Investigation of Tropospheric Turbulence Using the Adelaide VHF Radar

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Abstract

Turbulence is an important aspect of the whole makeup of atmospheric motions. It is the product of other atmospheric events such as atmospheric gravity waves and wind shear induced Kelvin Helmholtz instability, etc. To understand the morphology of turbulence, it is necessary to calculate certain parameters associated with it, and this involves determining the refractive index structure constant $\overline{C_n{}^2}$ and the average kinetic energy dissipation rate $\bar{\epsilon}$, which is a measure of the severity of turbulence.

Measurements of $\bar{\epsilon}$ can be made in several ways, and these are briefly described in the second chapter of this report. The method to be used for this experiment will be based on a statistical model proposed by VANZANDT *et. al.* (1978) and involves making measurements of the refractive index structure function $\overline{C_n{}^2}$ using radar observations during both clear as well as cloudy air conditions, from which the energy dissipation rate may be derived. This method is heavily dependent on the statistical analysis of wind shears, and the calculated values may be in error by as much as an order of magnitude. The studies include a careful analysis of biases and systematic errors which may be introduced by the radar measurements.

Preface

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and to the best of the author's knowledge and belief, it contains no material previously published or written by any other person, except when due reference is made in the text. I consent to this thesis being made available for photocopying and loan by the librarian of the University of Adelaide upon acceptance of the degree.

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