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Long-term Rainfall Observation Records through Korean History and its Application for Modern Hydro-Meteorological Science

Joo-Heon Lee (1) and Hyeonjun Kim (2,3)

(1) Joongbu University, Civil Engineering, Go Yang, GyeongGi, Korea, Republic Of (leejh@joongbu.ac.kr), (2) Korea Institute of Civil Engineering and Building Technology, Goyang, GyeongGi, Korea, Republic Of, (3) Construction Environment Eng. Dept., University of Science and Technology,Daejeon, Korea, Republic Of

The “Chuk-Woo-Kee”, invented in 1441, the Joseon Dynasty, was recognized as one of the most significant inventions in hydrological history because it was the first scientific rain gage in the world. In Europe, in 1639, B. Castelli of Italy observed rainfall for the first time with invented raingage. In France, rainfall has been observed since 1658 in Paris and from 1677 in England. In Korea, the rainfall was measured from May 1442, which is about 200 years earlier than Italy. In 1442 (King Sejong’s 24th year), the observation system including Chuk-Woo-Kee’s specifications and observation methods was established and a nationwide observation network was established

The Chuk-Woo-Kee is a cylinder with a diameter of 7 inches (14.7 cm) and a height of about 18 inches (45.5 cm). The depth of precipitation collected in the Chuk-Woo-Kee is measured with a ruler made of wood or bamboo. The Chuk-Woo-Kee is placed on the basement of rocks to collect the rain. The staff of the Meteorological Agency of Joseon Dynasty directly measures and reports the depth of the daily precipitation. It was installed at the Palace and Meteorological Agency in the capital area and at the supervision of each province offices in the local area. Chuk-Woo-Kee was originally made of iron, but later it was made of copper, and in the provinces, it also used porcelain.

The Chuk_Woo-Kee observation project was not only very scientific and accurate, but also maintained a nationwide observation network. The Chuk-Woo-Kee observational data has become a basic data that can be utilized as it is for various hydrologic and palaeoclimatic studies. Although most of the observed Chuk-Woo-Kee data have been lost due to the War against Japan (1592-1598), precipitation observations data after 1770, when the Chuk-Woo-Kee project was reconstructed by King Yeongjo, remained safely through Joseon dynasty’s palace diaries, and has been successfully restored by a few modern meteorologists.

The purpose of this study is to grasp the history of rainfall monitoring project and the establishment of observation network in Korea from the ancient times to the Joseon Dynasty. Also this study aims to provide recent research trends and achievements using the Chuk-Woo-Kee data in the area of hydrologic science. In addition, we compare the statistical characteristics of Chuk-Woo-Kee data with those of modern observational precipitation and climate change, and analyze the long-term fluctuation of precipitation on the Korean Peninsula.

This study also aims to analyze basic statistics, trends, periodicities, and outliers for the precipitation in order to evaluate statistical characteristics of the drought history in Korea using records by the Chuk-Woo-Kee and modern rain gage by the Korean Meteorological Administration (KMA).