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ON THE ASTEROIDAL JET-STREAM FLORA A

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Abstract

The problem of the virtual existence of the (1) Flora I separated from the rest of the Flora family and (2) jet-stream Flora A (Alfvén 1969) is discussed in connection with the observational selection effects. It is shown that observational selection effects operate as a whole and can be important in incomplete observational data set.

1 Introduction

The virtual existence of the most significant asteroidal jet-stream Flora A is fully explained as a consequence of observational selection effects (Klačka 1991). The aim of this paper is to point out the continuous presence of observational selection effects in incomplete set of observational data (e. g., many faint asteroids are members of these data). We discuss the problem of the existence of the jet-stream Flora A and structure of the Flora family in E - I (i. e. proper eccentricity - the sine of proper inclination, Brouwer and van Woerkom 1950) diagram, for this purpose.

2 Flora I and asteroidal jet-stream Flora A

The situation for the Flora family in E - I diagram for two data sets is depicted in Fig. 1. Fig. 1a represents Flora family selected from the first 1563 numbered asteroids (Alfvén 1969), Fig. 1b represents the current status (Klačka 1987). We see that the gap separating Flora I from the rest of Flora family occurring in Alfvén's data does not exist in reality. The explanation of the situation in 1969 is natural: the virtual separation of Flora I from Floras II - IV is simply due to the observational selection effects.

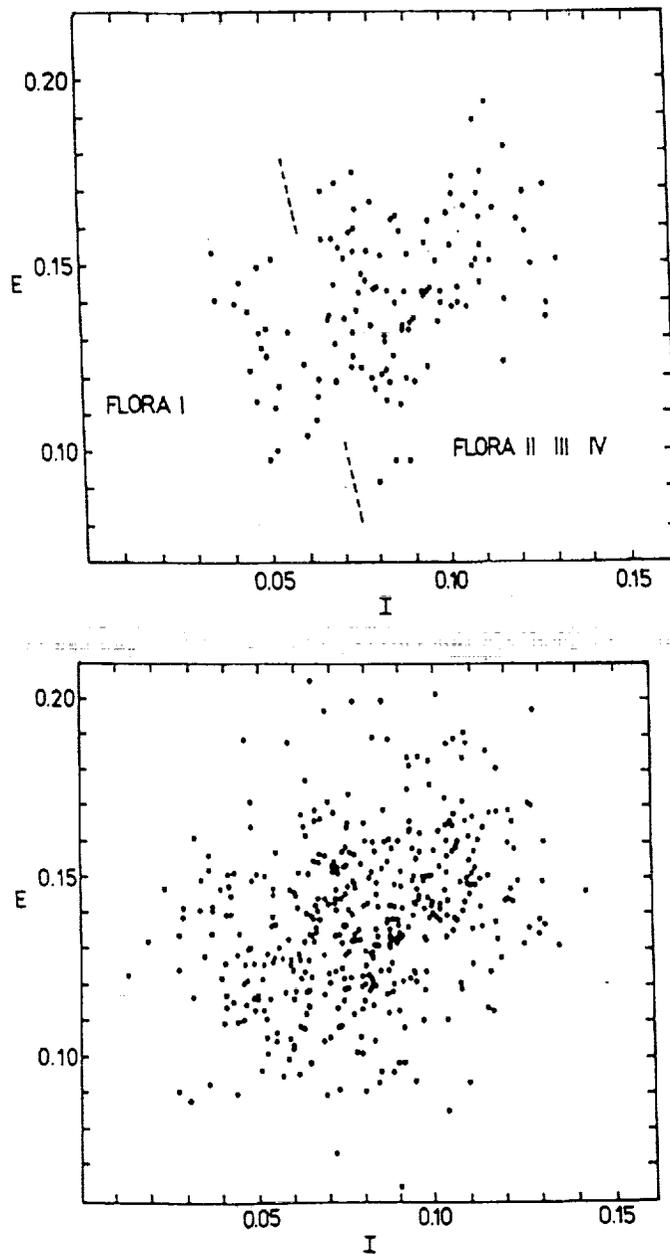


Fig. 1 Flora family in E - I diagram.
a) According to Alfvén (1969), upper.
b) According to Kláčka (1987), lower.

We can summarize: Observational selection effects were important in observational data used by Alfvén (1969). They caused the virtual existence of (1) the gap separating the Flora I from the rest of the Flora family, (2) the asteroidal jet-stream Flora A.

At present there exists no gap in E - I diagram for Flora family. It, however, does not mean that no observational selection effect can be found in observational data. We perform the following "Gedankenexperiment" for a proof. Let us introduce the virtual gap (line) in Fig. 1b corresponding to the line presented in Fig. 1a. We can look for asteroidal jet-streams in virtual Flora I obtained by this procedure. What is the result? We find asteroidal jet-stream as Alfvén in 1969 (but less significant). How can we understand it? (If you want, you can solve this problem as an exercise. Hint: see Kláčka 1991.) Virtual Flora I is formed mainly by asteroids with small inclinations, if observational selection effects are important. This explains the concentration of asteroids in proper element Θ_1 (Kláčka 1991). If we take into account observational selection effects important for discoveries of faint asteroids and manifested in Π_1 (Kláčka 1991), one should expect the existence of virtual jet-stream. Of course, the significance of such virtual jet-stream decreases with increasing number of numbered asteroids used (incompleteness of the set which manifests itself in the distribution of asteroids according to the Π_1 - and Θ_1 - elements clearly becomes less relevant as we enlarge the considered set).

In conclusion we can say that the virtual existence of Flora I is generated by the observational selection effects manifested in the incomplete data set mainly due to preference of asteroids with small inclinations. The same observational selection effects and some others (closely related to the formers), which manifest themselves in the distribution of asteroids according to the Π_1 -element, cause the virtual existence of the jet-stream, then. All this can be put down in a logical scheme:

$$A \Rightarrow B \Leftrightarrow \text{non}B \Rightarrow \text{non}A ,$$

where:

A = The gap, separating Flora I from the rest of Flora family, exists (or, is artificially created in E - I diagram),

B = Jet-stream (Flora A) exists,
if observational selection effects are important.

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