

SMR 304: SYNOPTIC METEOROLOGY AND WEATHER ANALYSIS

STUDY GUIDE

1. Course Unit Summary

The pre-requisite units covering to this unit are Introduction to Meteorology I, Introduction to Meteorology II and Weather Analysis. Synoptic Meteorology is one of the oldest branches of meteorology that provide the information needed for short-range weather forecasting. It is the major application of meteorology in the service of mankind, and has developed into a worldwide system of national and international meteorological support indispensable to civil aviation as it plays its role in social and economic activities.

In this unit, students learn about the analysis and interpretation of weather maps for the purpose of producing weather forecasts for use in the various fields of human endeavour. To help students grasp the concepts of this unit, the synoptic weather chart (weather map) is discussed. This is the geographical map on which meteorological data are presented to describe the atmospheric conditions at the synoptic scale. The weather map at a specific time and for various levels in the vertical constitutes the initial state of the atmosphere on which the forecasts for the different users are based.

2. General Course Unit Objectives

At the end of this unit, students should be able to:

- Describe the types of charts used in a forecasting office
- Analyse and identify the low, middle and high latitude disturbances
- Equip students with the knowledge required for the interpretation of synoptic systems
- Apply knowledge of dynamics in synoptic analysis

- Describe the various air masses, fronts and drylines
- Analyse and identify synoptic and mesoscale systems in Africa and their use in weather forecasting
- Use thermodynamic diagrams, and various charts and diagrams to make a forecast for specialized users of meteorological information
- To equip students with the knowledge required in the interpretation of synoptic systems

3. Course Unit Outcomes

By the end of this unit, the student should be able to:

- Analyze and interpret the common charts and diagrams used in a forecast office
- Define and identify the importance of winds in bringing about the divergence of mass and therefore vertical motions
- Define, understand the conditions conducive for the formation, identify regions prone to and know the hazards posed to aircraft by tropical cyclones
- Use a tephigram to assess of the stability of various atmospheric layers and estimate the depth of convective clouds and therefore possibility of convective precipitation
- Describe the life cycle of a thunderstorm, understand the conditions necessary for its formation and identify regions of East Africa prone to frequent thunder activity

4. Selected Resources & references

- Ahrens, C.D. 2003: Meteorology Today: An Introduction to Weather, Climate, and Environment. Seventh Edition, West Publishing Company

- Bureau of Meteorology, 1992: Aviation Meteorology, Australian Government Publishing Service, and Reprinted 1992. 131pp
- Casadevall, T.J., 1994: Volcanic Ash and Aviation Safety. U.S Geological Survey
- Bulletin, Vol. 2047, pp. 1-6.
- Fletcher, N.H., 1969: The Physics of Rainclouds. Cambridge University Press, 390pp
- Holton, J.R., 1979: An Introduction to Dynamic Meteorology. Second Edition, Academic Press. 391pp
- Krishnamurti, T.N., 2003: Compendium on Tropical Meteorology for Aviation Purposes.
- Liou, Kuo-Nan, 1980: An introduction to Atmospheric Radiation. Academic Press Inc. 392pp
- McIntosh, D.H. and Thom, A.S., 1972: Essentials of Meteorology. The Wykeham
- Science Series.239pp (Chapter 5)
- Sutcliffe, R.C., 1940: Meteorology for Aviators. Meteorological Office, HMSO, London 276pp
- Tyson, P.D. and Preston-Whyte, R.A., 2004: The Weather and Climate of Southern
- Africa. Oxford University Press Southern Africa 2000 pp 130
- World Meteorological Organization, WMO-No. 930, Geneva, Switzerland

5. Lecturers

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