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Abstract. Intense noise storm continua at low frequencies are mostly observed in the later phase of solar cycles (Böhme, 1989). Radioheliographs may be needed to determine whether this effect is mainly caused by type I or type III continua. However, based on single-frequency records from the Tremsdorf Observatory a method to discriminate type I and type III continua even from polarization measurements was derived. Intense 40 MHz continua identified by spectral criteria as a type III continuum are more weakly polarized than type I continua. The increase in the number of intense continua at frequencies ≤ 64 MHz during the second, compared to the first, activity maximum of cycle No. 20 was due to an enhanced number of continua with a significant contribution of type I continuum. Relations between the parameters of the continua and the concurrent storm bursts confirm the validity of the above-mentioned ideas and may be useful to test models which try to explain the generation of type I and type III storms under common aspects.

1. Introduction

Intense noise storm continua at \( v < 70 \) MHz occur mainly in the later phase of solar cycles (Böhme, 1989). This effect, obtained without spatial resolution, needs further considerations because these continua may come from both loop systems (McLean, 1981) and streamers (Gergely, 1974). Radioheliographs are needed, virtually, to determine the contribution of both kinds of continuum to the above-mentioned result; however, based on data of cycle No. 20 some general trends have been derived, even from polarization measurements.

Starting from records of the Tremsdorf Observatory, Table I shows the polarization of the intense 40 MHz continua yielding two peculiarities. Firstly, the great number of hours with \( P_{40} < 50\% \) is inconsistent with the polarization typical of type I continua. Secondly, the ratio of hours with \( P_{40} \geq 50\% \) increased with time. Our knowledge about the polarization of continua originating in streamers (hereafter named type III continua) was at first insufficient to decide \textit{a priori} whether the great number of hours with \( P_{40} < 50\% \) was due to type III continua or to depolarized type I continua. Therefore, we complemented the polarization measurements by spectral data; they allow at least a rough estimate of how much both kinds of continuum contributed to the 40 MHz net flux densities. Based on this data set the question to answer is whether the increase in the number of intense continua achieving \( P_{40} \geq 50\% \) with time was mainly caused by an enlarged number of intense type I continua or by a time variation of the polarization of the type III continua.

The basic data set, including a spectral scheme to classify the 40 MHz continua, is specified in Section 2. Typical deviations between the spectral classes are outlined in

TABLE I
The distribution of the hours with an intense 40 MHz continuum according to its circular degree of polarization for 3 different periods during cycle No. 20

<table>
<thead>
<tr>
<th>Time interval</th>
<th>$N(S_{40} \geq 50 \text{ sfu}, P_{40})/N(S_{40} \geq 50 \text{ sfu})$</th>
<th>$N(S_{40} \geq 50 \text{ sfu})$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$P$ (%)</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0.34</td>
<td>0.13</td>
</tr>
<tr>
<td>10–20</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>30–40</td>
<td>0.22</td>
<td>0.25</td>
</tr>
<tr>
<td>$\geq 50$</td>
<td>0.13</td>
<td>0.18</td>
</tr>
</tbody>
</table>

$N(S_{40} \geq 50 \text{ sfu}, P_{40})$: number of hours per time interval with a 40 MHz continuum which achieved an hourly mean $S_{40}$ of the net flux density $\geq 50$ sfu and had an hourly mean $P_{40}$ of the circular degree of polarization.

$N(S_{40} \geq 50 \text{ sfu})$: $\sum_{I=0}^{100} N(S_{40} \geq 50 \text{ sfu}, P_{40})$.

Section 3. Relations between the parameters of both the continua and the concurrent storm bursts are presented in Section 4. The results are summarized and discussed in Section 5.

2. Observations

The analysis of the continua is based on single-frequency records of the Tremsdorf Observatory at 234, 113, 64, and 40 MHz including 40 MHz polarization from July 1964 to December 1973. The continua were characterized by hourly means of the net flux density and the degree of polarization, named $S_v$ and $P_v$. The parameters of the storm bursts were derived from the IZMIRAN spectrograph working between 90 and 45 MHz.

The paper deals only with 40 MHz continua achieving $S_{40} \geq 50$ sfu which coincided in time with a type I storm specified by Böhme (1989). We study only the rather weak cycle No. 20; a consideration of its storm centres revealed for the majority of days that only one centre or at least a clearly dominating one was present on the Sun (Böhme, 1989). A common origin can mostly be assumed for the concurrent continua at high and low frequencies, though a coherence in general between concurrent type I and type III storms was questioned by Gergely (1982). Thus, in spite of the lack of detailed spatial information the basic data set is evidently sufficient to study both the long-term behaviour of intense continua at low frequencies and the dependence of characteristics of noise storms at low frequencies upon parameters of the associated type I storm.

Based on relations between the associated values of $S_{234}$, $S_{113}$, $S_{64}$, and $S_{40}$ a spectral scheme was defined to rate the 40 MHz continua:

$A_1$: $S_{40} < S_{64} < S_{113}$, i.e., as far as is discernible from our receiver system a decrease of $S_v$ towards low frequencies;

$A_2$: $S_{64} \geq S_{113} > S_{234}$; $S_{64} \geq S_{40}$, i.e., a maximum of $S_v$ between 113 and 40 MHz;

$B_1$: $S_{113} > S_{64}$; $S_{40} \geq S_{64}$, i.e., a minimum of $S_v$ between 113 and 40 MHz; the