A STUDY ON THE RELATIONSHIP BETWEEN THE
ROTATION OF BINARY TYPHOONS AND STEERING
CURRENT

Bao Chonglan (包澄漚)
Department of Atmospheric Sciences, Nanjing University, Nanjing

Ruan Junshi (阮均石) and Zhu Yaojian (朱耀建)
Department of Meteorology, Nanjing Institute of Meteorology, Nanjing

Received October 17, 1984

ABSTRACT

Many studies show that, within a certain distance (ca. 700—800 n mi), two typhoons forming a
binary typhoon (BT) system would rotate as a whole and attract each other, which is known as “Fuji-
whara Effect” (FE). This paper indicates that only 38.3%, of BTs has experienced remarkable cyclonic rotation
with a 12-hr angle of 10° when two components are less than 20° lat apart, and that the probability is
much higher with the eastern component in the NE than in the SE quadrant for the western one, implying
the steering effect of the environmental flow field (EFF) on them.

47 observations from 13 BTs are separately used for calculating the angular velocity due to FE and
EFF and the results are compared. The conclusion can be stated as follows: FE is dominant with the
centers of two elements below 7° lat apart; the EFF steering current plays a major role when they are in
the range of 7—15° and for a distance above 15° the principle of FE holds no longer.

I. INTRODUCTION

It is a well-known fact that BT (binary typhoon) is one of the major problems concerned
with the typhoon’s stagnation, looping and other behaviors in its course. As early as
1921—1923, Fujimura[51] noted that, when one vortex approaches the other, they will go
around the common mass center counterclockwise in the Northern Hemisphere or attract
each other, which is the famous FE (Fujimura Effect). Later, Haurwitz[49] calculated angular
velocity of a BT by assuming the tangential wind speed distribution in a typhoon to be
identical with that of Rankine Model. Brand[52] indicated in 1970, based on many case
studies, significant increase in the angular velocity with reduction of the center-to-center dis-
tance for a BT system, thus giving a concept in synoptics that when two typhoons are close
enough to each other, interaction occurs, but the rotation as a whole is prevalent.

In the 1960s Chinese meteorologists made preliminary study of the tracks of BTs[5—11]
and since the 1970s much research has been done on it synoptically, dynamically and cli-
matologically[14—15]. A general conclusion is achieved[13—14] that when typhoons’ centers are
within a distance of 20° lat, such interactions occur as stagnation, looping, cyclonic/anti-
cyclonic rotation as a BT, mutual attraction and even mergence. But the track for each