**Supplementary material**

**Possible role of warming on Indian summer monsoon precipitation over the north-central Indian subcontinent**

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**A screenshot of a cell phone

Description automatically generated**

**Figure S1.** The ecosystem in the studied site postulated using the Natural Vegetation Density Index (NDVI) sourced from http://apdrc.soest.hawaii.edu/datadoc/modis\_vegi.php.

**A close up of a map

Description automatically generated**

**Figure S2.** Locations of the sub-regions studied marked by box-panels.

**A screenshot of a video game

Description automatically generated**

**Figure S3.** Average ISM precipitation amount over three small boxes and the large box.

**Table S1.** Number of CRU measurement stations available from the studied box during ISM months for the time interval 1901–2016.

| June | Station no. | July | Station no. | August | Station no. | September | Station no. |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1901 | 2725 | 1901 | 2755 | 1901 | 2746 | 1901 | 2826 |
| 1902 | 2824 | 1902 | 2755 | 1902 | 2755 | 1902 | 2826 |
| 1903 | 2826 | 1903 | 2755 | 1903 | 2755 | 1903 | 2826 |
| 1904 | 2826 | 1904 | 2755 | 1904 | 2755 | 1904 | 2826 |
| 1905 | 2826 | 1905 | 2755 | 1905 | 2539 | 1905 | 2826 |
| 1906 | 2826 | 1906 | 2746 | 1906 | 2755 | 1906 | 2826 |
| 1907 | 2822 | 1907 | 2755 | 1907 | 2667 | 1907 | 2826 |
| 1908 | 2826 | 1908 | 2755 | 1908 | 2755 | 1908 | 2826 |
| 1909 | 2596 | 1909 | 2755 | 1909 | 2755 | 1909 | 2826 |
| 1910 | 2846 | 1910 | 2775 | 1910 | 2775 | 1910 | 2846 |
| 1911 | 2868 | 1911 | 2797 | 1911 | 2797 | 1911 | 2868 |
| 1912 | 2868 | 1912 | 2797 | 1912 | 2769 | 1912 | 2868 |
| 1913 | 2654 | 1913 | 2797 | 1913 | 2797 | 1913 | 2868 |
| 1914 | 2868 | 1914 | 2797 | 1914 | 2583 | 1914 | 2840 |
| 1915 | 2868 | 1915 | 2797 | 1915 | 2797 | 1915 | 2868 |
| 1916 | 2738 | 1916 | 2797 | 1916 | 2797 | 1916 | 2662 |
| 1917 | 2868 | 1917 | 2797 | 1917 | 2797 | 1917 | 2844 |
| 1918 | 2868 | 1918 | 2797 | 1918 | 2797 | 1918 | 2868 |
| 1919 | 2868 | 1919 | 2797 | 1919 | 2797 | 1919 | 2868 |
| 1920 | 2695 | 1920 | 2797 | 1920 | 2797 | 1920 | 2638 |
| 1921 | 2806 | 1921 | 2696 | 1921 | 2797 | 1921 | 2638 |
| 1922 | 2658 | 1922 | 2797 | 1922 | 2797 | 1922 | 2868 |
| 1923 | 2868 | 1923 | 2797 | 1923 | 2797 | 1923 | 2868 |
| 1924 | 2868 | 1924 | 2797 | 1924 | 2797 | 1924 | 2865 |
| 1925 | 2868 | 1925 | 2797 | 1925 | 2769 | 1925 | 2868 |
| 1926 | 2868 | 1926 | 2793 | 1926 | 2797 | 1926 | 2868 |
| 1927 | 2806 | 1927 | 2797 | 1927 | 2788 | 1927 | 2868 |
| 1928 | 2868 | 1928 | 2735 | 1928 | 2797 | 1928 | 2868 |
| 1929 | 2854 | 1929 | 2783 | 1929 | 2783 | 1929 | 2854 |
| 1930 | 2854 | 1930 | 2783 | 1930 | 2783 | 1930 | 2854 |
| 1931 | 2854 | 1931 | 2783 | 1931 | 2783 | 1931 | 2854 |
| 1932 | 2871 | 1932 | 2800 | 1932 | 2791 | 1932 | 2871 |
| 1933 | 2845 | 1933 | 2800 | 1933 | 2800 | 1933 | 2871 |
| 1934 | 2871 | 1934 | 2800 | 1934 | 2799 | 1934 | 2871 |
| 1935 | 2781 | 1935 | 2926 | 1935 | 2926 | 1935 | 2767 |
| 1936 | 2908 | 1936 | 2926 | 1936 | 2926 | 1936 | 2997 |
| 1937 | 2994 | 1937 | 2923 | 1937 | 2923 | 1937 | 2997 |
| 1938 | 2996 | 1938 | 2923 | 1938 | 2926 | 1938 | 2997 |
| 1939 | 2795 | 1939 | 2783 | 1939 | 2786 | 1939 | 2811 |
| 1940 | 3043 | 1940 | 2972 | 1940 | 2975 | 1940 | 3046 |
| 1941 | 3047 | 1941 | 3051 | 1941 | 3051 | 1941 | 3051 |
| 1942 | 3051 | 1942 | 3051 | 1942 | 3051 | 1942 | 2830 |
| 1943 | 3029 | 1943 | 3037 | 1943 | 3037 | 1943 | 3037 |
| 1944 | 3037 | 1944 | 3037 | 1944 | 3037 | 1944 | 3037 |
| 1945 | 3029 | 1945 | 3029 | 1945 | 3029 | 1945 | 3028 |
| 1946 | 3026 | 1946 | 3026 | 1946 | 3026 | 1946 | 3026 |
| 1947 | 3170 | 1947 | 3170 | 1947 | 3728 | 1947 | 3728 |
| 1948 | 4260 | 1948 | 4261 | 1948 | 4261 | 1948 | 4240 |
| 1949 | 4210 | 1949 | 4194 | 1949 | 4202 | 1949 | 4215 |
| 1950 | 4241 | 1950 | 4195 | 1950 | 4218 | 1950 | 4241 |
| 1951 | 4325 | 1951 | 4294 | 1951 | 4343 | 1951 | 4350 |
| 1952 | 4318 | 1952 | 4356 | 1952 | 4356 | 1952 | 4366 |
| 1953 | 4398 | 1953 | 4390 | 1953 | 4348 | 1953 | 4396 |
| 1954 | 4424 | 1954 | 4429 | 1954 | 4419 | 1954 | 4450 |
| 1955 | 4472 | 1955 | 4468 | 1955 | 4471 | 1955 | 4472 |
| 1956 | 4529 | 1956 | 4533 | 1956 | 4533 | 1956 | 4542 |
| 1957 | 4548 | 1957 | 4542 | 1957 | 4542 | 1957 | 4548 |
| 1958 | 4548 | 1958 | 4542 | 1958 | 4542 | 1958 | 4537 |
| 1959 | 4548 | 1959 | 4542 | 1959 | 4542 | 1959 | 4548 |
| 1960 | 4548 | 1960 | 4542 | 1960 | 4542 | 1960 | 4548 |
| 1961 | 4548 | 1961 | 4547 | 1961 | 4543 | 1961 | 4548 |
| 1962 | 4548 | 1962 | 4545 | 1962 | 4543 | 1962 | 4548 |
| 1963 | 4547 | 1963 | 4540 | 1963 | 4533 | 1963 | 4547 |
| 1964 | 4548 | 1964 | 4547 | 1964 | 4543 | 1964 | 4548 |
| 1965 | 4548 | 1965 | 4547 | 1965 | 4543 | 1965 | 4548 |
| 1966 | 4547 | 1966 | 4547 | 1966 | 4536 | 1966 | 4548 |
| 1967 | 4548 | 1967 | 4547 | 1967 | 4543 | 1967 | 4547 |
| 1968 | 4547 | 1968 | 4546 | 1968 | 4542 | 1968 | 4547 |
| 1969 | 4548 | 1969 | 4547 | 1969 | 4543 | 1969 | 4548 |
| 1970 | 4288 | 1970 | 4281 | 1970 | 4364 | 1970 | 4369 |
| 1971 | 4548 | 1971 | 4547 | 1971 | 4538 | 1971 | 4548 |
| 1972 | 4545 | 1972 | 4546 | 1972 | 4538 | 1972 | 4540 |
| 1973 | 4548 | 1973 | 4536 | 1973 | 4537 | 1973 | 4548 |
| 1974 | 4548 | 1974 | 4547 | 1974 | 4543 | 1974 | 4548 |
| 1975 | 4547 | 1975 | 4547 | 1975 | 4543 | 1975 | 4533 |
| 1976 | 4535 | 1976 | 4526 | 1976 | 4523 | 1976 | 4537 |
| 1977 | 4548 | 1977 | 4547 | 1977 | 4537 | 1977 | 4548 |
| 1978 | 4546 | 1978 | 4524 | 1978 | 4513 | 1978 | 4546 |
| 1979 | 4536 | 1979 | 4547 | 1979 | 4542 | 1979 | 4548 |
| 1980 | 4538 | 1980 | 4541 | 1980 | 4542 | 1980 | 4548 |
| 1981 | 4537 | 1981 | 4532 | 1981 | 4532 | 1981 | 4537 |
| 1982 | 4537 | 1982 | 4516 | 1982 | 4532 | 1982 | 4536 |
| 1983 | 4537 | 1983 | 4494 | 1983 | 4521 | 1983 | 4519 |
| 1984 | 4537 | 1984 | 4543 | 1984 | 4543 | 1984 | 4547 |
| 1985 | 4379 | 1985 | 4379 | 1985 | 4379 | 1985 | 4372 |
| 1986 | 4383 | 1986 | 4383 | 1986 | 4372 | 1986 | 4384 |
| 1987 | 4384 | 1987 | 4379 | 1987 | 4379 | 1987 | 4372 |
| 1988 | 4384 | 1988 | 4341 | 1988 | 4372 | 1988 | 4379 |
| 1989 | 4363 | 1989 | 4363 | 1989 | 4362 | 1989 | 4384 |
| 1990 | 4379 | 1990 | 4371 | 1990 | 4357 | 1990 | 4379 |
| 1991 | 4056 | 1991 | 4036 | 1991 | 3986 | 1991 | 3807 |
| 1992 | 4056 | 1992 | 3995 | 1992 | 3986 | 1992 | 4004 |
| 1993 | 4004 | 1993 | 3898 | 1993 | 4038 | 1993 | 3867 |
| 1994 | 4003 | 1994 | 4046 | 1994 | 3985 | 1994 | 4055 |
| 1995 | 4003 | 1995 | 4046 | 1995 | 4037 | 1995 | 4055 |
| 1996 | 3914 | 1996 | 3905 | 1996 | 3840 | 1996 | 3966 |
| 1997 | 3799 | 1997 | 3790 | 1997 | 3781 | 1997 | 3851 |
| 1998 | 3799 | 1998 | 3781 | 1998 | 3774 | 1998 | 3851 |
| 1999 | 3851 | 1999 | 3842 | 1999 | 3833 | 1999 | 3851 |
| 2000 | 3623 | 2000 | 3842 | 2000 | 3723 | 2000 | 3851 |
| 2001 | 2921 | 2001 | 2588 | 2001 | 2850 | 2001 | 2921 |
| 2002 | 2750 | 2002 | 3520 | 2002 | 2850 | 2002 | 2921 |
| 2003 | 2921 | 2003 | 2850 | 2003 | 2816 | 2003 | 2716 |
| 2004 | 2887 | 2004 | 2816 | 2004 | 2816 | 2004 | 1851 |
| 2005 | 2815 | 2005 | 2753 | 2005 | 2568 | 2005 | 3565 |
| 2006 | 2887 | 2006 | 2753 | 2006 | 2592 | 2006 | 2824 |
| 2007 | 2887 | 2007 | 2693 | 2007 | 2816 | 2007 | 2887 |
| 2008 | 2851 | 2008 | 2645 | 2008 | 2816 | 2008 | 2887 |
| 2009 | 2887 | 2009 | 2645 | 2009 | 2816 | 2009 | 2887 |
| 2010 | 2887 | 2010 | 2815 | 2010 | 2816 | 2010 | 2663 |
| 2011 | 2770 | 2011 | 2805 | 2011 | 2805 | 2011 | 2876 |
| 2012 | 3577 | 2012 | 3554 | 2012 | 2805 | 2012 | 3577 |
| 2013 | 3497 | 2013 | 3330 | 2013 | 3389 | 2013 | 3399 |
| 2014 | 2841 | 2014 | 3023 | 2014 | 2926 | 2014 | 2841 |
| 2015 | 2966 | 2015 | 2569 | 2015 | 2710 | 2015 | 3048 |
| 2016 | 2809 | 2016 | 2852 | 2016 | 2742 | 2016 | 3048 |

**Table S2.** Mann-Kendall test statistics for precipitation for all the months (1901–2016). ↓: there is a statistically significant decreasing trend; ×: there is no statistically significant trend.

|  |  |
| --- | --- |
| Month | Mann-Kendall test |
| January | × |
| February | × |
| March | × |
| April | × |
| May | × |
| June | ↓ |
| July | ↓ |
| August | ↓ |
| September | × |
| October | × |
| November | × |
| December | × |
| ISM | ↓ |
| Annual | ↓ |