

Factor Separation in the Atmosphere

Applications and Future Prospects

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Modeling atmospheric processes in order to forecast the weather or future climate change is an extremely complex and computationally intensive undertaking. One of the main difficulties is that there are a huge number of factors that need to be taken into account, some of which are still poorly understood. The Factor Separation (FS) method is a computational procedure that helps deal with these nonlinear factors. In recent years many scientists have applied FS methodology to a range of modeling problems, including paleoclimatology, limnology, regional climate change, rainfall analysis, cloud modeling, pollution, crop growth, and other forecasting applications. This book is the first to describe the fundamentals of the method, and to bring together its many applications in the atmospheric sciences. The main audience is researchers and graduate students using the FS method, but it is also of interest to advanced students, researchers, and professionals across the atmospheric sciences.

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1. Introduction; 2. The Factor Separation method and the fractional approach; 3. Investigation of the FS features for basic mathematical function; 4. Factor Separation and paleoclimates; 5. Meso-meteorology: Factor Separation examples in atmospheric meso-scale motions; 6. Using the Factor Separation method for land-use land-cover change impacts on weather and climate process with the Regional Atmospheric Modeling System; 7. Application of Factor Separation to heavy rainfall and cyclogenesis: Mediterranean examples; 8. Experience in applying Factor Separation analysis to assessing urban land-use and aerosol impacts on precipitation; 9. Free and forced thermocline oscillations in Lake Tanganyika; 10. Application of the Factor Separation method to quantify the effect of waste heat, vapour and pollution on cumulus convection; 11. The use of Factor Separation method for climate variable interaction studies in hydrological land surface models and crop yield models; 12. Linear model for the sea breeze; 13. Experience and conclusions from the Factor Separation method: ensemble data assimilation and forecasting applications; 14. Tagging systematic errors arising from different components of dynamics and physics in forecast models; 15. Some difficulties and prospects; 16. Summary; Index.

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