A LEAST MEAN SQUARE METHOD TO RETRIEVE ROCKET-MEASURED AIRGLOW EMISSION PROFILE IN THE PRESENCE OF PRECESSION

by

Paulo P. Batista and Hisao Takahashi

Instituto de Pesquisas Espaciais - INPE
São José dos Campos, SP, Brazil

ABSTRACT

Precessional motion of the rocket modulates the photometer signal of the night sky emissions in two ways: the angular variation of the atmospheric emissions by the van Rhijn effect and the variation of the background sky signal by viewing different areas in the sky. These effects can be extracted exactly only by knowing the precise attitude of the rocket. When insufficient sensor data are available, indirect methods need to be used to determine approximately the attitude. Alternately, without knowing the attitude, a least mean square method can be applied to the signal to remove frequencies that are sub-multiples of the precessional frequency. Firstly, a linear trend plus a few harmonics of the precessional frequency are fitted to the signal originated above the emitting layer and this fitting function is substracted from the complete signal to remove the sky background modulation. Afterwards, a new sum of sinusoids is fitted to the part of the signal below the emission layer. This fitted signal is then used to retrieve a signal without precessional harmonics. This method was applied to retrieve the volume emission profile of OI (5577A) and OI (6300A) from a rocket flight which took place in Natal (5.8° S, 35.2°W) on October 1986.