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Patterns in data of extreme droughts/floods and harvest grades derived from historical documents in eastern China during 801–1910

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In China, historical documents record a large quantity of information related to climate change and grain harvest. This information can help to explore the impacts of extreme drought or flood on crop production, which can provide implications for the adaptation of agriculture to higher-probability extreme climate in the context of global warming. In this paper, reported extreme drought/flood chronologies and reconstructed grain harvest series derived from historical documents were adopted in order to investigate the association between the reported frequency of extreme drought/flood in eastern China and reconstructed poor harvests during 801–1910. The results show that extreme droughts were reported more often in 801–870, 1031–1230, 1481–1530, and 1581–1650 over the whole of eastern China. On a regional scale, extreme droughts were reported more often in 1031–1100, 1441–1490, 1601–1650, and 1831–1880 in the North China Plain, 801–870, 1031–1120, 1161–1220, and 1471–1530 in Jianghuai, and 991–1040, 1091–1150, 1171–1230, 1411–1470, and 1481–1530 in Jiangnan. The grain harvest was reconstructed to be generally poor in 801–940, 1251–1650, and 1841–1910, but the reconstructed harvests were bumper in 951–1250 and 1651–1840, approximately. During the entire period from 801 to 1910, the frequency of reporting of extreme droughts in any subregion of eastern China was significantly associated over the long term with lower reconstructed harvests. The association between reported frequency of extreme floods and reconstructed low harvests appeared to be much weaker, while reconstructed harvest was much worse when extreme drought and extreme flood in different subregions were reported in the same year. The association between reconstructed poor harvests and reported frequency of regional extreme droughts was weak during the warm epoch of 920–1300 but strong during the cold epoch of 1310–1880, which could imply that a warm climate could weaken the impact of extreme drought on poor harvests; yet other historical factors may also contribute to these different patterns extracted from the two datasets.