

Satellite-induced electron acceleration and related auroras

S. L. G. Hess
(1) LASP, University of Colorado, USA

Abstract

Satellite-induced auroral emissions are known since decades, in particular those associated with the interaction of Io with the Jovian ionosphere. These emissions range from low frequency radio to UV. Flyby of Io allowed to better understand the power generation close to the satellite, and showed the existence of electron beams accelerated at high latitude. I will present a study of the power transfer between the local interaction at Io and the electron accelerated close to Jupiter. It shows that Alfvén acceleration can explain all the observations. Moreover the study is extended to the Europa and Enceladus cases.

I present in this talk the conditions under which the correct amount of power is transferred to the electrons, in order to explain the observed brightness of the auroral emissions.

1. Introduction

The auroral emissions induced by the Io interaction with the Jovian magnetosphere are observed since decades. These emissions extend over a large spectrum, from low frequency radio to Infrared, visible and UV. The total power emitted reaches more than 10^{10} Watts, for the main Io spot only and up to 10^{11} Watts for the whole Io footprint.

On the other end, the Io local interaction with the Jovian magnetic field delivers about 10^{12} Watts. Thus few percents of the power generated at Io have to be transferred to the electrons above the sole main spot.

The most commonly accepted mechanism for transferring the power from Io to the acceleration region, located at high latitude, is the propagation of an Alfvén wave packet. However, this wave packet has to be partially reflected along its way. Moreover, only a small part of the wave packet power is transferred to the electron.