[] Dendrochronology Program Library Run MWOHG Program COF 14:57 Fri 28 Jul 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30161

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: mwo\_hg.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 1670 to 2016 347 years

Continuous time span is 1670 to 2016 347 years

Portion with two or more series is 1750 to 2016 267 years

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

\*C\* Number of dated series 19 \*C\*

\*O\* Master series 1670 2016 347 yrs \*O\*

\*F\* Total rings in all series 3956 \*F\*

\*E\* Total dated rings checked 3876 \*E\*

\*C\* Series intercorrelation .590 \*C\*

\*H\* Average mean sensitivity .278 \*H\*

\*A\* Segments, possible problems 9 \*A\*

\*\*\* Mean length of series 208.2 \*\*\*

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

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

MWO04A 1 absent rings: 1825

MWO09B 1 absent rings: 1909

2 absent rings .051%

PART 2: TIME PLOT OF TREE-RING SERIES: 14:57 Fri 28 Jul 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

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

. . . . . . . . . . . . . . .<========================> . MWO01A 1 1763 2016 254

. . . . . . . . . . . . . . <=========================> . MWO01B 2 1754 2016 263

. . . . . . . . . . . . . . . <=======================> . MWO02A 3 1777 2016 240

. . . . . . . . . . . . . . . .<===================> . MWO02B 4 1815 2016 202

. . . . . . . . . . . . . . . .<===================> . MWO03A 5 1811 2016 206

. . . . . . . . . . . . . . <=========================> . MWO03B 6 1750 2016 267

. . . . . . . . . . . . . . .<========================> . MWO04A 7 1761 2016 256

. . . . . . . . . . . . . . . . .<==============> . MWO04B 8 1860 2016 157

. . . . . . . . . . . . . . . . . <=============> . MWO05A 9 1876 2016 141

. . . . . . . . . . . . . . . . <===============> . MWO05B 10 1850 2016 167

. . . . . . . . . . . . . . . . .<==============> . MWO06A 11 1860 2016 157

. . . . . . . . . . . . . . . . . <=============> . MWO06B 12 1874 2016 143

. . . . . . . . . . . . . . . .<===================> . MWO07A 13 1810 2014 205

. . . . . . . . . . . . . <=================================> . MWO07B 14 1670 2016 347

. . . . . . . . . . . . . . . . . <=============> . MWO08A 15 1870 2016 147

. . . . . . . . . . . . . . . . .<==============> . MWO08B 16 1868 2016 149

. . . . . . . . . . . . . . . .<===================> . MWO09B 17 1814 2016 203

. . . . . . . . . . . . . . . . <==================> . MWO10A 18 1823 2014 192

. . . . . . . . . . . . . . <=========================> . MWO10B 19 1757 2016 260

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

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: 14:57 Fri 28 Jul 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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1700 1.070 1 1750 .557 2 1800 1.176 7 1850 -.479 13 1900 .582 19

1701 .421 1 1751 .393 2 1801 -.764 7 1851 1.294 13 1901 .039 19

1702 1.260 1 1752 -.508 2 1802 .170 7 1852 -2.138 13 1902 1.098 19

1703 .254 1 1753 -.805 2 1803 -1.341 7 1853 .595 13 1903 .418 19

1704 .525 1 1754 .497 3 1804 -1.666 7 1854 .086 13 1904 .914 19

1705 1.564 1 1755 .923 3 1805 -1.235 7 1855 -.041 13 1905 .122 19

1706 1.688 1 1756 1.125 3 1806 -1.203 7 1856 -.826 13 1906 .468 19

1707 2.487 1 1757 -.689 4 1807 .092 7 1857 -2.112 13 1907 -.197 19

1708 1.078 1 1758 -.249 4 1808 -.490 7 1858 -.888 13 1908 -.889 19

1709 -.739 1 1759 -.343 4 1809 1.007 7 1859 -1.011 13 1909 -2.139 19 1

1710 -1.027 1 1760 .530 4 1810 .710 8 1860 1.513 15 1910 .248 19

1711 -1.814 1 1761 .487 5 1811 .957 9 1861 .891 15 1911 -.888 19

1712 -.419 1 1762 -.647 5 1812 .218 9 1862 1.798 15 1912 .756 19

1713 -.363 1 1763 -.194 6 1813 .774 9 1863 .462 15 1913 .194 19

1714 -.918 1 1764 -.355 6 1814 .762 10 1864 -.425 15 1914 -.881 19

1715 -1.743 1 1765 -.134 6 1815 -2.168 11 1865 -1.889 15 1915 1.151 19

1716 -.935 1 1766 .929 6 1816 -.730 11 1866 .066 15 1916 1.668 19

1717 -2.220 1 1767 -.813 6 1817 1.317 11 1867 -.427 15 1917 -.135 19

1718 -1.309 1 1768 1.317 6 1818 1.052 11 1868 .256 16 1918 -1.536 19

1719 -.230 1 1769 .387 6 1819 .560 11 1869 .609 16 1919 -1.485 19

1670 -.849 1 1720 -.502 1 1770 -.914 6 1820 -.096 11 1870 -.047 17 1920 -.167 19

1671 -.548 1 1721 1.073 1 1771 1.166 6 1821 .186 11 1871 -.522 17 1921 -.747 19

1672 1.560 1 1722 1.702 1 1772 .070 6 1822 -.254 11 1872 1.314 17 1922 -.108 19

1673 -.971 1 1723 -.701 1 1773 .016 6 1823 .230 12 1873 .504 17 1923 .298 19

1674 1.354 1 1724 .407 1 1774 -1.625 6 1824 .837 12 1874 -.828 18 1924 1.102 19

1675 -.932 1 1725 1.102 1 1775 .855 6 1825 -1.496 12 1 1875 .622 18 1925 .093 19

1676 -.292 1 1726 .547 1 1776 1.102 6 1826 -1.164 12 1876 .608 19 1926 .237 19

1677 1.202 1 1727 1.664 1 1777 .019 7 1827 -2.256 12 1877 -.554 19 1927 1.204 19

1678 1.478 1 1728 1.365 1 1778 -.830 7 1828 1.132 12 1878 .389 19 1928 .435 19

1679 -1.606 1 1729 -1.731 1 1779 -.889 7 1829 -.260 12 1879 -.385 19 1929 .585 19

1680 -1.778 1 1730 -.366 1 1780 -.841 7 1830 1.535 12 1880 .483 19 1930 -.532 19

1681 .410 1 1731 -.471 1 1781 .078 7 1831 .656 12 1881 -1.162 19 1931 -1.285 19

1682 -.367 1 1732 -1.317 1 1782 -1.103 7 1832 .682 12 1882 .403 19 1932 .049 19

1683 -.577 1 1733 1.371 1 1783 -1.244 7 1833 .634 12 1883 .919 19 1933 .098 19

1684 2.379 1 1734 .188 1 1784 -.380 7 1834 -1.260 12 1884 .544 19 1934 .311 19

1685 1.417 1 1735 1.673 1 1785 .243 7 1835 -.327 12 1885 -.339 19 1935 .628 19

1686 1.273 1 1736 .612 1 1786 .956 7 1836 .297 12 1886 .379 19 1936 -1.106 19

1687 -.197 1 1737 -.269 1 1787 .812 7 1837 1.166 12 1887 -.750 19 1937 -.272 19

1688 -3.405 1 1738 -1.285 1 1788 -.078 7 1838 -.483 12 1888 -2.156 19 1938 1.209 19

1689 .506 1 1739 -1.934 1 1789 -.693 7 1839 -1.984 12 1889 .564 19 1939 .200 19

1690 .962 1 1740 -.868 1 1790 .057 7 1840 -.266 12 1890 .122 19 1940 .294 19

1691 1.384 1 1741 1.846 1 1791 -.646 7 1841 -1.022 12 1891 -.280 19 1941 -1.582 19

1692 -.991 1 1742 2.525 1 1792 .875 7 1842 .900 12 1892 .528 19 1942 .514 19

1693 .451 1 1743 .971 1 1793 .214 7 1843 -.663 12 1893 -.081 19 1943 -.305 19

1694 .760 1 1744 -.259 1 1794 -.559 7 1844 .903 12 1894 .451 19 1944 -.723 19

1695 .737 1 1745 -1.692 1 1795 .333 7 1845 .273 12 1895 -1.168 19 1945 -.197 19

1696 -1.367 1 1746 -2.318 1 1796 .836 7 1846 1.071 12 1896 -.077 19 1946 -.723 19

1697 -1.430 1 1747 -.895 1 1797 1.588 7 1847 1.601 12 1897 .365 19 1947 -.107 19

1698 -2.865 1 1748 .328 1 1798 1.260 7 1848 .911 12 1898 -.604 19 1948 .213 19

1699 -2.017 1 1749 .812 1 1799 .451 7 1849 .286 12 1899 -.107 19 1949 .338 19

PART 3: Master Dating Series: 14:57 Fri 28 Jul 2017 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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1950 2.513 19 2000 .114 19

1951 .780 19 2001 .833 19

1952 -.680 19 2002 .669 19

1953 -.671 19 2003 -.036 19

1954 -1.240 19 2004 .283 19

1955 -.272 19 2005 .768 19

1956 1.044 19 2006 -.962 19

1957 .591 19 2007 -1.982 19

1958 1.080 19 2008 -1.225 19

1959 -.554 19 2009 .371 19

1960 .743 19 2010 .183 19

1961 -.305 19 2011 -.218 19

1962 .026 19 2012 -1.327 19

1963 -.306 19 2013 -.308 19

1964 -.915 19 2014 .458 19

1965 -.029 19 2015 1.075 17

1966 .268 19 2016 1.021 17

1967 -.799 19

1968 .664 19

1969 .723 19

1970 -3.041 19

1971 -.434 19

1972 -.365 19

1973 .860 19

1974 .787 19

1975 -.006 19

1976 .698 19

1977 -.044 19

1978 .872 19

1979 1.110 19

1980 -.196 19

1981 -.519 19

1982 .872 19

1983 -.461 19

1984 -.895 19

1985 -.164 19

1986 -.608 19

1987 -.214 19

1988 -.881 19

1989 .013 19

1990 .822 19

1991 -2.033 19

1992 .672 19

1993 1.014 19

1994 -.301 19

1995 -.163 19

1996 .071 19

1997 .172 19

1998 .654 19

1999 1.004 19

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PART 4: Master Bar Plot: 14:57 Fri 28 Jul 2017 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

1700---------D 1750-------B 1800---------E 1850---b 1900-------B 1950----------J 2000-----@

1701------B 1751------B 1801--c 1851---------E 1901-----@ 1951--------C 2001--------C

1702---------E 1752---b 1802-----A 1852i 1902---------D 1952--c 2002-------C

1703------A 1753--c 1803-e 1853-------B 1903------B 1953--c 2003-----@

1704-------B 1754-------B 1804g 1854-----@ 1904--------D 1954-e 2004------A

1705----------F 1755--------D 1805-e 1855-----@ 1905-----@ 1955----a 2005--------C

1706----------G 1756---------D 1806-e 1856--c 1906-------B 1956---------D 2006-d

1707----------J 1757--c 1807-----@ 1857h 1907----a 1957-------B 2007h

1708---------D 1758----a 1808---b 1858--d 1908--d 1958---------D 2008-e

1709--c 1759---a 1809---------D 1859-d 1909i 1959---b 2009------A

1710-d 1760-------B 1810--------C 1860----------F 1910------A 1960--------C 2010-----A

1711g 1761-------B 1811---------D 1861--------D 1911--d 1961----a 2011----a

1712---b 1762--c 1812------A 1862----------G 1912--------C 1962-----@ 2012-e

1713---a 1763----a 1813--------C 1863-------B 1913-----A 1963----a 2013----a

1714--d 1764---a 1814--------C 1864---b 1914--d 1964--d 2014-------B

1715g 1765----a 1815i 1865h 1915---------E 1965-----@ 2015---------D

1716-d 1766--------D 1816--c 1866-----@ 1916----------G 1966------A 2016---------D

1717i 1767--c 1817----------E 1867---b 1917----a 1967--c

1718-e 1768----------E 1818---------D 1868------A 1918f 1968-------C

1719----a 1769------B 1819-------B 1869-------B 1919-f 1969--------C

1670--c 1720---b 1770--d 1820----@ 1870-----@ 1920----a 1970l

1671---b 1721---------D 1771---------E 1821-----A 1871---b 1921--c 1971---b

1672----------F 1722----------G 1772-----@ 1822----a 1872----------E 1922----@ 1972---a

1673-d 1723--c 1773-----@ 1823------A 1873-------B 1923------A 1973--------C

1674----------E 1724------B 1774g 1824--------C 1874--c 1924---------D 1974--------C

1675-d 1725---------D 1775--------C 1825-f 1875-------B 1925-----@ 1975-----@

1676----a 1726-------B 1776---------D 1826-e 1876-------B 1926------A 1976--------C

1677---------E 1727----------G 1777-----@ 1827i 1877---b 1927---------E 1977-----@

1678----------F 1728----------E 1778--c 1828---------E 1878------B 1928------B 1978--------C

1679f 1729g 1779--d 1829----a 1879---b 1929-------B 1979---------D

1680g 1730---a 1780--c 1830----------F 1880-------B 1930---b 1980----a

1681------B 1731---b 1781-----@ 1831-------C 1881-e 1931-e 1981---b

1682---a 1732-e 1782-d 1832-------C 1882------B 1932-----@ 1982--------C

1683---b 1733----------E 1783-e 1833-------C 1883--------D 1933-----@ 1983---b

1684----------J 1734-----A 1784---b 1834-e 1884-------B 1934------A 1984--d

1685----------F 1735----------G 1785------A 1835---a 1885---a 1935-------C 1985----a

1686---------E 1736-------B 1786---------D 1836------A 1886------B 1936-d 1986--b

1687----a 1737----a 1787--------C 1837---------E 1887--c 1937----a 1987----a

1688n 1738-e 1788----@ 1838---b 1888i 1938---------E 1988--d

1689-------B 1739h 1789--c 1839h 1889-------B 1939-----A 1989-----@

1690---------D 1740--c 1790-----@ 1840----a 1890-----@ 1940------A 1990--------C

1691----------F 1741----------G 1791--c 1841-d 1891----a 1941f 1991h

1692-d 1742----------J 1792--------C 1842--------D 1892-------B 1942-------B 1992-------C

1693-------B 1743---------D 1793------A 1843--c 1893----@ 1943----a 1993---------D

1694--------C 1744----a 1794---b 1844--------D 1894-------B 1944--c 1994----a

1695--------C 1745g 1795------A 1845------A 1895-e 1945----a 1995----a

1696-e 1746i 1796--------C 1846---------D 1896----@ 1946--c 1996-----@

1697-f 1747--d 1797----------F 1847----------F 1897------A 1947----@ 1997-----A

1698k 1748------A 1798---------E 1848--------D 1898--b 1948------A 1998-------C

1699h 1749--------C 1799-------B 1849------A 1899----@ 1949------A 1999---------D

PART 5: CORRELATION OF SERIES BY SEGMENTS: 14:57 Fri 28 Jul 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 1750 1775 1800 1825 1850 1875 1900 1925 1950 1975

1799 1824 1849 1874 1899 1924 1949 1974 1999 2024

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

1 MWO01A 1763 2016 .69 .68 .74 .74 .59 .54 .55 .54 .64 .65

2 MWO01B 1754 2016 .44 .55 .61 .71 .60 .59 .64 .77 .74 .73

3 MWO02A 1777 2016 .40 .57 .78 .71 .70 .58 .34 .52 .48

4 MWO02B 1815 2016 .71 .77 .70 .59 .44 .30A .37 .17B

5 MWO03A 1811 2016 .77 .74 .71 .70 .63 .70 .64 .70

6 MWO03B 1750 2016 .11B .65 .72 .78 .75 .68 .73 .76 .65 .64

7 MWO04A 1761 2016 .18B .25B .63 .71 .57 .34 .37 .74 .75 .78

8 MWO04B 1860 2016 .56 .49 .42 .66 .71 .71

9 MWO05A 1876 2016 .58 .63 .86 .74 .62

10 MWO05B 1850 2016 .67 .70 .69 .78 .73 .67

11 MWO06A 1860 2016 .56 .62 .68 .80 .70 .62

12 MWO06B 1874 2016 .45 .44 .66 .87 .74 .69

13 MWO07A 1810 2014 .71 .74 .60 .49 .38 .57 .63 .53

14 MWO07B 1670 2016 .49 .70 .64 .66 .71 .54 .48 .64 .71 .56

15 MWO08A 1870 2016 .59 .58 .55 .54 .61 .66

16 MWO08B 1868 2016 .68 .73 .72 .52 .43 .52

17 MWO09B 1814 2016 .65 .58 .29A .30B .54 .23B .28B .36

18 MWO10A 1823 2014 .79 .78 .68 .56 .54 .48 .50 .40

19 MWO10B 1757 2016 .73 .84 .83 .82 .66 .55 .60 .65 .60 .62

Av segment correlation .44 .58 .70 .73 .61 .56 .57 .62 .61 .58

PART 6: POTENTIAL PROBLEMS: 14:57 Fri 28 Jul 2017 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 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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MWO01A 1763 to 2016 254 years Series 1

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

Lower 1892< -.009 1767> -.007 1859> -.006 1936> -.005 1815> -.005 1933> -.004 Higher 1991 .014 1827 .007

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

1991 -4.8 SD; 2007 -5.1 SD; 2008 -5.5 SD

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MWO01B 1754 to 2016 263 years Series 2

[B] Entire series, effect on correlation ( .614) is:

Lower 1757< -.019 1762> -.011 1979< -.008 1984> -.008 1802< -.007 1844< -.006 Higher 1970 .029 1991 .016

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

1757 -5.1 SD; 1762 +3.5 SD; 1802 -4.6 SD

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

MWO02A 1777 to 2016 240 years Series 3

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

Lower 1970> -.027 1925< -.011 1777> -.007 1971< -.007 1778> -.007 1808< -.006 Higher 1852 .018 1991 .014

[E] Outliers 6 3.0 SD above or -4.5 SD below mean for year

1778 +3.4 SD; 1875 +3.1 SD; 1940 +3.6 SD; 1960 +3.3 SD; 1970 +4.3 SD; 2011 +3.0 SD

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

MWO02B 1815 to 2016 202 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

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1925 1974 0 .12 -.19 -.08 .01 -.09 .11 -.04 -.17 .25 .10 .30\*-.01 -.24 .05 -.22 .08 -.03 .06 -.01 .03 -.34

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

1967 2016 -2 -.05 -.23 -.19 .15 .05 -.05 .01 .07 .33\* .04 .17| - - - - - - - - - -

[B] Entire series, effect on correlation ( .464) is:

Lower 2009< -.034 1998< -.025 1932< -.024 1970> -.024 2014< -.013 1931> -.010 Higher 1991 .023 1839 .014

1925 to 1974 segment:

Lower 1932< -.089 1970> -.082 1931> -.039 1958< -.021 1972< -.018 1942< -.013 Higher 1950 .077 1941 .039

1967 to 2016 segment:

Lower 2009< -.083 1998< -.061 1970> -.041 2014< -.031 1980> -.016 1984> -.014 Higher 1991 .127 1992 .020

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

1931 +3.6 SD; 1960 +3.2 SD; 1970 +3.5 SD; 1998 -5.1 SD; 2009 -5.1 SD

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MWO03A 1811 to 2016 206 years Series 5

[B] Entire series, effect on correlation ( .694) is:

Lower 1983> -.009 1964< -.008 1992< -.008 1960< -.008 1991> -.006 1858> -.006 Higher 1970 .032 1852 .011

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

1858 +3.2 SD

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MWO03B 1750 to 2016 267 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

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

1750 1799 -6 .13 .03 .03 -.05 .38\* .26 .00 -.26 -.09 .22 .11|-.05 -.12 .12 .06 -.01 -.01 -.03 -.28 -.13 -.04

[B] Entire series, effect on correlation ( .595) is:

Lower 1757> -.034 1991> -.013 1762> -.010 1768< -.010 1775< -.007 1968< -.007 Higher 1970 .034 1852 .013

1750 to 1799 segment:

Lower 1757> -.163 1762> -.048 1768< -.026 1772> -.025 1775< -.019 1766< -.015 Higher 1767 .053 1797 .046

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

1757 +6.0 SD; 1762 +3.6 SD; 1991 +3.2 SD

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MWO04A 1761 to 2016 256 years Series 7

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

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

1761 1810 -5 .23 -.14 -.02 .01 -.38 .29\*-.06 .01 .08 -.15 .18|-.05 .04 -.01 .03 .14 -.31 -.02 -.07 -.05 .23

1775 1824 10 .19 .01 -.07 .14 -.40 .12 .07 -.06 .01 .01 .25| .03 -.22 .04 -.08 -.01 -.18 -.07 -.18 -.01 .39\*

[B] Entire series, effect on correlation ( .536) is:

Lower 1895> -.022 1780> -.009 1786< -.009 1798< -.008 1833< -.006 1789> -.006 Higher 1970 .031 1815 .016

1761 to 1810 segment:

Lower 1786< -.038 1780> -.038 1798< -.037 1789> -.025 1787< -.021 1795< -.021 Higher 1768 .044 1771 .034

1775 to 1824 segment:

Lower 1780> -.044 1786< -.040 1798< -.039 1789> -.028 1787< -.022 1795< -.021 Higher 1815 .192 1797 .026

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

1825 -1.496 12 1

[E] Outliers 8 3.0 SD above or -4.5 SD below mean for year

1780 +3.6 SD; 1786 -4.5 SD; 1789 +3.0 SD; 1825 -6.8 SD; 1895 +5.5 SD; 1896 +3.4 SD; 1920 +3.2 SD;

1921 +3.7 SD

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MWO04B 1860 to 2016 157 years Series 8

[B] Entire series, effect on correlation ( .584) is:

Lower 1924< -.023 1860< -.012 1931> -.009 1980> -.009 1932> -.008 1984> -.008 Higher 1970 .024 1888 .019

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

1932 +4.3 SD

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MWO05A 1876 to 2016 141 years Series 9

[B] Entire series, effect on correlation ( .641) is:

Lower 2006> -.024 1902< -.020 1980> -.012 1990< -.011 1911> -.010 1901< -.010 Higher 1970 .070 1950 .016

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

1980 +3.1 SD; 2006 +3.2 SD

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MWO05B 1850 to 2016 167 years Series 10

[B] Entire series, effect on correlation ( .673) is:

Lower 1986> -.017 2006> -.014 1852> -.013 1887> -.009 1893> -.007 1964> -.006 Higher 1970 .050 1865 .007

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

1986 +4.3 SD; 1998 +3.8 SD

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MWO06A 1860 to 2016 157 years Series 11

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

Lower 1981> -.012 1872< -.012 1978< -.011 1972> -.008 1925< -.007 2006> -.006 Higher 1970 .071 1950 .011

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MWO06B 1874 to 2016 143 years Series 12

[B] Entire series, effect on correlation ( .648) is:

Lower 1881> -.016 1996< -.014 1976< -.014 1981> -.010 1916< -.010 1893> -.009 Higher 1970 .058 1991 .017

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

1881 +3.3 SD

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MWO07A 1810 to 2014 205 years Series 13

[B] Entire series, effect on correlation ( .572) is:

Lower 1945< -.023 1992< -.017 1900< -.012 1816> -.012 2008> -.010 1897< -.007 Higher 1970 .021 1839 .013

[E] Outliers 7 3.0 SD above or -4.5 SD below mean for year

1816 +4.9 SD; 1833 +3.2 SD; 1858 +3.4 SD; 1903 +3.9 SD; 1945 -4.6 SD; 1996 +3.2 SD; 2008 +4.5 SD

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MWO07B 1670 to 2016 347 years Series 14

[\*] Early part of series cannot be checked from 1670 to 1749 -- not matched by another series

[B] Entire series, effect on correlation ( .583) is:

Lower 2001< -.023 1900< -.012 1827> -.007 1773< -.007 1752> -.006 1830< -.006 Higher 1991 .018 1970 .015

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

1925 +3.3 SD; 2001 -4.9 SD

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MWO08A 1870 to 2016 147 years Series 15

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

Lower 1941> -.016 1931> -.014 1957< -.012 1898> -.011 1877> -.010 1962< -.010 Higher 1970 .031 1950 .011

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

1888 -6.3 SD; 1931 +3.2 SD

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MWO08B 1868 to 2016 149 years Series 16

[B] Entire series, effect on correlation ( .572) is:

Lower 1970> -.009 1956< -.009 1983> -.008 1977> -.008 1958< -.007 1879> -.007 Higher 1888 .022 1909 .011

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

1900 +3.1 SD; 1977 +3.1 SD

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MWO09B 1814 to 2016 203 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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1850 1899 0 -.07 .27 -.01 .17 -.08 .08 -.19 -.23 .18 -.02 .29\* .20 -.07 -.16 .00 -.07 .03 .01 -.03 .01 -.21

1875 1924 1 .22 .12 .01 -.04 -.05 -.08 -.01 -.21 -.01 -.01 .30| .33\* .03 .19 .09 -.11 -.18 -.22 -.19 -.10 .01

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1925 1974 1 .08 -.07 .15 -.02 .07 .07 -.12 -.25 -.02 -.08 .23| .25\*-.34 .00 -.14 .13 .05 .00 .04 -.10 .11

1950 1999 1 .29 -.19 .07 .08 -.09 .05 -.03 -.10 .09 -.16 .28| .37\*-.48 .32 -.19 -.12 -.07 .09 -.02 -.14 .00

[B] Entire series, effect on correlation ( .427) is:

Lower 1970> -.016 1888> -.015 1881> -.015 1969< -.014 1871> -.011 1889< -.008 Higher 1909 .018 1852 .015

1850 to 1899 segment:

Lower 1881> -.063 1888> -.059 1871> -.047 1889< -.037 1892< -.023 1856> -.023 Higher 1852 .103 1857 .064

1875 to 1924 segment:

Lower 1888> -.073 1881> -.066 1889< -.039 1892< -.023 1877> -.019 1886< -.017 Higher 1909 .120 1916 .033

1925 to 1974 segment:

Lower 1969< -.043 1970> -.037 1959> -.028 1943> -.021 1960< -.016 1944> -.014 Higher 1931 .041 1950 .037

1950 to 1999 segment:

Lower 1969< -.050 1970> -.035 1959> -.030 1983> -.018 1960< -.018 1981> -.014 Higher 1950 .034 1954 .023

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

1909 -2.139 19 1

[E] Outliers 6 3.0 SD above or -4.5 SD below mean for year

1871 +4.3 SD; 1881 +4.2 SD; 1888 +3.7 SD; 1909 -5.0 SD; 1931 -4.8 SD; 1943 +3.5 SD

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MWO10A 1823 to 2014 192 years Series 18

[B] Entire series, effect on correlation ( .572) is:

Lower 1974< -.026 1980< -.026 2002< -.009 1968< -.008 1882< -.007 1871< -.007 Higher 1970 .020 1991 .014

[E] Outliers 6 3.0 SD above or -4.5 SD below mean for year

1906 +4.0 SD; 1932 +3.0 SD; 1971 +3.1 SD; 1974 -4.5 SD; 1980 -6.5 SD; 2013 +3.0 SD

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MWO10B 1757 to 2016 260 years Series 19

[B] Entire series, effect on correlation ( .673) is:

Lower 1988> -.015 1758> -.010 1956< -.009 1945> -.008 1891> -.007 1761< -.007 Higher 1970 .021 1815 .009

[E] Outliers 7 3.0 SD above or -4.5 SD below mean for year

1758 +4.2 SD; 1891 +3.6 SD; 1900 +3.2 SD; 1906 +3.5 SD; 1945 +4.2 SD; 1988 +5.0 SD; 1989 +3.1 SD

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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 MWO01A 1763 2016 254 10 0 .623 1.04 6.17 .720 .786 .274 2.57 .356 .007 1

2 MWO01B 1754 2016 263 10 0 .614 .97 2.67 .434 .600 .299 2.73 .458 -.014 1

3 MWO02A 1777 2016 240 9 0 .564 1.35 4.57 .771 .774 .246 2.87 .551 -.022 1

4 MWO02B 1815 2016 202 8 2 .464 1.28 3.14 .544 .713 .240 2.81 .501 -.052 1

5 MWO03A 1811 2016 206 8 0 .694 1.12 2.68 .547 .770 .247 2.52 .369 -.034 1

6 MWO03B 1750 2016 267 10 1 .595 1.12 3.06 .626 .731 .280 2.84 .396 .027 3

7 MWO04A 1761 2016 256 10 2 .536 1.20 3.50 .821 .795 .304 2.63 .343 -.029 1

8 MWO04B 1860 2016 157 6 0 .584 1.45 5.07 .927 .687 .326 2.87 .478 -.043 2

9 MWO05A 1876 2016 141 5 0 .641 1.57 3.86 .521 .462 .249 2.76 .382 .024 1

10 MWO05B 1850 2016 167 6 0 .673 1.87 4.73 .694 .407 .293 2.78 .376 -.003 1

11 MWO06A 1860 2016 157 6 0 .628 1.31 4.03 .648 .721 .252 2.56 .339 -.050 1

12 MWO06B 1874 2016 143 6 0 .648 1.41 3.95 .617 .648 .272 2.72 .433 -.055 1

13 MWO07A 1810 2014 205 8 0 .572 1.00 2.98 .532 .651 .291 2.88 .504 .065 2

14 MWO07B 1670 2016 347 10 0 .583 .86 2.59 .526 .695 .330 2.79 .413 -.017 3

15 MWO08A 1870 2016 147 6 0 .560 1.64 4.93 1.036 .868 .219 2.40 .314 -.002 1

16 MWO08B 1868 2016 149 6 0 .572 1.49 4.57 .996 .786 .253 2.70 .469 -.047 2

17 MWO09B 1814 2016 203 8 4 .427 .90 2.19 .349 .530 .286 2.63 .393 -.020 1

18 MWO10A 1823 2014 192 8 0 .572 1.20 7.54 .819 .661 .284 2.85 .430 -.032 2

19 MWO10B 1757 2016 260 10 0 .673 1.14 4.61 .556 .576 .275 2.72 .401 -.013 1

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Total or mean: 3956 150 9 .590 1.21 7.54 .650 .681 .278 2.88 .417 -.015

- = [ COFECHA MWOHGCOF ] = -