



UNIVERSITY OF NAIROBI

**A NEURAL NETWORK IMPLEMENTATION FOR NEAR REAL TIME
TROPOSPHERIC WATER VAPOUR PROFILING OVER NAIROBI
USING GROUND-BASED GPS RECEIVER**

BY

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Requirements for Award of the Degree of Master of Science in Physics of
the University of Nairobi.**

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I declare that this thesis is my original work and has not been submitted elsewhere for examination, award of a degree or publication. Where other people's work or my own work has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.

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DEDICATION

To my Parents, C. J. Onyango and Hellen A. Onyango

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ABSTRACT

A remote sensing tool employing an Artificial Neural Networks algorithm was proposed for near real time determination of the relative humidity profile using Global Positioning System (GPS) data recorded by a ground-based GPS receiver. The GPS data was processed to obtain the Integrated Water Vapour. This Integrated Water Vapour in conjunction with ground level information for temperature, pressure and relative humidity were fed as inputs to the developed neural network which in turn generated the instantaneous relative humidity profile as output.

GPS and radiosonde data for the years 2009 and 2010 were used to train the system while the same data for 2011 were used to validate the system. The RH profile results for 2011 generated using GPS data and the neural network, upon comparison with recorded *in situ* radiosonde relative humidity profile measurements for the same days and times in the year 2011, had Root Mean Square Error of less than 4%, which fell within the margin of error of the Vaisala RS92 Radiosonde's humidity measurement regime.

TABLE OF CONTENTS

DEDICATION	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT.....	v
TABLE OF CONTENTS.....	vi
ABBREVIATIONS.....	viii
LIST OF TABLES	x
LIST OF FIGURES.....	xi
CHAPTER 1. INTRODUCTION	1
1.1 The Troposphere	1
1.2 Water Vapour in the Troposphere	3
1.3 Water Vapour Measurement	3
1.4 Importance of Water Vapour Profiling in Meteorological Forecasting	8
1.5 Study Area	9
1.6 Problem Statement	10
1.7 Research Questions.....	11
1.8 Hypothesis.....	11
1.9 Objectives.....	12
1.9.1 Main Objective	12
1.9.2 Specific Objectives	12
1.10 Justification and Significance of the Study.....	12
1.11 Report Outline	14
CHAPTER 2. LITERATURE REVIEW	15
CHAPTER 3. THEORETICAL BACKGROUND.....	20
3.1 The Global Positioning System.....	20
3.1.1 GPS Signals.....	22
3.1.2 Physics of Atmospheric Phase Delay of Radio Signals and its Application to GPS Meteorology	25