A STUDY ON EARTH CLOUD SPACE INFLUENCED BY CERTAIN DYNAMICS FACTORS

Vivekanand Yadav and R. S. Yadav
Department of Electronics and communication Engineering
J K Institute for Applied Physics and Technology
University of Allahabad, Allahabad – 211002

ABSTRACT

In this paper, dynamics factors and their influences in the formation of earth's cloud field have been studied. These influences are mainly based on heat and water-vapour flow equations in a turbulence atmosphere. The equations for cloud water content have been developed, considering the influence of vertical movement and heat, cold advection and turbulence exchange. The conditions of formation and development of many form of cloud are observed in mesospheric region.

I. INTRODUCTION

The clouds are formed a result of the transformation of water vapour form a gaseous into a liquid or solid state. The optical properties of clouds differ from the properties of a cloudless atmosphere. The relationships between atmospheric (air) temperature T and clouds exceed many times the relationships between T and greenhouse gases and admixtures, primarily carbon dioxide Matveev.et.al [1]. The formation of cyclones (including tropical ones), tornados, strong winds, and floods is closely related to clouds Steven M. Smith [13], Matveev.et.al [9-10], Michael A.Persinger [11] and Stubenrauch.t.al [12].

Matveev.et.al [2–4] obtained formulas for changes in air temperature and cloud water content with time under the action of vertical movement. In this paper, other factors have been investigated which influence the formation and development of a cloud depending on the atmospheric temperature and water content. The accuracy of the results of this paper is obtained by the help of MATLAB Simulation setup.

The paper has been devided into sections: Initial Equations, Vertical Movement, Turbulence, Cloud Formation and the Change in Water Content with Time, results and discussions, conclusion and future work.

II. INITIAL EQUATIONS

Before any cloud forms, water vapor must achieve a state of saturation and the relative air humidity must attain a value of f = $\frac{e}{E}$ – 100%. Since the pressure of saturated water vapor E is a function of temperature, to estimate change f, it is necessary to use the flow (balance) equation for water vapor and the heat flow (balance) equation.

We write the heat balance equation in the form

$$c_p \frac{dT}{dt} - \frac{RT}{p}\frac{dp}{dt} + \mathrm{L}\frac{dq_m}{dt} = \epsilon_T \qquad (1)$$

Where T and P are air temperature and Pressure; R is the gas constant; c_p is the heat capacity of air; L is the heat of vapor transformation (condensation); $\frac{d}{dt} = \frac{\partial}{\partial t} + u\frac{\partial}{\partial x} + v\frac{\partial}{\partial y} + w\frac{\partial}{\partial z}$ is the operator of the total (individual)derivative; u, v and w are the airspeed(wind speed) projections along axes x, y and z(axis z is directed upward along the vertical0; t is time ; and ϵ_T is the turbulent flow of heat(all quantity refer to 1kg of air).