

Type III Radio Burst Emission and Sunspot Cycles

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ABSTRACT

The paper considers the formation of type III solar radio bursts caused by plasma excitation and to examine the sunspot cycle length with an emphasis on the intervals between consecutive maxima and minima. From an elaborate analysis it appears that the most common cycle length is around 10.5 years, with few cycles in the range 11.5 to 12.5 years.

Keywords -

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I. INTRODUCTION

Type III bursts can be observed where there is no activity at other wavelengths. It is a short-duration strong enhancement that drifts over a range of frequencies. Typically, the frequencies go from higher to lower over the course of the burst, which can be explained by the current theory of the creation of this type of activity. Experts believe that type III bursts are caused by plasma excitation from a stream of energetic electrons travelling upward in the corona of the sun [1, 2]. A beam-plasma system is unstable and tries to approach equilibrium by generating Langmuir waves, which are high frequency plasma waves at the local plasma frequency. Langmuir waves scattered off ions and low-frequency turbulence which results in radiation at the fundamental or first harmonic of the local plasma frequency [Figure 1].

III. DISCUSSION

Different spectral types of radio emissions are usually not used to define the solar cycles in relation to other solar parameters on the long term basis. Prediction of the solar activity is a complicated problem, resembling in some ways to terrestrial weather forecasting [3, 4]. The current Solar Cycle 24 is the 24th cycle started in January 2008 and will peak in May 2013. There is a certain probability of the cycle to be a Dalton minimum as there are certain resemblance of cycles 1, 2, 3 and 4 with cycles 20, 21, 22 and 23. As cycles 5 and 6 have low activity so we can say that cycles 24 and 25 will be of very low sunspot activity.

It is the purpose of the paper to consider the formation of type III solar radio bursts briefly and to examine the sunspot cycle length particularly the intervals between consecutive maxima and minima.

II. SUNSPOT CYCLE LENGTH

The Figure 2 demonstrates that there is no other value for the cycle length with values spread across the graph. The most common cycle length is around 10.5 years though there are a few cycles in the range 11.5-12.5 years. Interestingly, only one cycle falls close to the average cycle length of 11.1 years.

It appears from Figure 3 that the interval between two maxima of consecutive solar cycles as well as that between two consecutive minima is nearly equal.

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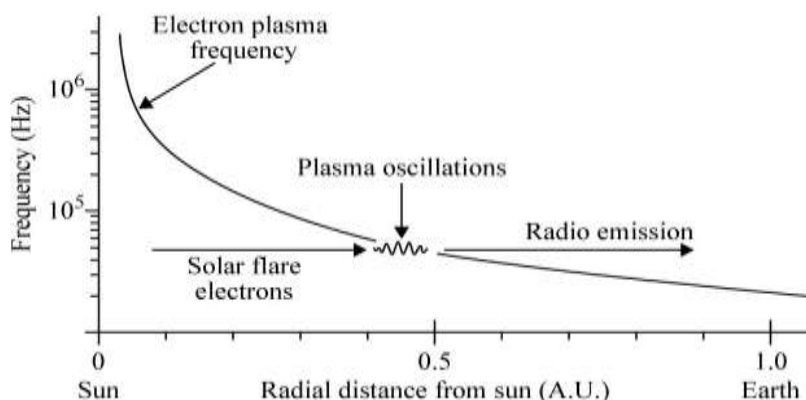


Fig. 1 The process of radio wave generation from solar flare electron in type III bursts

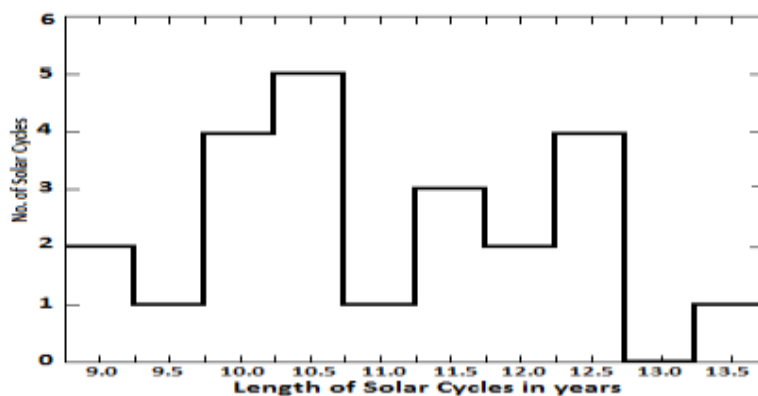


Fig. 2 Solar cycle of different length

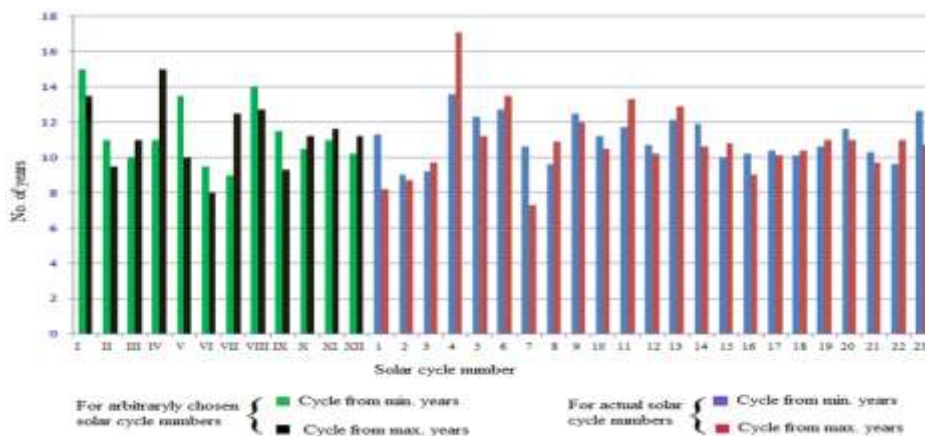


Fig. 3 Representation of solar cycle length showing cycles from minimum years and cycles from maximum years.

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