher 1829 .302 1830 .076

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

1812 -2.132 5 1

Present in series 1 516A time span 1779 to 2012

Present in series 13 503A time span 1750 to 2012

Present in series 16 504B time span 1737 to 2012

Present in series 17 511A time span 1811 to 2012

1829 -2.752 7 1

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

1780 +3.2 SD; 1829 -5.1 SD; 1844 +3.8 SD

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504A 1835 to 2012 178 years Series 15

[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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1920 1949 -5 -.19 .23 .04 .08 .32 .58\* .30 -.04 .12 .42 .46|-.06 -.01 -.10 .13 -.11 -.01 -.16 .01 -.32 -.32

[B] Entire series, effect on correlation ( .482) is:

Lower 1877< -.039 1992< -.010 1835> -.009 1879> -.008 1949< -.008 1841> -.008 Higher 1860 .019 1847 .012

1920 to 1949 segment:

Lower 1949< -.069 1939> -.044 1934< -.038 1943> -.030 1947> -.026 1924< -.024 Higher 1948 .115 1938 .050

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

1876 1877 -5.6 SD

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

1877 -.927 10 4

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

1877 -8.5 SD

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504B 1737 to 2012 276 years Series 16

[\*] Early part of series cannot be checked from 1737 to 1749 -- 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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1750 1779 5 .09 -.23 .22 -.02 -.02 .26 -.09 .06 -.13 -.10 .32|-.31 .34 .04 -.33 .41\*-.12 -.29 .02 .13 -.06

1755 1784 5 .14 -.27 .29 -.05 -.09 .26 -.21 .07 -.22 -.10 .44|-.25 .29 -.01 -.27 .48\*-.19 -.27 .00 .08 .05

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1875 1904 0 -.15 .03 .35 .02 .01 .03 .16 -.29 .25 -.10 .37\*-.25 .13 -.15 -.14 -.01 -.05 .03 -.22 -.38 .10

[B] Entire series, effect on correlation ( .481) is:

Lower 1750> -.021 1770> -.014 1814< -.014 1800< -.009 1811> -.008 1962> -.008 Higher 1829 .011 1812 .010

1750 to 1779 segment:

Lower 1750> -.056 1758< -.039 1768< -.028 1762< -.025 1777> -.022 1752< -.021 Higher 1759 .059 1763 .031

1755 to 1784 segment:

Lower 1758< -.047 1770> -.039 1768< -.033 1762< -.028 1777> -.027 1773> -.019 Higher 1759 .051 1763 .027

1875 to 1904 segment:

Lower 1893> -.073 1885< -.045 1879> -.031 1880< -.031 1890> -.028 1877< -.025 Higher 1886 .059 1896 .054

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

1813 1814 -4.5 SD

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

1814 -1.978 5 1

Present in series 1 516A time span 1779 to 2012

Present in series 13 503A time span 1750 to 2012

Present in series 14 503B time span 1766 to 2012

Present in series 17 511A time span 1811 to 2012

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

1791 +3.3 SD; 1814 -7.2 SD; 1963 +3.4 SD

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511A 1811 to 2012 202 years Series 17

[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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1980 2009 0 .28 .16 -.13 -.05 -.15 .01 -.24 -.10 .15 -.22 .41\*-.30 -.19 -.24 - - - - - - -

1983 2012 0 .29 .09 .00 -.08 -.17 .08 -.32 -.08 .10 -.21 .41\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .590) is:

Lower 1986< -.042 1846< -.010 1848< -.009 2000> -.008 1877> -.007 1879< -.006 Higher 1830 .014 1844 .013

1980 to 2009 segment:

Lower 1986< -.182 2000> -.047 1994> -.040 1980< -.017 1995> -.009 2003> -.006 Higher 2006 .037 1999 .035

1983 to 2012 segment:

Lower 1986< -.169 2000> -.047 1994> -.041 1995> -.010 2011< -.008 2003> -.007 Higher 2006 .037 1999 .034

[D] 3 Absent rings: Year Master N series Absent

1901 -.869 12 1

1902 -.511 12 1

1919 -.982 12 1

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

1814 +3.1 SD; 1865 -5.4 SD; 1986 -5.0 SD

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511B 1820 to 2012 193 years Series 18

[B] Entire series, effect on correlation ( .579) is:

Lower 1843> -.025 1968< -.012 1846< -.011 1869> -.008 1948> -.008 1839> -.007 Higher 1829 .010 1844 .009

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

1843 +4.7 SD; 1998 +3.1 SD

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512A 1934 to 2012 79 years Series 19

[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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1965 1994 -3 .11 -.08 -.27 -.06 -.04 .18 .10 .39\* .13 .32 .27|-.07 -.13 -.36 -.20 -.28 -.18 .06 -.17 .19 .12

1980 2009 -1 .28 .20 -.27 .36 -.17 .16 -.17 -.27 -.06 .36\* .25|-.02 .03 -.20 - - - - - - -

1983 2012 -1 .31 .16 -.34 .30 -.15 .05 -.13 -.25 -.01 .43\* .20| - - - - - - - - - -

[B] Entire series, effect on correlation ( .441) is:

Lower 2000> -.031 2001< -.029 1994> -.029 1976> -.020 2006> -.014 1974> -.013 Higher 1948 .023 1962 .019

1965 to 1994 segment:

Lower 1994> -.092 1976> -.063 1974> -.037 1966< -.021 1993< -.018 1985< -.016 Higher 1977 .061 1975 .029

1980 to 2009 segment:

Lower 2000> -.082 2001< -.081 1994> -.065 2006> -.028 1985< -.017 1993< -.017 Higher 1999 .063 1996 .062

1983 to 2012 segment:

Lower 2000> -.077 2001< -.075 1994> -.054 2011> -.021 2006> -.021 1985< -.017 Higher 1996 .070 1999 .063

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513A 1937 to 2012 76 years Series 20

[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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1937 1966 0 .08 -.01 .24 -.10 -.07 .08 -.04 -.17 -.06 -.36 .28\*-.04 -.04 -.07 -.01 -.03 .12 .10 .08 -.10 -.11

1950 1979 1 .17 -.12 .25 -.38 -.20 .07 -.30 -.31 -.01 -.14 .29| .36\* .06 .29 .32 -.09 .07 .07 -.10 -.42 -.31

[B] Entire series, effect on correlation ( .437) is:

Lower 1964< -.043 1963> -.027 1962> -.024 1995> -.018 1937< -.016 1944> -.014 Higher 2003 .031 2006 .015

1937 to 1966 segment:

Lower 1963> -.041 1962> -.040 1937< -.026 1964< -.022 1944> -.020 1961< -.019 Higher 1948 .038 1956 .024

1950 to 1979 segment:

Lower 1962> -.069 1963> -.059 1961< -.022 1964< -.021 1950> -.017 1958< -.015 Higher 1957 .034 1956 .023

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

1964 -1.182 21 1

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

1963 +4.1 SD; 2003 -4.6 SD

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513B 1946 to 2012 67 years Series 21

[B] Entire series, effect on correlation ( .628) is:

Lower 2002< -.046 1970< -.019 1984> -.019 1947< -.018 1952< -.012 1946> -.008 Higher 1994 .032 1948 .021

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PART 7: DESCRIPTIVE STATISTICS: Final 13:32 Tue 02 Jul 2013 Page 7

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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 516A 1779 2012 234 16 3 .554 .57 1.92 .341 .845 .247 2.46 .274 -.041 2

2 529B 1934 2012 79 6 2 .429 1.21 2.30 .584 .890 .219 2.42 .390 .013 1

3 529A 1930 2012 83 6 1 .471 1.21 2.79 .602 .858 .223 2.55 .349 .021 2

4 528B 1930 2012 83 6 1 .473 1.08 2.70 .444 .785 .217 2.92 .537 -.012 1

5 528A 1937 2012 76 5 1 .482 2.12 4.57 .849 .847 .161 2.58 .437 -.002 1

6 521B 1939 2012 74 5 1 .605 2.68 5.87 1.485 .952 .165 2.49 .557 -.048 1

7 521A 1956 2012 57 4 0 .566 3.98 7.81 1.077 .763 .154 2.56 .453 -.017 1

8 517B 1893 2012 120 8 1 .598 1.53 4.78 1.337 .953 .210 2.62 .450 -.017 1

9 517A 1893 2012 120 8 1 .516 1.28 3.90 .981 .950 .196 2.45 .388 -.054 1

10 516B 1839 2012 174 12 1 .559 .66 5.98 .709 .863 .278 2.51 .270 -.104 1

11 501A 1825 2012 188 13 3 .521 1.14 5.13 1.171 .912 .382 2.59 .363 -.045 1

12 501B 1846 2012 167 11 1 .637 1.09 4.53 .907 .888 .329 2.95 .430 -.042 1

13 503A 1750 2012 263 18 4 .534 .96 3.90 .849 .909 .288 2.65 .402 -.005 2

14 503B 1766 2012 247 17 2 .569 .86 4.27 .817 .922 .307 2.57 .303 -.017 2

15 504A 1835 2012 178 12 1 .482 .89 3.04 .669 .881 .280 2.57 .299 -.002 4

16 504B 1737 2012 276 18 3 .481 .62 3.70 .707 .917 .276 2.63 .333 -.009 4

17 511A 1811 2012 202 14 2 .590 .65 3.18 .678 .947 .299 2.95 .386 -.040 1

18 511B 1820 2012 193 13 0 .579 .66 3.04 .584 .918 .259 2.85 .337 -.075 1

19 512A 1934 2012 79 6 3 .441 1.84 5.38 1.317 .878 .247 2.64 .567 -.048 1

20 513A 1937 2012 76 5 2 .437 1.49 3.44 .973 .914 .275 2.63 .391 -.112 1

21 513B 1946 2012 67 5 0 .628 1.88 4.55 1.371 .937 .269 2.61 .565 -.031 1

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Total or mean: 3036 208 33 .538 1.08 7.81 .817 .899 .269 2.95 .375 -.033

- = [ COFECHA FINALCOF ] = -