TYPHOON TURNING ATLAS

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Preface

Typhoons, or severe tropical cyclones, with most destructive forces are frequently formed in the South China Sea (SCS) to the western Pacific regions. Typhoons generally move westwards or northwestwards in summer and autumn, following the steering flows associated with the dominant Pacific subtropical high. But, there are often some unusual tracks, turning to the left and/or to the right for one or more times. It is difficult to forecast whether, when, and where the turning occurs based on the traditional synoptic charts and numerical weather forecast model products, because atmospheric variables include multiscale physical components and observational/model errors. *Typhoon Turning Atlas* provides an additional tool to deal with the problem. The global atmospheric variables of observations and model products can be decomposed into four components: (i) the zonal-averaged symmetric climate, (ii) the asymmetric climate (monsoon troughs), (iii) the zonal-averaged anomaly, and (iv) the synoptic-scale anomaly (including anomalous anti-cyclonic systems and anomalous vortices). This atlas, with thousands of plots, covers important information of 330 historical typhoons occurring in the last three decades in the period of 1979–2011 and demonstrates how the typhoons' motions and intensities were influenced by climatic monsoon troughs and anomalous vortices, respectively.

Classification of the positions from tropical disturbance to typhoon's peak intensity as well as diagnostic method of typhoon motions in this atlas will be surely useful as a good reference for researchers and forecasters in the practice of typhoon prediction. The decomposition method used in this atlas demonstrates how to extract useful information from observations (or model products), which is unlike most mathematical decompositions based on orthogonal basis functions, such as spherical harmonic expansion and empirical orthogonal functions. The atlas consists of seven chapters as follows.

The principle and method of physical decomposition of atmospheric variables, as well as some distribution features of typhoons occurring in the western Pacific and the SCS are described in Chapter 1. In order to understand this atlas, three typhoons with unusual motions and intensity changes are also illustrated as examples in this chapter.

In Chapter 2, typhoon motions without obvious turning are divided into five sections according to their geneses in the SCS, intensity peaked in the SCS, the Philippines, the east seas of China, and the western Pacific, respectively. Typhoons achieving their peak intensities in the SCS, the Philippines, the equatorial Pacific, and the tropical Pacific are illustrated in Chapter 3. Typhoons generated in the Philippines, the equatorial western Pacific, the equatorial central Pacific, and the tropical Pacific and also achieving their peak intensities in the Philippines are shown in Chapter 4. Most typhoons with their peak intensities located in the Taiwan area but generated in the equatorial western Pacific, the equatorial central Pacific, the tropical western Pacific, and the tropical central Pacific are given in Chapter 5. Some typhoons with their intensities peaked in the east seas of China but generated in the equatorial western Pacific, the equatorial central Pacific, the tropical western Pacific, the east seas of China, and the Northwest Pacific are plotted in Chapter 6. Typhoons with their intensities peaked in the equatorial Pacific and in the Northwest Pacific, typhoons generated in the western/central Pacific and entered the east seas of China, as well as twin typhoons and complex tracks of typhoons are described in Chapter 7.

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Weihong Qian
28 December 2012

Contents

Preface	v
Chapter 1: Variable Decomposition	1
1.1. Typhoons in the Northwest Pacific and the South China Sea	1
1.2. Decomposition Principles	2
1.3. Statistical Tracks	5
1.4. Unusual Motions of Three Typhoons	8
1.5. Climatic Monsoon Troughs	22
1.6. Two Close Tropical Cyclones	29
References	35
Chapter 2: Typhoons Without Obvious Turning Motions	37
2.1. Geneses in the South China Sea and the Philippines	37
2.2. Intensity Peaked in the South China Sea	49
2.3. Intensity Peaked in the Philippines	76
2.4. Intensity Peaked in the East Seas of China	109
2.5. Intensity Peaked in the Western Pacific	131
Chapter 3: Intensity Peaked in the South China Sea	151
3.1. Geneses in the South China Sea	151
3.2. Geneses in the Philippines	166
3.3. Geneses in the Equatorial Pacific	171
3.4. Geneses in the Tropical Pacific	177
Chapter 4: Intensity Peaked in the Philippines	195
4.1. Geneses in the Philippines	195
4.2. Geneses in the Equatorial Western Pacific	198
4.3. Geneses in the Equatorial Central Pacific	213
4.4. Geneses in the Tropical Pacific	235
Chapter 5: Intensity Peaked in the Taiwan Area	253
5.1. Geneses in the South China Sea	253
5.2. Geneses in the Philippines	256
5.3. Geneses in the Equatorial Western Pacific	262
5.4. Geneses in the Equatorial Central Pacific	267
5.5. Geneses in the Tropical Western Pacific	271
5.6. Geneses in the Tropical Central Pacific	291
Chapter 6: Intensity Peaked in the East Seas of China	297
6.1. Geneses in the Equatorial Western Pacific	297
6.2. Geneses in the Equatorial Central Pacific	301
6.3. Geneses in the Tropical Western Pacific	309

6.4. Geneses in the East Seas of China	326
6.5. Geneses in the Northwest Pacific	333
Chapter 7: Intensity Peaked in the Pacific	345
7.1. Intensity Peaked in the Equatorial Pacific	345
7.2. Intensity Peaked in the Northwest Pacific	359
7.3. Geneses in the Western Pacific and Entering the East Seas of China	382
7.4. Geneses in the Central Pacific and Entering the East Seas of China	386
7.5. Twin Typhoons	406
7.6. Complex Tracks	423