Zhamaludining: Jamāl al-Dīn Muḥammad ibn Ṭāhir ibn Muḥammad al-Zaydī al-Bukhārī

Benno van Dalen

Alternate name

Jamāl al-Dīn

Flourished (Mongolia) and Beijing, China, circa 1255-1291

The Muslim astronomer Zhamaludining (Chinese transliteration of Jamāl al-Dīn) was the first director of the Islamic Astronomical Bureau established in Beijing in 1271. He was involved in the compilation of a zīj (astronomical handbook with tables) in Persian, which was largely based upon newly observed planetary parameters and was translated into Chinese, under the title Huihuilifa, during the early Ming dynasty. Furthermore, Zhamaludining’s name is associated with a “Geography of the Yuan empire,” finished in 1291.

Most of the historical information concerning Zhamaludining stems from the official annals of the Yuan dynasty, the Yuanshi, and from the “Annals of the Yuan Office of Confidential Records and Books” (Yuan bishujian zhi, reprinted in the Sikuquanshu). It appears that Zhamaludining was in the service of the Mongol Great Khans from the 1250s onward. A certain Jamāl al-Dīn Muḥammad ibn Ṭāhir ibn Muḥammad al-Zaydī al-Bukhārī, hailing from the region of Bukhara in present-day Uzbekistan and presumably identical with Zhamaludining, is mentioned in the Jāmiʿ al-tawārīkh (World history) of the famous Persian historian Rashīd al-Dīn (died: 1317) as not having been capable of carrying out the construction of an astronomical observatory for Möngke Khan (1251-1259) in his capital Karakorum in central Mongolia. Möngke’s successor Khubilai had already consulted Zhamaludining and other Muslim astronomers before he became the first emperor of the Yuan dynasty in 1264 and moved his capital to Beijing (Dadu). Three years later, Zhamaludining presented to Khubilai the Wannianli (Ten thousand-years calendar, presumably an Islamic zīj), which was for a short period distributed as an official calendar but is no longer extant. Furthermore, Zhamaludining offered models or depictions of seven astronomical instruments of Islamic type, namely an armillary sphere, a parallactic ruler, an instrument for determining the time of the equinoxes, a mural quadrant, a celestial and a terrestrial globe, and an astrolabe.

In 1271, Khubilai Khan founded an Islamic Astronomical Bureau with observatory, which was to operate parallel to the traditional Chinese bureau. He thus maintained the bureaucratic structure of the preceding Jin dynasty, but at the same time allowed Chinese observations and predictions to be
checked against those of the highly respected Muslim astronomers. Zhamaluding became the first director of the Islamic Bureau and headed a staff of approximately 40 persons, including astronomers, teachers, and administrative personnel. Because, in particular during the 1260s, tens of thousands of Muslims had arrived in China, it need not surprise us that the staff included capable astronomers and that a large observational program could be carried out in order to re-determine most of the planetary parameters and to measure anew the longitudes and latitudes of hundreds of fixed stars. The Islamic Astronomical Bureau of Yuan China thus became one of the very few Islamic institutions where observations were carried out at such a large scale. Although the bureau was not abolished until 1656, its direct influence on Chinese astronomy was very limited and no Islamic methods were incorporated into the official calendar of the Yuan dynasty, the Shoushili, by Guo Shoujing.

Zhamaluding was also one of the directors of the imperial “Office for Confidential Records and Books” (bishujian), to which both astronomical bureaus were subordinate. The extant annals of this office contain a list of books and instruments present at the Islamic Observatory and in Zhamaluding’s private library. From the Chinese transliterations of the book titles and brief descriptions, it can be seen that the following works were available: the Almagest of Ptolemy, the Elements of Euclid, the Madkhal (Introduction to astrology) by Kushyar ibn Lubbân, the Stellar constellations by Süfi, zijes, and books on haya (cosmology) and the construction of instruments. The transliterations were clearly made from the Persian (rather than from the Arabic), as can be seen from certain grammatical elements and some small variations in terminology.

Zhamaluding was very probably the author of a zīj in Persian, or at least was associated with its compilation. The original of this work is lost, but a Chinese translation entitled Huihulifa (Islamic calendar) has drawn the attention of Chinese scholars ever since its publication in the annals of the Ming dynasty (Mingshi) prepared in the late 17th century. The translation was made in 1383 by a Muslim astronomer, Ma-shayihei (possibly a shaykh who had assumed the common Chinese surname for Muslims, Ma), in cooperation with Chinese scholars. This project, which also included a translation of Kushyâr’s Madkhal, was carried out at the Astronomical Bureau of the new capital Nanjing on the order of the first emperor of the Ming dynasty, Hong Wu.

In recent years the number of known sources from which the contents of Zhamaluding’s original zīj may be reconstructed has significantly increased. A late-15th-century restoration of the Chinese translation by the vice director of the Astronomical Bureau in Nanjing, Bei Lin, as well as a Korean reworking made on the order of King Sejong (1419-1451), turned out to be more complete than the version published in the Mingshi. An Arabic zîj written in Tibet in 1366 by al-Sanjufînî contains many tables taken directly from the Huihulifa and others that were derived from that work. Al-Sanjufinî’s solar tables are said to be based on the “Jamâ’il observations,” i.e., probably, those carried out under Zhamaluding. A Persian–Arabic manuscript at the Oriental Institute in Saint Petersburg, Russia, which was clearly copied by someone who did not know Arabic or Persian very well, was presumably a working document of the Chinese translators, since it contains original tables for Beijing besides newly computed ones for Nanjing.

An investigation of all these sources has shown that Zhamaluding’s original zîj contained planetary tables of standard Ptolemaic type, but based on mostly new values for the mean motions, eccentricities, and epicycle radii. For example, the solar mean motion in longitude as found in the Huihulifa implies a length of the tropical year (in sexagesimal notation) of 365;14,31,55 days, one of the most accurate values hitherto found in Islamic sources (the actual year length in 1300 was approximately 365.242236, i.e., 365;14,32,3 days). Zhamaluding’s method for predicting solar and lunar eclipses appears to be a mixture of Islamic and Chinese methods. The origin of the star table in the Huihulifa, which lists non-Ptolemaic longitudes, latitudes, and magnitudes of 277 stars near the ecliptic with Ptolemaic as well as Chinese star names, has not yet been completely clarified. The translators in the early Ming dynasty certainly made various modifications to this table, which they
utilized for the calculation of so called encroachments (lingfan), i.e., passings of the Moon and planets through stellar constellations, which were highly significant in Chinese astrology.

In 1286, undoubtedly as a senior scholar, Zhamaluding suggested to Kubilai a large-scale geographical survey of the Yuan empire. He became the head of an office especially established for this purpose and, since he did not speak Chinese, was provided with a personal translator. The result of the survey, the Dayitongzhi (Geography of the whole empire) in 755 volumes, was offered to the emperor in 1291 and finally printed in 1347. Unfortunately, only the introduction of this work is extant.

Selected References


