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ON THE ORIGIN OF A VERY CLOSE SIMILARITY BETWEEN THF SPECTRA OF THE SUPERNOVA TYPE 1 IN NGC 3198 AND THE ABSORPTION SPECTRUM OF DQ Her

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ON THE ORIGIN OF A VERY CLOSE SIMILARITY BETWEEN THE SPECTRA OF THE SUPERNOVA TYPE I IN NGC 3198 AND THE ABSORPTION SPECTRUM OF DQ Her

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The Type I Supernova discovered late in 1966 in NGC 3198 /1* has the following pecularities: the broad minima in its spectrum "break down" into a number of significantly narrower absorption bands. In Figure 1a, we present the distribution of energy in the spectrum of the Supernova for 9 Jan. 67 taken from [1]. Figure 1b shows a recording of the spectrum of the same star (photographic density) for the same moment on 9 Jan. 67 taken from [2]. We can see from Figure 1 that the broad minima of τ, σ and μ, which usually show no details in the spectra of Type I Supernovas, contain a number of narrow absorption bands. The reality of most of these absorption bands is demonstrated by comparison of recordings of spectra of the Supernova presented in [1] for two moments in time: 23 Dec. 66 9 Jan. 67 Furthermore, the clearest absorption bands are present simultaneously in Figures 1a and 1b.

In his articles in identification of the spectra of Type I Supernovas ([3] and its bibliography), the author noted that these minima (particularly of τ and μ) are a result of blending of several broad absorption bands. Thus, we would expect [3], [4], that the minimum of τ should be a blend of intensive and very broad absorption lines of FeII, in which the lower level is metastable. The wavelengths of these lines are: 5169, 5198, 5235, 5276, 5317, 5363A.

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[1]Numbers in the margin indicate pagination in the foreign text.

According to [5], the very great width of the absorption lines in the spectra of Type I Supernovas result from the great masses of their shells and the greatly suppressed content of hydrogen within them. Therefore, if the shell, expelled by any Supernova, has anomalously low mass, we might /3 hope to see these blends of τ and μ in the spectrum of the star broken down into the component absorption lines. Therefore, a detailed identification of the absorption bands in the spectrum of the Supernova with the strongly shifted spectrum of the Nova DQ Her was undertaken (using Table 1 in [3]). The identification was performed for $\kappa = \frac{\Delta\lambda}{\lambda} = -0.0255$.

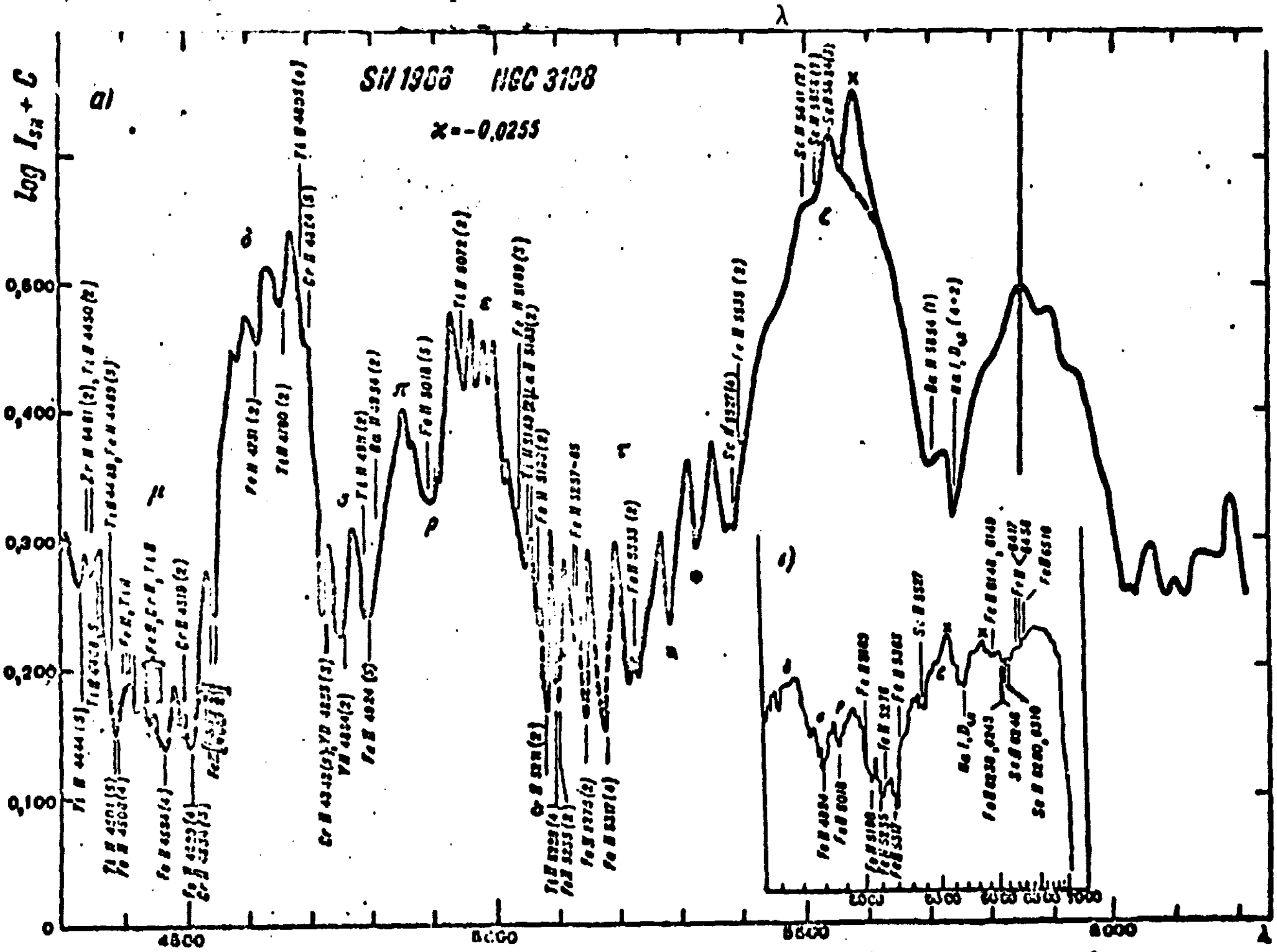

Figure 1. Identification of absorption bands in spectra of the Supernova in NGC 3198 on 9 Jan.67 [1], [2] with absorption lines of the spectrum of DQ Her.

For purposes of identification, we selected the absorption lines of the main absorption spectrum of DQ Her, Table 6 of [6], with intensities of 2 and higher, these intensities being presented in Figure 1a within the parentheses after the normal wavelength of the line of the corresponding element. The main spectrum of DQ Her was selected because dilution effects are seen in this spectrum much less frequently than in the premaximal spectrum of the Nova. We excluded only the lines of H and He from Table 6 of [6] (see [3], [7]), as well as the lines of O, C and N (the lines of these elements in the spectrum of DQ Her were anomalously strong, see also [7]). We should note that the present report does not confirm the presence of the lines only of the elements listed in the spectrum of the Supernova. The lines of the neutral metals such as Fe I are missing (apparently, due to the very low density of the gases in the shell) (an exception is the line of D_{12}NaI, see [3]).

The crosses in Figures 1a and 1b mark the emission lines of the night sky. The asterisks mark the absorptions, the existence of which is doubtful, although absorption lines with intensity 1 can be found in the spectrum of DQ Her for their identification. There are other comments. For example, the line Fe II 5363 in the spectrum produced on 23 Dec. 66 narrower and, apparently, corresponds more closely to the true spectrum. However, as a whole, we find quite satisfactory agreement (within the limits of the resolution of the spectrogram) between the observed and predicted positions of the absorption lines. In particular, Figures 1a and 1b of the present work indicate the presence, within blend r, of all of the six lines of Fe II listed above. This report confirms once more the great significance in the spectra of Type I Supernovas of the absorption line of Fe II. However, here we simultaneously see the great significance played by the Cr II line; in the spectra of most Type I Supernovas, they are difficult to separate from the other lines. /4

In conclusion, we note that the phase of development of the Supernova which we have discussed 9 Jan. 67 comparatively late. Therefore, we see noticable development of the "red" portion of the spectrum [3] (Figure 1b), the lines of absorption in which belong to Fe II, Sc II and, apparently, Ba II. A more detailed analysis of the Supernova in NGC 3198 will be published later.

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