

A vertical parallax technique for determining the peak altitude of the radiowave absorption layer using imaging riometers

M.B. Terkildsen¹, B.J. Fraser¹, H. Yamagishi², R.J. Morris³, and R. Liu⁴

¹ School of Mathematical and Physical Sciences, University of Newcastle, NSW, Australia

² National Institute of Polar Research, Itabashi, Tokyo, Japan

³ Space and Atmospheric Sciences, Australian Antarctic Division, Kingston, TAS, Australia

⁴ Polar Research Institute of China, Shanghai, China

Abstract.

The riometry technique of observing rapid variations in the level of absorption of cosmic radio noise as a proxy for ionospheric density fluctuations, is limited by its inability to directly determine the altitude at which the radiowave absorption occurs. We describe here a technique based on the simple vertical parallax principle, which enables direct measurements of this altitude to be made. The technique utilises the overlapping beams of two closely spaced imaging riometers in Antarctica. In this paper, peak absorption heights are presented for all suitable absorption events over a three month period. The altitude determination of both a 'classical' absorption event occurring in the D-region as well as one occurring in the F-region near 200km altitude are presented in more detail. The identification of an F-region event using the parallax technique confirms earlier findings that radiowave absorption in the F-region is a potentially significant contributor to the Cosmic Noise Absorption (CNA) measured by riometers. Finally, an event with multiple absorption enhancements is studied showing a significant variation in peak absorption altitude over short time scales closely correlated to the amplitude of the observed absorption. This new technique enables a simple and repeatable ground-based measurement of the peak altitude of the CNA layer.