

The Freezing Rain and Snow Storm Events over South China and the Analysis of the Characteristics

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This paper gives definition and detection to the station-based and regional persistent freezing rain and snow storm events over South China (Guangxi and Guangdong) by using daily temperature and precipitation data of 178 stations during 1951-2012. It also comprehensively studies the spatio-temporal variation characteristics of the events. The results are shown as follows.

(1) Station-based events over South China occur mainly in the north of 23°N, and high-frequency events area mainly concentrates over northeast of Guangxi and northwest of Guangdong. The regional events occur mainly in the north of the 24°N, and high-frequency events area is basically the same as the station-based events.

(2) The most of the station-based persistent freezing rain and snow storm events occur in January, followed by February, and the regional ones as well. The events are more frequent in the 1970s and 1980s, which is consistent with the climatic change characteristics of winter temperature over South China.

(3) The occurrence of freezing rain and snow storm events is closely related to altitude and terrain. The events occur more easily in the stations where the altitude is between 100m and 200m.

(4) Using the cold-wet index to analyze the intensity of regional persistent freezing rain and snow storm events, it shows that serious events are more frequent in the 1970s. After 1990s, the serious events tend to reduce but more extreme, indicating that the extreme freezing events easily occur under the background of climate warming.

Disaster Influence of Regional Events

The index called PT value is calculated to represent the intensity for freezing rain and snow storm event:

$$PT_i = \frac{P_i - \bar{P}}{P_s} - \frac{T_i - \bar{T}}{T_s}$$

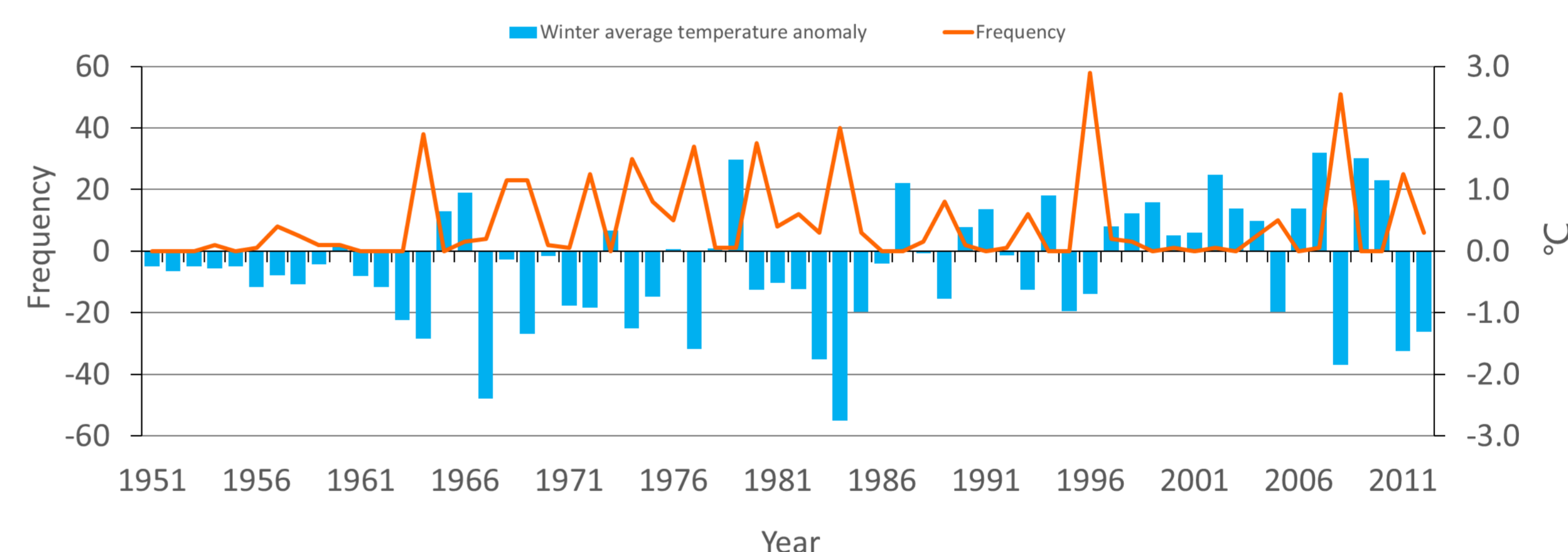
- Regional PT value can generally reflect the comprehensive intensity, involving the information of affected area and duration of multi-stations. Regional events with larger influence area or/and longer duration always yield higher PT values.

Table. Decadal variation of regional freezing rain and snow storm events

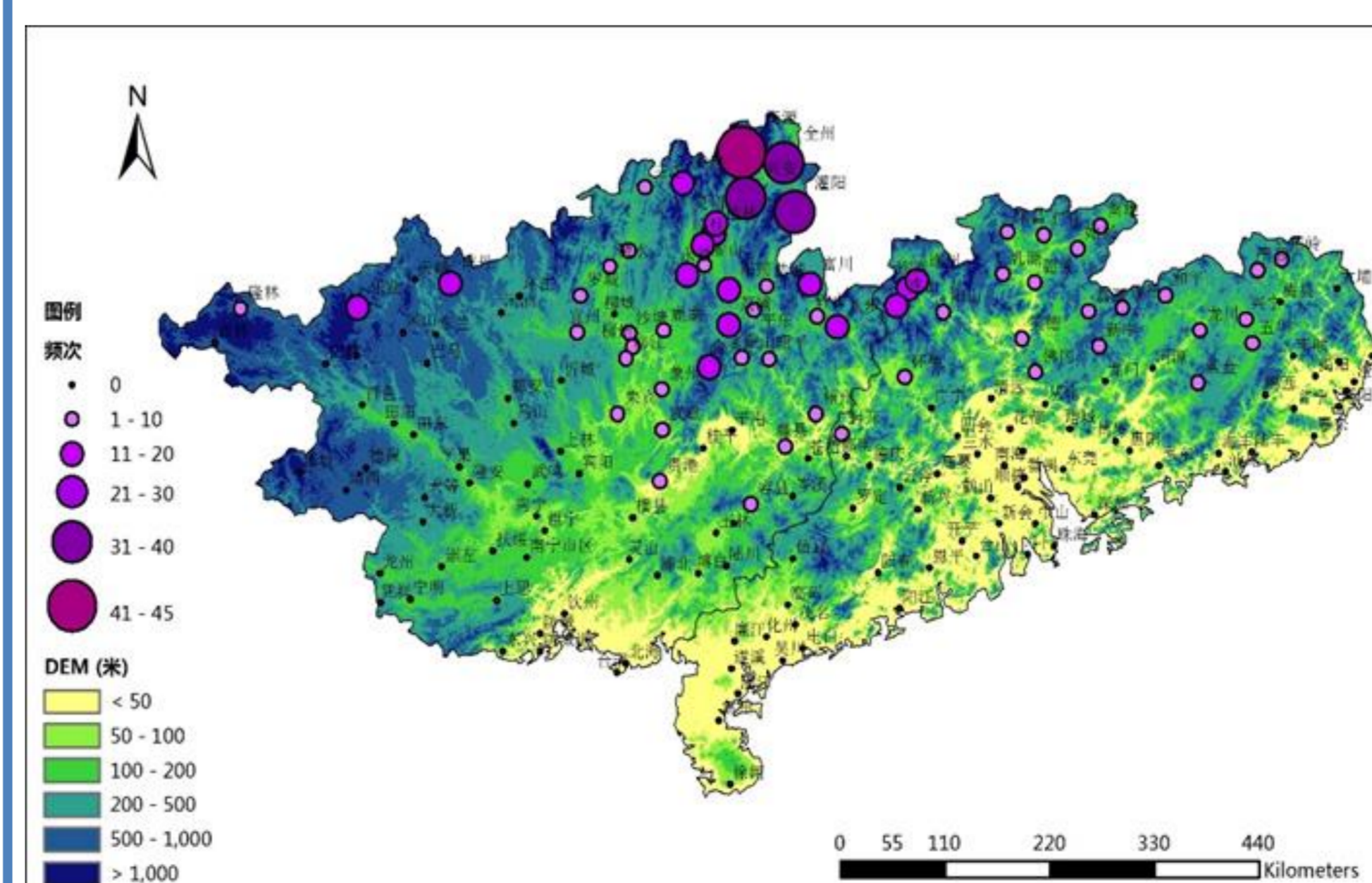
	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Frequency	2	6	7	11	4	4	3
Duration	9	7.5	8	9	8.5	11.8	8.3
Affected stations	5.5	7.0	10.3	5.6	7.8	10.0	7.3
Affected area	1.23	1.55	2.16	1.35	1.67	2.16	1.46
PT value	86.9	84.0	155.7	87.1	117.2	234.1	69.6

- Using the cold-wet index to analyze the intensity of regional persistent freezing rain and snow storm events, it shows that serious events are more frequent in the 1970s. After 1990s, the serious events tend to reduce but more extreme, indicating that the extreme freezing events easily occur under the background of climate warming. Once it happens, The damage is more serious.

Spatio-temporal Variation of Station-based Events Frequency



- The station-based events are more frequent in the 1970s and 1980s, which is consistent with the climatic change characteristics of winter temperature over South China.



- The occurrence of freezing rain and snow storm events is closely related to altitude and terrain. The events occur mainly in the north of 23°N and more easily in the stations where the altitude is between 100m and 200m. Especially the stations located on the windward slope of winter northerly winds over northeast of Guangxi and northwest of Guangdong.