

# The Observations of Planets in Japan until the 10th century

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**Abstract.** The Japanese observational astronomy began in the seventh century AD. Evidence for this is provided. For the eighth, ninth, and tenth centuries, the motions of the Moon and Planets recorded in the Japanese history books are described. The number of records increases much, so we will talk about planets after 10th century elsewhere. Our calculation shows that these records are based on observation.

## 1 Introduction

Japanese astronomy was born under the influence of Chinese astronomy. Using the same Kanji characters, the terminology for the astronomy was almost identical with that of Chinese astronomy.

The seventh century AD is a very interesting period in the east Asia. Wars were frequent and some nations emerged and other nations perished. Astronomy should have been affected by this general situation. The authors (Tanikawa & Sôma 2008, Sôma & Tanikawa 2011, Tanikawa & Sôma 2018) have shown that in Japan observational astronomy began in the 7th century AD. We first provide evidence of its beginning. We also talk about the non-monotonicity of the evolution of astronomy in relation to the ancient history of Japan.

In the beginning of the seventh century, Japan wanted to get rid of Chinese fetters. One of what Japan did was to observe astronomical phenomena. Observations of the motion of the Sun and Moon is indispensable for making calendars. Solar and Lunar eclipses were particularly important because these fixed the first and 15th days of a luni-solar month. In other efforts, Japan directed herself to make laws, bureacuracy, and to edit history books.

Being independent politically and being independent scientifically are different. The latter independence is more difficult to attain. As a first step to be independent, Japanese astronomy followed the tradition of Chinese astronomy.

In the second part, we take astronomical data mainly from the book edited by S. Kanda (1935). The name of the book is "Nihon Tenmon Siryou" meaning astronomical material of Japan. Kanda with his collaborators read extensively the Japanese ancient to medieval material, and took out astronomical records. Their material were taken from formal and private history books and official diaries of high aritocrates.

For each record of the Moon and planets, we calculate their positions using DE431 ephemeris of Jet Propulsion Laboratory (Folkner et al. 2014), and checked whether the records were based on observations. Our conclusion is that the records in the 8th, 9th, and 10th centuries were based on observation.