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Poster

STATISTICAL ANALYSIS OF LANGMUIR WAVES ASSOCIATED WITH TYPE III RADIO BURSTS: I. WIND OBSERVATIONS

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Radio observations of the waves in a range of 4 - 256 kHz from the WAVES experiment onboard the WIND spacecraft have been statistically analyzed. From the radio observations starting from November 1994 to the beginning of 2010 a subset of 36 events with Langmuir waves and type III bursts occurred at the same time, has been selected. In order to remove the background consisting of thermal noise, type III bursts and Galactic background, we have developed a heuristic algorithm based on numerical techniques with a few parameters only. After background has been removed, the remaining power spectral density has been modeled by Pearsons system of probability distributions. The coefficients of the probability distributions have been calculated by using two methods: method of moments and maximum likelihood estimation method. We have shown that the probability distributions of the power spectral density of the Langmuir waves belong to the three main types of Pearsons probability distributions: type I, type IV and type VI. In order to compare the goodness of the fits, a few statistical tests have been applied, showing for all of the considered events that the Pearsons probability distributions fit the data better than the Gaussian ones. This is in contradiction with the Stochastic Growth Theory (SGT) which predicts log-normal distribution for the power spectral density of the Langmuir waves. The uncertainty analysis that has been performed also goes in favor of the use of Pearsons system of distributions to model the data. This result indicates that the SGT possibly requires additional verifications and examinations.