Supplementary information

Table S1 List of Town/City histories used in this study.

No.	Title	North longitude	East latitude	Year of publication
1	Tajimi City history	35° 20'	137° 08'	1980
2	Kasahara Town history	35° 18'	137° 10'	1993
3	Toki City history	35° 21'	137° 11'	1971
4	Tumaki Village history	35° 19'	137° 11'	1931
5	Mizunami City history	35° 22'	137° 15'	1974
6	Ena City history	35° 27'	137° 25'	1989
7	Iwamura Town history	35° 22'	137° 26'	1961
8	Kamiyahagi Town history	35° 18'	137° 30'	2008
9	Takenami Town history	35° 27'	137° 20'	1993
10	Nakanoho Town history	35° 31'	137° 18'	1968
11	Yamaoka Town history	35° 21'	137° 23'	1984
12	Nakatsugawa City history	35° 29'	137° 30'	1988
13	Hirukawa Village history	35° 31'	137° 23'	1974
14	Kawakami Village history	35° 37'	137° 30'	1983
15	Sakashita Town history	35° 34'	137° 32'	2005
16	Fukuoka Town history	35° 34'	137° 27'	1992
17	Tukechi Town history	35° 40'	137° 26'	1974
18	Kani City history	35° 26'	137° 04'	2010
19	Mitake Town history	35° 26'	137° 08'	1992
20	Gifu Prefecture disaster history	35° 26'	136° 46'	1996

Table S2 Total number of disaster descriptions in a total of twenty titles of Town/City history in the Tono area for each of eight disaster types for each year in 1601–1900.

	Long rain	Drought	Flood	Heavy rain	Poor harvest	Famine	Heavy wind	Damage from pests
1601	0	0	0	0	0	0	0	0
1602	0	0	0	0	0	0	0	0
1603	0	0	0	0	0	0	0	0
1604	0	0	0	0	0	0	0	0
1605	0	0	0	0	0	0	0	0
1606	0	0	0	0	0	0	0	0
1607	0	0	0	0	0	0	0	0
1608	0	0	1	0	0	0	0	0
1609	0	0	0	0	0	0	0	0
1610	0	0	2	0	0	0	0	0
1611	0	0	0	0	0	0	0	0
1612	0	0	0	0	0	0	0	0
1613	0	0	0	0	0	0	0	0
1614	0	0	1	0	0	0	0	0
1615	0	0	0	0	1	1	0	0
1616	0	0	0	0	0	0	0	0
1617	0	0	1	0	1	0	0	0
1618	0	0	0	0	0	0	0	0
1619	0	0	0	0	0	0	0	0
1620	1	0	0	0	0	1	0	0
1621	0	0	0	0	0	0	0	0
1622	0	0	0	0	1	0	0	0
1623	0	0	0	0	0	0	0	0
1624	0	0	0	0	0	0	0	0
1625	0	0	0	0	0	0	0	0
1626	0	0	0	0	0	0	0	0
1627	0	1	0	0	0	0	0	0
1628	0	0	0	0	0	0	0	0
1629	0	0	2	0	0	0	0	0
1630	0	0	0	0	0	1	0	0
1631	0	0	0	0	0	1	0	0
1632	0	0	0	0	0	0	0	0
1633	0	0	0	0	0	0	0	0
1634	0	0	0	0	0	0	0	0
1635	0	0	0	0	0	0	0	0
1636	0	0	0	0	0	0	0	0
1637	0	0	0	0	0	0	0	0
1638	0	0	1	0	0	0	0	0
1639	0	0	0	0	0	0	0	0
1640	0	0	0	0	1	1	0	0
1641	0	5	0	0	0	1	0	0
1642	1	0	0	0	2	6	0	0
1643	0	0	0	0	0	0	0	0
1644	0	0	0	0	0	0	0	0
1645	0	0	0	0	0	0	0	0
1646	0	0	0	0	0	0	0	0
1647	0	0	0	0	0	0	0	0
1648	0	0	1	1	0	0	0	0
1649	0	0	0	0	0	0	0	0
1650	0	0	5	0	0	0	0	0
1651	0	0	0	0	0	0	0	0
1652	0	0	0	0	0	0	0	0
1653	0	0	0	0	0	0	0	0
1654	0	0	0	0	0	0	0	0
1655	0	0	0	0	0	0	0	0
1656	0	0	1	0	0	0	0	0

1657	0	0	0	0	0	0	0	0
1658	0	0	0	0	0	0	0	0
1659	0	0	0	0	0	0	0	0
1660	0	0	1	0	0	0	0	0
1661	0	0	1	0	0	0	0	0
1662	0	0	0	0	0	0	0	0
1663	0	4	0	0	0	1	0	0
1664	0	0	0	0	0	0	0	0
1665	1	0	2	0	0	0	0	0
1666	0	0	1	0	0	0	0	0
1667	0	0	0	0	0	0	0	0
1668	0	1	1	0	0	0	0	0
1669	0	0	0	0	0	0	0	0
1670	0	0	0	0	0	0	0	0
1671	0	0	0	0	0	0	0	0
1672	0	0	0	0	0	0	0	0
1673	0	0	0	0	0	1	0	0
1674	0	1	1	0	1	1	0	0
1675	1	0	0	0	1	5	0	0
1676	0	0	0	1	0	0	0	0
1677	0	0	0	0	0	0	0	0
1678	0	0	2	0	0	0	0	0
1679	0	0	0	0	0	0	0	0
1680	1	0	2	1	0	0	0	3
1681	0	0	0	0	1	2	0	0
1682	0	0	0	0	0	1	0	0
1683	0	0	0	0	0	0	0	0
1684	0	1	0	0	0	0	0	0
1685	0	0	1	0	0	0	0	0
1686	0	0	0	0	0	0	0	0
1687	0	0	3	0	0	0	0	0
1688	0	0	0	0	0	0	0	0
1689	0	0	2	0	0	0	0	0
1690	0	0	0	0	0	0	0	0
1691	0	0	1	0	1	1	0	0
1692	0	0	1	0	0	0	0	0
1693	0	1	0	0	0	0	0	0
1694	0	0	0	0	0	0	0	0
1695	0	0	0	0	0	0	0	0
1696	0	0	0	0	0	0	0	0
1697	0	0	0	0	0	0	0	0
1698	0	0	1	0	0	0	0	0
1699	0	0	1	0	0	0	0	0
1700	1	0	0	0	0	0	0	0
1701	0	0	1	0	0	0	0	0
1702	0	0	0	0	0	0	0	0
1703	0	0	0	0	1	0	0	0
1704	0	0	0	0	0	0	0	0
1705	0	0	0	0	0	0	0	0
1706	0	0	0	0	0	0	0	0
1707	0	0	0	0	0	0	0	0
1708	0	0	0	0	0	0	0	0
1709	0	1	0	0	0	0	0	0
1710	0	1	0	0	0	0	0	0
1711	0	0	0	0	0	0	0	0
1712	0	0	0	0	0	0	0	0
1713	0	0	4	0	0	0	0	0
1714	0	0	0	0	0	0	0	0
1715	0	0	2	0	0	0	0	0
1716	0	0	2	0	1	0	0	0
1717	0	0	0	0	0	0	0	0
1718	0	2	0	0	0	0	0	0

1719	0	0	0	0	0	0	0	0
1720	0	0	0	0	0	0	0	0
1721	0	0	0	0	0	0	0	0
1722	0	0	0	0	0	0	0	0
1723	0	0	1	1	0	0	0	0
1724	0	1	1	0	0	0	0	0
1725	0	1	1	0	0	0	0	0
1726	0	0	0	0	0	0	0	0
1727	0	0	0	0	0	0	0	0
1728	1	0	0	0	2	0	0	0
1729	0	0	0	0	0	0	0	0
1730	0	0	0	0	1	0	0	0
1731	0	0	2	0	1	1	0	0
1732	1	0	0	0	1	2	0	2
1733	0	0	0	1	0	2	0	0
1734	0	0	0	0	0	0	0	0
1735	0	0	0	0	0	0	0	0
1736	0	0	1	0	0	0	0	0
1737	0	0	0	0	0	0	0	0
1738	1	0	0	0	0	0	0	0
1739	0	0	0	0	0	0	0	0
1740	0	0	0	0	0	0	1	0
1741	0	0	1	0	0	0	0	0
1742	0	0	1	0	0	0	0	0
1743	0	0	0	0	0	0	0	0
1744	0	1	0	0	0	0	0	0
1745	0	1	0	0	1	0	0	0
1746	0	0	0	0	0	0	0	0
1747	0	1	0	0	0	0	0	0
1748	0	0	0	0	0	0	0	0
1749	0	0	0	0	0	0	0	0
1750	0	0	0	0	1	0	0	0
1751	0	0	2	1	0	0	0	0
1752	0	0	0	1	0	0	0	0
1753	0	0	1	0	0	0	0	0
1754	0	0	1	0	0	0	0	0
1755	0	0	0	0	0	0	0	0
1756	0	0	1	0	0	0	0	0
1757	0	0	4	2	0	0	0	0
1758	0	2	0	1	1	0	0	0
1759	0	0	0	0	0	1	0	0
1760	0	0	0	0	0	0	0	0
1761	0	1	0	0	0	0	0	0
1762	0	2	0	0	0	1	0	0
1763	0	0	0	1	0	0	0	0
1764	0	0	0	0	0	0	0	0
1765	0	2	2	0	0	1	1	0
1766	0	0	1	0	0	0	0	0
1767	0	2	1	0	0	0	0	0
1768	0	2	0	0	0	0	0	0
1769	0	0	0	0	0	1	0	0
1770	0	8	0	0	0	1	0	0
1771	0	3	0	0	0	0	0	0
1772	0	1	0	0	1	0	0	0
1773	0	0	0	0	0	0	0	0
1774	0	0	0	0	0	0	0	0
1775	0	0	1	0	1	0	0	0
1776	0	1	1	0	0	0	0	0
1777	0	0	0	0	0	0	0	0
1778	0	1	0	0	0	0	0	0
1779	0	0	2	0	0	0	0	0
1780	0	1	0	0	0	0	0	0

1781	3	0	0	0	0	0	0	0
1782	5	0	0	1	0	0	0	0
1783	3	0	0	0	2	2	0	0
1784	0	1	1	0	3	5	0	0
1785	0	2	0	0	0	0	0	0
1786	8	0	1	0	6	3	1	0
1787	3	0	0	1	6	2	0	0
1788	0	0	0	0	2	0	0	0
1789	2	0	2	0	2	0	0	0
1790	0	4	1	0	0	0	0	0
1791	0	1	0	0	1	0	0	0
1792	1	0	1	1	0	0	1	0
1793	0	1	0	1	0	0	0	0
1794	0	4	1	0	0	0	0	0
1795	0	0	0	1	0	0	0	0
1796	0	0	0	0	1	0	0	0
1797	0	4	0	0	0	0	0	0
1798	0	0	3	1	0	1	0	0
1799	0	1	0	0	0	0	0	0
1800	3	0	0	0	0	0	0	0
1801	0	0	0	0	0	0	0	0
1802	0	0	0	0	0	0	1	0
1803	0	0	0	0	0	0	0	0
1804	0	0	2	0	0	0	0	0
1805	0	3	0	0	0	0	0	0
1806	0	0	0	0	1	0	0	0
1807	0	0	0	0	1	0	2	1
1808	1	0	1	1	0	0	0	0
1809	0	1	0	0	0	0	0	0
1810	0	0	0	0	0	0	0	0
1811	0	0	0	0	0	0	0	0
1812	0	0	0	0	0	0	0	0
1813	0	1	0	0	0	0	0	0
1814	0	1	0	1	0	1	0	0
1815	0	0	2	0	0	0	0	0
1816	0	0	0	1	1	0	0	0
1817	0	2	0	0	0	0	0	1
1818	0	4	0	0	0	0	0	0
1819	0	0	0	0	0	0	0	0
1820	0	0	0	0	0	0	0	0
1821	0	2	0	0	1	0	1	0
1822	0	1	1	2	0	0	0	0
1823	0	1	0	1	0	0	1	0
1824	0	0	0	0	0	0	0	0
1825	1	0	0	0	2	0	0	3
1826	0	0	0	1	0	0	0	0
1827	0	1	0	0	0	0	0	0
1828	0	0	0	1	0	0	0	0
1829	1	0	0	0	0	0	0	0
1830	0	0	0	0	0	1	0	0
1831	0	0	0	0	1	0	0	0
1832	0	4	0	0	4	2	0	0
1833	2	1	0	0	2	4	0	1
1834	0	0	0	0	2	3	0	0
1835	2	0	1	0	3	1	0	0
1836	5	0	0	0	6	7	1	3
1837	0	1	2	0	0	3	6	0
1838	0	1	0	0	1	0	0	0
1839	0	1	0	0	1	0	0	1
1840	0	1	0	1	0	0	0	0
1841	0	1	1	0	2	1	0	1
1842	0	0	1	0	0	0	0	0

1843	0	0	0	0	0	0	1	0
1844	0	1	0	0	0	0	0	0
1845	0	0	0	0	0	0	0	0
1846	0	0	0	0	0	0	0	0
1847	0	0	0	0	0	0	0	0
1848	0	1	2	0	0	0	0	0
1849	0	0	0	0	0	0	0	0
1850	0	0	3	0	1	1	2	0
1851	0	2	1	1	0	0	0	0
1852	0	2	0	1	0	0	0	0
1853	0	5	0	0	0	0	0	0
1854	0	0	3	0	1	1	0	0
1855	1	1	3	1	1	0	1	0
1856	0	2	0	3	1	0	0	0
1857	0	0	2	1	0	0	0	0
1858	0	0	1	0	0	0	0	1
1859	0	0	0	0	0	0	0	0
1860	3	0	2	0	2	0	2	0
1861	0	1	1	0	0	1	0	0
1862	0	0	1	0	0	0	0	0
1863	0	1	0	0	0	0	0	0
1864	0	0	1	1	0	0	0	0
1865	2	0	3	1	1	0	0	0
1866	3	1	1	0	3	1	1	0
1867	0	1	0	0	0	1	0	0
1868	1	0	1	0	1	0	0	0
1869	0	0	1	0	1	1	0	0
1870	0	0	1	0	0	0	1	0
1871	0	0	0	0	0	0	1	0
1872	0	0	0	0	0	0	0	0
1873	0	0	0	0	0	0	0	0
1874	0	0	0	0	0	0	0	0
1875	0	0	0	0	0	0	0	0
1876	0	0	0	0	0	0	0	0
1877	0	0	0	0	0	0	0	0
1878	0	0	0	0	0	0	0	0
1879	0	0	1	0	0	0	0	0
1880	0	0	0	0	0	0	0	0
1881	0	1	0	0	0	0	0	0
1882	0	0	1	0	0	0	0	0
1883	0	0	0	0	0	0	0	0
1884	0	0	2	0	0	0	0	0
1885	0	0	0	0	0	0	0	0
1886	0	0	0	0	0	0	0	0
1887	0	0	0	0	0	0	0	0
1888	0	0	0	0	0	0	0	0
1889	0	0	0	0	0	0	0	0
1890	0	0	0	0	0	0	0	0
1891	0	0	1	0	0	0	0	0
1892	0	0	1	0	0	0	0	0
1893	0	0	1	0	0	0	0	0
1894	0	0	0	0	0	0	0	0
1895	0	0	0	0	0	0	0	0
1896	0	0	1	1	0	0	0	0
1897	0	0	1	0	0	0	0	0
1898	0	0	1	0	0	0	0	0
1899	0	0	0	0	0	0	0	0
1900	0	0	0	0	0	0	0	0

10
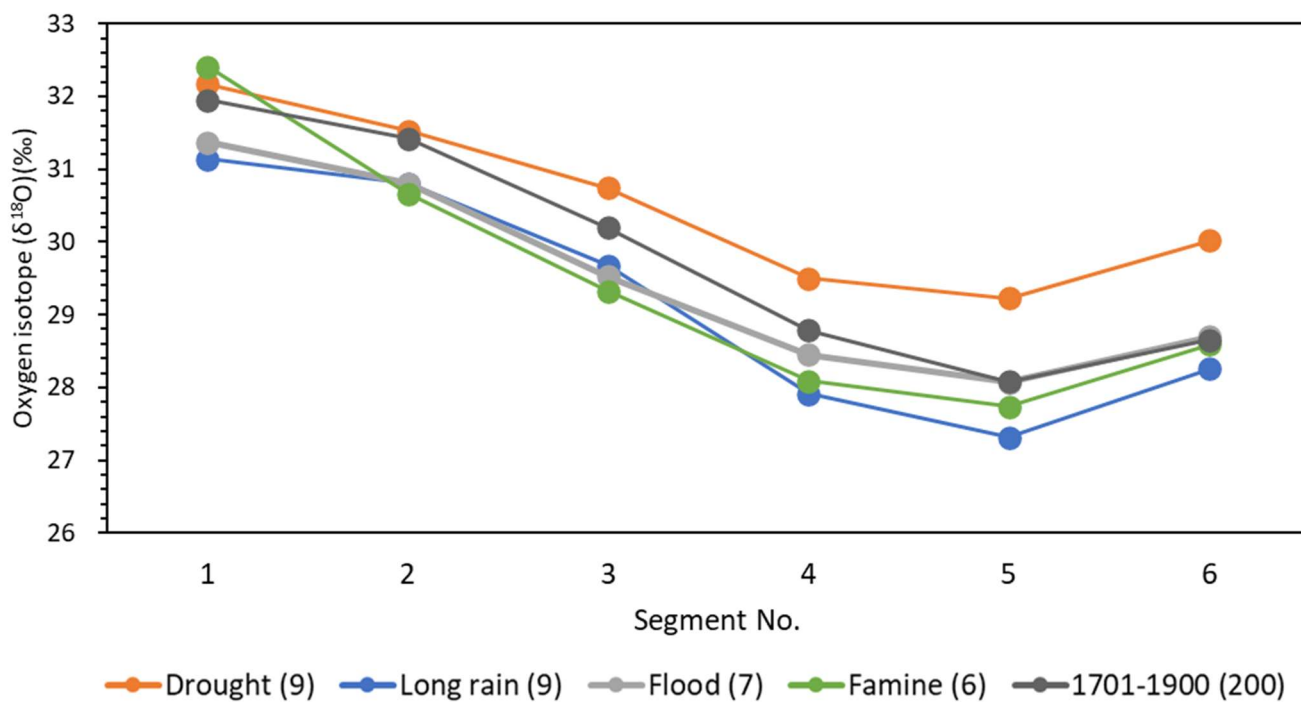
Figure S1 Intra-ring δ¹⁸O variation by disaster types. The mean and standard deviation of $\delta^{18}O$ for the four types of disaster years and all years for the 1701–1900 period are indicated by solid dots and bars, respectively. Numbers in the parentheses in the legend indicate the number of years belonging to each disaster type. Years of each disaster type were extracted as years for which the disaster description is found in ≥3 titles of Town/City history.