

METR 6803.001: NUMERICAL WEATHER PREDICTION

SPRING SEMESTER 2012

Class Times: Tues Thurs 11-30am-12-45pm, Room NWC 5930

INSTRUCTOR: Lance M. Leslie (lml Leslie@ou.edu)

1. **Introduction and Course Overview**

- brief historical perspective
- what are numerical weather analysis (NWA) and numerical weather prediction (NWP)?
- how does NWP differ from climate modeling?
- why are NWA and NWP so important?
- how good are they?

2. **Governing Equations for NWP**

- derivation of equations
- classification of equations
- the barotropic vorticity equation
- shallow water equations
- normal modes
- forced modes

3. **Numerical Weather Analysis I: Background**

- definitions
- concepts
- applications

4. **Numerical Weather Analysis II: Techniques**

- local and global polynomial interpolation
- empirical linear interpolation
- least squares minimization
- emerging techniques

5. **Geostrophic Adjustment**

- theory
- applications

6. **Model Initialization**

- model shock and model spin-up
- static and dynamic initialization

7. **NWP Methods I: Definitions and Operators**
 - spectral and finite element methods
 - finite-difference methods

8. **NWP Methods II: Theory of Finite –difference methods**
 - concepts
 - consistency, convergence and stability

9. **NWP Methods III: Types of Finite-difference Schemes**
 - time differencing
 - spatial differencing
 - boundary conditions
 - filters

10. **NWP Methods IV: Examples of Models**
 - numerics of LFM, GFS, ETA, RSM, RAMS, MM5, WRF models

11. **Climate Modeling: An Introduction**
 - a climate modeling primer

12. **Atmospheric Predictability**
 - basic concepts and definitions
 - chaos theory
 - error growth
 - predictability of tropics vs. extra-tropics
 - ensemble forecasting methods

13. **The Future of NWA and NWP**
 - a look at what we might expect over the next decade or so

Review of “Tropical cyclone climatology of the South Pacific Ocean and its relationship to the El Nino-Southern Oscillation”

General Comments:

This paper focuses on an area that has long been relatively neglected and to that end it is a useful contribution worth publishing. However, it does not particularly push the boundaries of our knowledge or understanding of TC activity in the region. In this sense it is a bland study with few unexpected results. The authors acknowledge this originality weakness explicitly on page 29, last paragraph.

Moreover, the figures and analysis methods are pedestrian, relying too heavily on simple TC density maps and inferences from figures.

Clearly, a great deal of work always is needed in these kinds of studies and the authors have done so in a solid manner. I liked their use of the vortex-tracking package developed by a number of local researchers and used extensively in a wide range of contexts. In brief, I have read and reread this paper several times and have concluded it is worth publishing as a documentation of the impact of ENSO phases on various TC related parameters.

In brief, I did not find any strong reasons not to publish this study as although it is not new, it is at the very least a useful starting point for future work in understanding the underlying reasons for their findings, and for developing a useful seasonal TC prediction with a possible 3-6 months lead time.

Minor Comments:

The paper is written clearly and appears to be free of major typographical errors and references issues.

Perhaps the authors also should have examined the contributions from neutral ENSO years, which are more frequent than either El Nino or La Nina years. Nor did they discuss the various different kinds of ENSO episodes.

Finally, I expected to see a reference to the extensive study by Goebbert and Leslie (Journal of Climate, 2010) of TC activity in the WA region which, I believe, is a considerably more expansive documentation of TC activity (despite focusing on a different part of the Australian region) and provides both a more comprehensive assessment of the links between large scale modes, including ENSO, and also develops and tests a seasonal TC prediction scheme which has high skill out to 6 months in advance of the TC season.

