THE SPECTRUM OF THE Cr STAR
EPSILON URSAE MAJORIS

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Abstract. Fourteen coudé spectrograms (eight with dispersion 12.4 Å mm⁻¹ and six 7 Å mm⁻¹) of the
Cr star εUMa (Ap) have been studied. The observations were made at the Haute Provence
Observatory. The radial velocities of the various ions have been measured. The existence of Balmer
progression in radial velocity is doubtful. The variability of some lines is in the opposite sense of K
of Ca ii. Both a rough and a fine analysis have been made. The results of these analyses are
compared and found to be in good agreement. The results of the fine analysis indicate a defect of Al,
Si and Ca; Sc, Ti, Fe and Sr are normal, Mg and Ni are in slight excess. V, Cr and Mn are in excess
by factors of 3, 12, 19; Y, Zr and Ba are in excess by factors of 9, 15, 30. Rare earths are in excess by
factors ranging between 100–1000. These results are compared with the majority of the Cr-Eu-Sr
stars.

1. Introduction

Light and spectrum variability is common among the peculiar A stars of the Si,
Sr, Cr, Eu group. This variability is quite complex and can provide considerable
insight into the usual physical processes taking place in the Ap stars. These
variations are often periodic and this is an important aspect of the Ap star
phenomenon.

The brightest star among the peculiar A stars of the Si, Sr, Cr, Eu group is
εUMa. The spectral types according to the different criteria are A0p (HD), A2s
(Mt Wilson), A0V (Yerkes MKK or MK), A0 (λtD), B9 (HDK) and A0 (H&D).
The peculiar features, according to the different authors include: Cr and Eu
(Slettebak, 1954; Bertaud, 1959), Cr (Osawa, 1965; Cowley et al., 1969). From a
study of a great number of spectra, Guthnick (1931) has established that the K
line of Ca ii is periodically variable with intensity minima on

(1931 April 5.01 = JD 2 426 437.01) + 5.0887 E.

Many of the other lines are slightly weaker when the K line is stronger.
According to Deutsch (1947) and Hack and Casati (1957), Cr ii lines are variable
in the opposite sense of K. According to the preliminary results of the study of
εUMa made by Engin (1975), Sr ii lines vary 180° out of phase with Ca ii and
Cr ii lines also vary in phase with Sr ii.

Table I gives some data for εUMa.

* On leave of absence from the Astronomical Department, Istanbul University. The observations
have been made at the 152 cm coudé telescope of the Haute Provence Observatory.
The purpose of the present work is (a) to study the variations of the spectral lines and radial velocity, (b) to perform a quantitative analysis of this star by the method of the differential curve of growth, and (c) a fine analysis by computing an atmospheric model, and to compare the results of the analyses obtained by the two methods.

### 2. Observations

The present study is based on 14 spectrograms taken at the Haute Provence Observatory with the 152 cm coudé telescope. The observational data of the

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