



ON THE DYNAMICS OF THE SOLAR SYSTEM V: SEMIMAJOR AXIS VARIATION

RAMON GONZÁLEZ CALVET

Communicated by Angel Zhivkov

The evolution of the semimajor axes of the planets of the solar system is calculated from linear combinations of 434 distinct frequencies showing that the semimajor axes are bounded. Those of the giant planets vary by less than $\pm 0.1\%$. Within four million years, the semimajor axes of Mars and Earth change by less than $\pm 2\%$, that of Venus varies by less than $\pm 5\%$ and that of Mercury ranges from -22% to 13% of its average. Since the semimajor axes as well as the other orbital elements of the planets are bounded, it is concluded that the solar planetary system is stable.

MSC: 70F10, 70F15

Keywords: *N*-body problem, semimajor axis, solar system, stability

Contents

1	Introduction	62
2	Variation of the Semimajor Axes	62
3	Analysis of Frequencies	65
3.1	First Harmonic	66
4	Mercury	67
5	Venus, Earth and Mars	67
6	Jupiter and Saturn	69
7	Uranus and Neptune	72
8	Discussion of Results	72
9	Conclusions	76
	References	78
	doi: 10.7546/giq-30-2024-61-79	61