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Effciency of the noise storm radiation process in the solar corona

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We re-examine the energetics of nonthermal electron acceleration in solar noise storms. We consider the requirement on the nonthermal electron number density required to produce a sufficiently intense Langmuir wave population, which is an intermediate stage in the noise storm emission process. We combine this requirement with the stochastic electron acceleration formalism presented in Subramanian & Becker (2004) to arrive at an improved estimate of the efficiency of the overall process starting from nonthermal electron acceleration and culminating in noise storm radiation. This efficiency estimate makes use of only one free parameter. In this paper, we have obtained an improved estimate of the overall efficiency of the noise storm emission process. We have focused closely on the first stage of the problem; that of induced Langmuir wave emission from the nonthermal electrons. We consider Lin, the power input to the electron acceleration process, Lout, the output power observed in noise storm radiation and LL, the power in the Langmuir wave population that is first produced by the (nonthermal) accelerated electron distribution. We obtain solutions for the efficiency of the overall noise storm emission process $\eta \equiv L_{out}/L_{in}$ and also the first stage of the process $\eta \equiv L_L/L_{in}$ .We find that 0:25 $\gtrsim \eta 1 \gtrsim 10^{-3}$ and $10^{-3.4} \gtrsim \eta \gtrsim 10^{-6.5}$.

Keywords: solar corona; noise storms; langmuir waves; acceleration processes.

References

[1] Prasad Subramanian and Peter A. Becker, 2005, to appear in Solar Physics.