(b) Characteristics of the conversion of circulation types and storm weather systems should be fully understood. This should include experience in weather analyses, and characteristics of storm weather systems. Special attention needs to be given to ensuring the time lag between events is meteorologically plausible.

7.5.2.2.4 *Procedure*

(a) Weather types (storm weather systems) affecting precipitations in the design watershed based on weather maps are classified. They are named based on key characteristics, such as shearing vorticity, westerly trough and typhoon. All weather processes during a selected period are ranked and possible storm sequences are created in a reasonable manner.
(b) Flow fields and humidity fields of typical storm processes are analysed to learn their circulation characteristics and moisture transportation.
(c) Comprehensive dynamic maps are drawn (of, for example, the location and the intensity of the blocking system, paths of vortexes and cyclones, frontal system evolvement, and cold and warm air movements), and the cause of the storm process is thereby determined.
(d) Rainfall distribution maps and discharge hydrographs corresponding to severe weather processes are drawn.
(e) Several storm processes are selected through analysis and comparison, that have large precipitations and are favourable for generating severe floods. These are combined into a new storm sequence using meteorological judgement for floods.

7.5.3 Analysis of combination scheme rationality

For both methods – the similar process substitution method and the evolvement trend analysis method – the rationality of the combination scheme needs to be analysed after it is determined. This can be done via synoptic meteorology, climatology and study of historical extraordinary storm floods.

7.5.3.1 Analysis based on synoptic meteorology

For combinations with many elements, the overall rationality of the combined sequence needs to be checked based on the evolvement of historical weather type sequences in the flood period. For combinations with few elements (two or three elements), the check should focus on the rationality of the interval between two elements and the possibility of the conversion of the first element into the second one in terms of the combination of synoptic situations. For combinations with long durations (one to two months), the check can also be done in terms of characteristics of seasonal changes in atmospheric circulations.

In regions affected by westerly belts, for example, the westerly circulation index of the combined sequence can be calculated and compared with typical years for large floods. At low latitudes, locations and intensities of subtropical anticyclones as well as changes to the configurations and intensities of major system members of high-altitude deformation fields, with special attention to the preservation and development of blocking systems, can be assessed.

7.5.3.2 Analysis based on climatology

The combined sequence can be compared with days of storms, locations of storm centres, storm extremes, characteristics of spatio-temporal distributions and so on in the design watershed. There should be no large contradictions between the two. Meanwhile, the combined sequence can also be compared with the distribution of storm extremes as well as corresponding synoptic situations, moisture conditions, etc., in adjacent watersheds in the same climate zone.

7.5.3.3 Comparison with historical extraordinary storm floods in the watershed

The storm duration, temporal distribution, storm area distribution, locations of major storm areas, etc. of the combined storm sequence is compared to historical extraordinary storms in the watershed to confirm that key characteristics are reflected.

7.5.4 Combination model maximization

A combination model itself not only extends durations of actual typical storms, but also increases the typical precipitation total. This can be considered maximization of some sort, so it can usually be regarded as a high-efficiency storm, for which only moisture maximization is needed to determine PMP. In most cases, only major elements are maximized.

7.5.5 Example calculations

7.5.5.1 Similar process substitution method

The Manwan project on the Lacang River, Yunnan Province, China is a dam with a height of 132 m, a