



AUTOMATED MULTIFREQUENCY MEASUREMENTS OF IONOSPHERIC MOVEMENTS

BY

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## TABLE OF CONTENTS

1. INTRODUCTION
  - 1.1 General introduction
  - 1.2 Investigations of ionospheric movements
  - 1.3 The effect of ionospheric disturbances on direction finding techniques
  - 1.4 The development of acoustic-gravity wave theory
2. DESCRIPTION OF EXPERIMENT
  - 2.1 Equipment and facilities
  - 2.2 Aerial array
  - 2.3 Receiver and phase measurement circuitry
  - 2.4 Controller and interface circuitry
  - 2.5 Experimental arrangement
  - 2.6 Data analysis procedures
  - 2.7 Input data conversion and plotting programme
  - 2.8 Data compounding programme
  - 2.9 Spectral analysis programme
  - 2.10 FFT digital low pass filter
  - 2.11 Polar plotting programme
  - 2.12 Real height analysis
3. EXPERIMENTAL RESULTS
  - 3.1 Introduction to the experimental data
  - 3.2 Descriptions of data plots
4. SPECULAR REFLECTION OF AN E.M. SIGNAL FROM A DISTORTED IONOSPHERE
  - 4.1 Development of a geometrical model
  - 4.2 The behaviour of the tilt angle
  - 4.3 Full simulation of zenith angle data
  - 4.4 Tilt angle plots

5. INTERNAL GRAVITY WAVE ANALYSIS AT IONOSPHERIC ALTITUDES

5.1 Theoretical development

5.2 Numerical results of the analysis

5.3 Discussion

5.4 Additional results

6. CONCLUSIONS

6.1 Summary of results obtained

APPENDICES

A Exponential digital filter

B Modified procedure for smoothing of spectral estimates

C Correction factor for spectral estimates

D Calculation of scale height from electron density profile analysis  
data

E List of raw data files

F Discussion on the group velocity of a gravity wave

BIBLIOGRAPHY

## LIST OF ILLUSTRATIONS

### FIGURE

- 2.1 View of the equipment racks
- 2.2 View of the interferometer aerial array
- 2.3 Block schematic of the dual channel receiver and phase measurement circuitry
- 2.4 Controller block diagram
- 2.5 Map showing the location of the receiver site, transmitter site and Salisbury ionosonde
- 2.6 Flow diagram of data analysis procedures
- 2.7 Response of the FFT digital filter
- 2.8 Diagram defining the component angles for computation of zenith angles
- 2.9 Parabolic layer approximation
- 3.1 Zenith angle plot: For comparison with ( $h't$ ) data
- 3.2 Three station ( $h't$ ) record
- 3.3 Compounded zenith angle data for day 346
  - a. 3.84 and 5.38 Mhz plots
  - b. 5.745 and 6.7155 Mhz plots
- 3.4 Low pass filtered data for period 1200 to 1400 hours on day 346 showing reflection from sporadic E layer
  - a. 3.48 and 5.38 Mhz plots
  - b. 5.745 and 6.7155 Mhz plots
- 3.5 (a) Series of ionograms for the period 1200 to 1315 hours on day 346 showing blanketing sporadic E traces  
(b) Series of ionograms during the period 1800 to 2030 hours on day 347.

- 3.6 Polar plots of filtered zenith angle data for the period 1240 to 1320 hours. (3.84, 5.38, 5.745, 6.7155 Mhz frequencies)
- 3.7 Spectra from sporadic E data
- 3.8 Zenith angle data plots from 1930 to 2200 hours on 11/12/75.
  - a. 3.84 and 5.38 Mhz frequencies
  - b. 5.745 and 6.7155 Mhz frequencies
- 3.9 Zenith angle data plots from 1800 to 2030 hours on 13/12/75.
  - a. 3.84 and 5.38 Mhz frequencies
  - b. 5.745 and 6.7155 Mhz frequencies
- 3.10 Spectra between adjacent signal frequencies for the zenith angle data shown in figure 9
  - a. 3.84 and 5.38 Mhz frequencies
  - b. 5.38 and 5.745 Mhz frequencies
  - c. 5.745 and 6.7155 Mhz frequencies
- 3.11 Sample of early morning zenith angle data: W355A
- 3.12 Sample of unfiltered data: W354 O-ray
- 3.13 The same sample as for figure 12 after smoothing with the exponential filter: W354 O-ray
- 3.14 Sample of unfiltered data with test oscillators used as input signal sources
- 3.15 The same sample as for figure 14 after smoothing with the exponential filter
- 3.16 Histogram of unfiltered test data from figure 14
- 3.17 Zenith angle data: W004B
- 4.1 Geometrical construction used to determine the reflection point coordinates of a tilted ionosphere
- 4.2 Model used to determine the behaviour of the tilt angle  $\theta$

- 4.3 Ray paths taken by reflected signals as the travelling wave progresses
- 4.4 Asymmetry displayed by the angle of tilt
- 4.5 Experimental configuration of transmitting and receiving site showing parameters  $D$  and  $\phi$
- 4.6 Illustration of simulated zenith angle data
- 4.7 Series of zenith angle simulation plots with increments of 45 degrees in the direction of the wave motion
- 4.8 Construction for determining the reflection point in terms of zenith angles and effective height
- 4.9 Tilt data plot of data from figure 6
- 5.1 Zenith angle plot of evenly spaced data: W354 O-ray
- 5.2 Zenith angle plot of low pass filtered data: W354 O-ray
- 5.3 Series of ionograms for the period 1430 to 1645 hours: W354
- 5.4 Spectral plots of NS and EW components of zenith angle data: W354 O-ray
- 5.5 True height analysis for 5.38 Mhz and 5.745 Mhz signals: W354 O-ray
- 5.6  $k_x, k_z$  dispersion plot: W354 O-ray
- 5.7 Tilt plots for the period 1430 to 1645 hours: W354 O-ray
- 5.8 Polar plots of zenith angle data: W354 O-ray
- 5.9 Zenith angle plot of evenly spaced data: W354 X-ray
- 5.10 Zenith angle plot of low pass filtered data: W354 X-ray
- 5.11 Series of ionograms for the period 1645 to 1900 hours: W354
- 5.12 Spectral plots of NS and EW components of zenith angle data: W354 X-ray
- 5.13 Tilt plots for the period 1645 to 1900 hours: W354 X-ray
- 5.14 Polar plots of zenith angle data: W354 X-ray

- 5.15 Zenith angle plot of evenly spaced data: W355 O-ray
- 5.16 Zenith angle plot of low pass filtered data: W355 O-ray
- 5.17 Zenith angle plot of low pass filtered data: W355 O-ray  
(cut off period = 10 minutes)
- 5.18 Series of ionograms for the period 1800 to 2015 hours: W355
- 5.19 Spectral plots of NS and EW components of zenith angle data: W355  
O-ray
- 5.20 Tilt plots for the period 1800 to 2015 hours: W355 O-ray
- 5.21 Polar plots of zenith angle data: W355 O-ray
- F.1 Relationship between vector and trace velocity components

## SUMMARY

The experimental data described in this thesis have been obtained with a fully automated ground based equipment which measures the angle of arrival of electromagnetic waves reflected from the ionosphere at a number of selected frequencies. The measurements are made sequentially at the successive frequencies at a maximum rate of one measurement every two or three seconds. Near-vertical incidence c.w. signals from a transmitting station 32 km distant from the receiver site are used to investigate the travelling waves in the ionosphere. Electron density profile analysis together with spectral analysis of the angle of arrival data yields estimates of the vertical trace velocities of the ionospheric waves. This data is then interpreted in terms of the dispersive properties of atmospheric gravity waves in order to estimate horizontal parameters associated with the waves. The interpretation of the data is extended with the use of a geometrical simulation of ionospheric reflection in the presence of an assumed travelling sinusoidal reflecting surface.



## STATEMENT

To the best of the author's knowledge this thesis contains no material previously published or written by another person, except where due reference is made in the text. It contains no material which has been submitted or accepted for the award of any other degree or diploma in any university.

(D.N. WARREN-SMITH)

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The data described in this thesis were obtained using equipment at the Weapons Research Establishment (now D.R.C.S.) with the permission of the director. The equipment used to obtain the data was developed jointly by members of Cybernetics Electronics Group (D.R.C.S.) and Ionospheric Studies Group (D.R.C.S.) for the use of Ionospheric Studies Group, and was based on concepts developed by Ionospheric Studies Group over preceding years. The contribution of the author to this development was the design of the microcontroller and computer interface circuitry and to write the computer software for the system.

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The electron density profile data used in chapter 5 and described in the section on real height analysis in chapter 2 was supplied and scaled by Ionospheric Studies Group. Assistance has also been received with the production of drawings and photographic work.

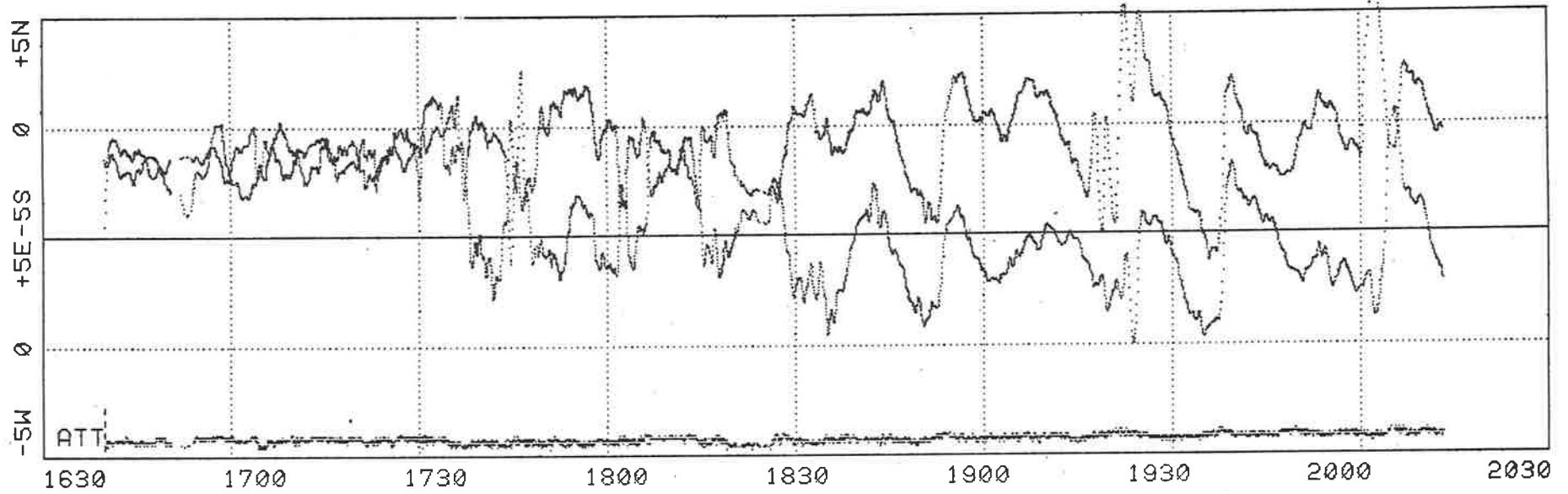
## FRONTISPIECE

Direction of arrival data for two signals reflected from the ionosphere at near vertical incidence displayed as components of zenith angle.

KERSBROOK TEST W004B 4/1/76

ZENITH ANGLE PLOT PAGE 1

1: 5.3800 MHZ FINE FILTER 2 K=0.25 4756 POINTS MEANS: NS -0.73 EW 5.96 :W004AA



2: 5.7450 MHZ FINE FILTER 2 K=0.25 2415 POINTS MEANS: NS -1.14 EW 3.91 :W004AB

