

Introduction to the Zhongxiu-Daming calendar (重修大明曆)

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ABSTRACT: We study calendrical calculations of solar eclipse times in the Zhongxiu-Daming calendar of the Jin Dynasty (A.D. 1115 – 1234) in China. This calendar was made by Zhi-Wei Zhao in 1180 as an improvement (i.e., Zhongxiu in Chinese) to the Daming calendar, which was made in 1127 by Ji Yang of the same dynasty. It was used in China until 1281, when the Shoushi calendar was enforced in the Yuan Dynasty (A.D. 1279 – 1368). Meanwhile, since the reign of King Sejong (1418 – 1450) of the Joseon Dynasty (A.D. 1392 – 1910) in Korea, the Chiljeongsan-Naepyeon (i.e., Datong calendar) was used as the main calendar with the Zhongxiu-Daming and Chiljeongsan-Oepyeon (i.e., Huihui calendar) as supplementary calendars for calculating astronomical events, particularly solar and lunar eclipses. For this reason, not only books on each calendar but also series of Jeongmyoyeon-Gyeosik-Garyeong (Example Supplement for the Calculations of Solar and Lunar Eclipses Occurred in 1447) for each calendar are preserved at the Kyujanggak Institute for Korean Studies. In this study, we develop a computer program for calculating sunrise times using the Zhongxiu-Daming calendar. We also calculate the times at Seoul (the capital of the Joseon dynasty) using the astronomical algorithms of Meeus and the Bessellian elements extracted from a modern ephemeris. We compare first contact, greatest, and last contact times calculated using the Zhongxiu calendar with the results of modern calculations. We find that the difference in greatest time the smallest among the three calendars at ~1.2 min but the differences in contact times were relatively large, with an average of ~33 min. In the future, we plan to verify the solar eclipse records listed in the Yuanshi (History of the Yuan Dynasty) and to investigate the accuracy of the Zhongxiu calendar for other periods.