

Übung zu Terra-Astronomie WiSe 2018/19

Übungszettel 5 (15. November 2018)

Abgabe bis Do 22.11.

Besprechung in der Übung am 29.11.

Ort der Übung: Seminarraum, Sternwarte, Schillergäßchen 2 (Oliver Lux)

1. European observations around AD 807:

In the Royal Frankish Annals, the main chronicle about Charlemagne and his time, there is a detailed report about celestial observations in AD 806 and 807. The text reads as follows:

The Emperor [Charlemagne] celebrated christmas at Aachen. And the number of the years was changed into [AD] 807. In the preceding year, 4th nones September, was an eclipse of the moon, the sun was then in the 16th degree of Virgo. The moon therefore was in the 16th degree of Pisces. Moreover in this year on the 2nd calends February the moon was at the 17th when the star Jupiter was seen to pass through it. And on the 3rd ides February was an eclipse of the sun at midday, both stars being in the 25th degree of Aquarius. Again on the 4th calends March, was an eclipse of the moon, and flames appeared that night of an amazing brightness, and the Sun stood in the 11th degree of Pisces and the moon in the 11th degree of Virgo. And, still more, the star Mercury on the 16th calends April was seen in the Sun like a small black spot, a little above the center of that very body, and it was seen by us for 8 days, but when it first entered, and when it left, clouds kept us from observing. And again in August, on the 11th calends September was an eclipse of the moon at the 3rd hour of the night the sun's position being in the 5th degree of Virgo and the moon in the 5th degree of Pisces.

(a) Please specify the dates of the observations in the Julian calendar, in particular on which day of the month the observations happened (by counting forward from the beginning of the month to its end).

(1 point)

(b) Compare the given dates with the actual dates of the reported lunar and solar eclipses by comparison, e.g., to <https://eclipse.gsfc.nasa.gov/eclipse.html> (the “five millennia catalog” for both lunar and solar eclipses). Also check, whether these occultations were visible over the Carolingian empire and in particular Aachen. Take into account that, for Carolingians, the 24-day (and date) started and ended at sunset. Where the lunar eclipses in the first or 2nd half of the night(s) visible in the Carolingian empire ?

(2 points)

(c) For the solar eclipse, specify the time of start and end of the eclipse, as well as the time and percentage of maximal obscuration at Aachen.

(1 point)

(d) Please also check, whether the positions of Sun and Moon (a certain degree within a zodiacal sign or constellation ?) are correct – either with or without precession ?

(1 point)

(e) Please consider the interpretation of “*flames appeared that night of an amazing brightness*” during the full moon night with a lunar eclipse.

(1 point)

(f) Please consider the interpretation of “*the star Mercury on the 16th calends April ... seen in the Sun like a small black spot, a little above the center of that very body, and it was seen by us for 8 days*”.

Was a Mercury or Venus transit observable in this year or another year closeby ?

(For Venus transits, you can use <https://eclipse.gsfc.nasa.gov/transit/transit.html>, for Mercury transits, you can use <https://www.projectpluto.com/transits.htm>).

(2 points)

(g) What was observed when the report says

“on the 2nd calends February the moon was at the 17th when the star Jupiter was seen to pass through it”.

You could use a planetarium software like Stellarium to check.

Please also check whether the two dates given (*2nd calends February* and *moon was at the 17th*) are consistent with each other.

(2 points)

NB: The date (day within a month) is given in the Latin way (Roman calendar), i.e. as an ordinal number of days counted down until a certain fixed calendar day (counted inclusively):

- *Nonae* for the 7th day of March, May, July, and October (the four months with 31 days already in the pre-Julian Roman republican calendar) and the 5th day of the other months; also used for the 2nd to 7th or 5th days, respectively, of the month by counting down inclusively until the *Nonae*;
- *Idus* for the 15th day of March, May, July, and October and the 13th day of the other months; also used for the eight days after the *Nonae* by counting down inclusively until the *Ides*;
- *Kalendae* (English: *calends*) used for the 1st day of the month; also used from the 16th or 14th day, respectively, by counting down inclusively until the end of the (previous) month.

These terms have their origin in the old Etruscan-Roman lunar calendar with *Kalendae* (from the Greek *kalein* for *to announce* the start of a new month) for new moon (or new light or first crescent), *Nonae* for the quarter phase (half moon) on the ninth (*nonae*) day counted inclusively before *Idus*, and *Idus* for full moon (from Etruscan *iduo* for *to divide* the month). (In the pre-Julian calendar, Feb normally had 28 days, Mar, May, Jul, and Oct 31 days, the others 29 days, in total 355 days, i.e. close to 12 synodic months.) The day before the fixed calendar days was also called *pridie*.