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Climatic Sensitivity over the Tibetan Plateau based on Tree-ring network, Observation, and Modelling

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Located in central Asia and having an area nearly 2.5 million km2 with an average elevation greater than 4000 m above sea level, the Tibetan Plateau is in a critical position to record the behaviour of the Asian monsoon circulation and its atmospheric teleconnection. Numerical experiments have shown that seasonal evolution of the plateau's surface heating plays an important role in the development of Asian monsoon system.
Tibetan Plateau, the Third Pole of the world, is an important area in the global climate. Information about its climate variability and sensitivity is of importance for understanding the linkage between the Tibetan Plateau climate and global climate systems. Here we report a study of tree-ring network and observation on the plateau, and the ECHO-G long run output to examine the plateau climatic sensitivity in the about last 1000 years. In this study, we defined a sensitive index to show the climatic sensitivity of the Tibetan Plateau, and Empirical Orthogonal Function (EOF) analysis is used to show the leading principal components (PCs) of the 22 tree-ring chronologies and special patterns of temperature/precipitation over the plateau.
The distribution of sensitive index showed a strong signal on the Tibetan Plateau. The second EOF mode of the tree-ring chronologies showed a seesaw structure in the northeastern and the central plateau with a dividing line at latitude approximately 33°N. The spring moisture and variation may have a link with the North Atlantic Oscillation but this linkage is unstable through time. And the ECHO-G modelling results show that the Northern Pacific Oscillation (NPO)has a high correlation with the temperature and precipitation on the Tibetan Plateau in the historical time scale. Our results imply that TP tree rings, observation, and modelling output will help to reveal the climatic sensitivity on the Tibetan Plateau and large-scale climate signals that may relate with the plateau climate, and vice versa.