Book review

Gary Lackmann's book *Midlatitude Synoptic Meteorology: Dynamics, Analysis* and *Forecasting and Synoptic-Dynamic Meteorology Lab Manual*, by Gary M. Lackmann, Brian E. Mapes and Kevin R. Tyle

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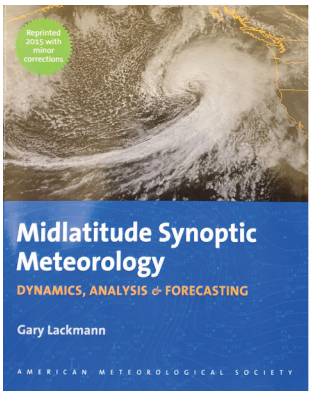
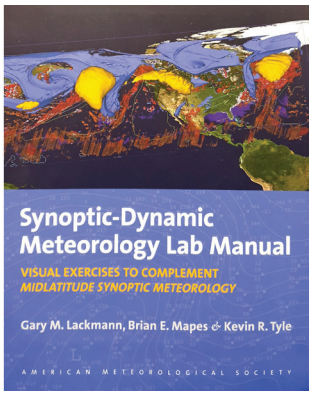
https://doi.org/10.17159/2410-972X/2019/v29n1a11

The study of atmospheric motions as solutions of the fundamental equations of hydrodynamics, or better known by students in the atmospheric sciences as dynamic meteorology, is a complex and challenging theoretical subject. The book by Lackmann is primarily on synoptic analysis, including manual analysis, and on weather forecasting with a target audience of anyone interested to find out more about the dynamics of atmospheric motion. However, an undergraduate level knowledge of meteorology and mathematics will come in handy. This book certainly is not the only good one on synoptic analysis and forecasting, but what makes it quite different from most other such books is the emphasis put on *application* of theoretical concepts and the human weather forecast process. There is also a technical manual that presents visual exercises and introduces powerful visualization capabilities through open source, free software that can run on all contemporary computer operating systems.

The Lackmann book primarily attempts to bridge the gap between text book theory and weather analysis and forecasting. After an introductory chapter on the basic concepts of dynamic meteorology, the book covers topics that are often enjoyed by meteorology students such as the quasi-geostrophic theory. In addition to case study examples, the book also emphasizes practical weather forecasting and how to best apply numerical weather prediction models in a forecast process. Through discussion of sophisticated numerical weather prediction models, experiments are presented, and data assimilation and ensemble prediction are introduced. A chapter on an atmospheric process analysis tool that has only fairly recently become popular among dynamic meteorologists called potential vorticity is comprehensively addressed in a dedicated chapter. Detailed discussions, always accompanied by real observed and/or model data, on synoptically driven mesoscale phenomena, extra-tropical cyclones, frontogenesis and types of fronts, and baroclinic instability (arising from the existence of a meridional temperature gradient) are all well presented.

The book and its manual only cover mid-latitude synoptic-dynamic meteorology and do not cover tropical meteorology.





Although there are strong interactions between tropical and extra-tropical circulation systems, tropical systems can be less often dealt with using, for example, the quasi-geostrophic techniques presented in the two books. The books also focus entirely on the Northern Hemisphere. From a southern African perspective, the books have limited application for areas where weather systems are of a predominantly tropical nature. Moreover, students and the broader atmospheric science community of the region will have to make the conversion to Southern Hemisphere circulation first to obtain maximum benefit from these wonderful books.