

## **New possibilities for ephemeris support of minor planets**

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Rapid growth of number of the numbered minor planets (67% increase during 2001 over the total number of the objects known to the end of 2000) involves specific difficulties in organization of ephemeris support of minor planets. To retain the annual volume of the Ephemerides of Minor Planets within reasonable limits it became necessary to reorganize the most visual table of ephemeris oppositions. In the volume for 2003 [1] the space of the table was cut down at the expense of shortening the number of entries in each ephemeris and elimination of some other important information. In the future the new reductions will be inevitable.

To compensate the loss of information in the printed volume of EMP and to offset the lagging of information in it from the actual state the IAA renders now a number of services through WWW. First, one should mention among them the Updated Ephemerides of Minor Planets. Since the last year the IAA places at its FTP server **quasar.ipa.nw.ru** the monthly updated files with minor planet elements, opposition dates for all numbered minor planets and ephemerides for all planets at oppositions within three months of the current date. The content of the files is updated on the last working day of each month. The files can be downloaded via FTP by anonymous user. To facilitate the selection of necessary information from the files and its subsequent use the package MUSE (Monthly Updated Search Ephemerides) has been developed and placed at the same server at user disposal. When first used the package records data of the files into internal data base and in subsequent enables one to perform a number of operations such as selection from tabular data, their sorting, interpolating ephemeris data, computation of  $O - C$ , identification of minor planets and so on.

This year a new integrated software package (conventional name AMPLE — Adaptable Minor Planet Ephemerides) has been developed in the Institute of Applied Astronomy. According to its authors intention it should play a role of computer version of the Ephemerides of Minor Planets.

AMPLE follows the pattern of a yearbook. Yearly issue of the package is designed for operating basically within the time interval (basic interval) covering 16 months (from November of the year preceding the title year of the package to February of the subsequent one). The package computes positions of minor planets by the formulas of elliptic motion using sets of orbital osculating elements obtained in advance for a number of non–uniformly distributed moments of time. The space between the moments is determined in such a way as to assure precision of computation of spherical coordinates not worse than 0.2 arcsec within 120 day intervals centered at oppositions of each planet. For minor planets with perihelion distances less than 1.4 a.u. the created set of osculating elements assures the above precision during the whole basic interval. The computed positions whose precision can not be ensured are marked by asterisk.

It is to be noted that the employed method of computations enables one to solve effectively with good precision a variety of time–consuming problems.

Ephemeris computations as well as some other problems can be treated for groups of minor planets having numbers within specified limits, or for minor planets having oppositions within specified interval of time, or else for minor planets entering in some list.

The package provides ephemeris computations in various coordinate systems (spherical, rectangular) referred to different main planes and centers. In so doing AMPLE enables one to display only those lines of ephemerides which fit combination of restrictions imposed on several ephemeris data.

AMPLE is developed in two modifications. One of them works under MS DOS, the other one is under Windows 95/98. DOS modification has higher performance in most applications. The version under Windows provides extra possibilities specific to the system.

AMPLE for 2003 is also available on FTP server of IAA in public domain.

The paper contains description of various potentialities of the package.

## References

1. Shor V. A. (ed.) Ephemerides of Minor Planets for 2003, IAA RAS, 2002.