COMET Mesoscale

Analysis and Prediction Course

March 9 - May 5, 1993

COURSE PLAN

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October 1992

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I.INTRODUCTION

The COMET Mesoscale Analysis and Prediction course (COMAP) is designed for the NWS Science and Operations Officers. The eight week course is taught once or twice per year to NWS employees selected to be a SOO. Additionally, some slots in each class are filled by other NWS Employees and representatives from DOD weather services.

The Goals of the COMET Course are to:

1. Increase participants knowledge of mesoscale meteorology;

2. Enhance participants' knowledge of the capabilities, limitations and applications of new observing systems;

3. Improve participants' skills in forecasting/nowcasting mesoscale weather phenomena;

4. Enhance participants' ability to lead an on-station training program, making use of COMET Outreach Program products and computer-based learning modules.

5. Improve participants' understanding of the applied research/forecasting techniques development methodology.

The COMAP Course is taught at the graduate level to experienced operational forecasters and has have seven major components:

1. major case studies which will provide a mechanism for introducing much of the course subject matter. The case studies will cover the general subjects of winter storms, summer convection, and excessive rainfall.

2. displaced real-time case studies which will provide a simulation of the forecast process on case studies that illustrate variations of subjects covered in the major case studies.

3. seminars which will cover special topics and be taught by visiting experts from across the country and the Boulder research community.

4. daily forecasts and briefings of current weather which allow group interaction and discussion of the forecast process.

5. lectures and discussion of the applied research process which will introduce the participants to how they might lead forecast techniques development at their forecast office.

6. ~~lectures and discussions of instructional techniques which will help the NWS Science Operations Officer perform their duties as the Forecast Office training leader. The Science Operations Officer is the Chief Scientist at each reorganized NWS office.~~

use of Computer-Based Learning in the WFO.

7.discussions and presentations about how the new observational systems and a better understanding of mesoscale processes can improve aviation forecasting.

II.CURRICULUM

The following topics (in outline format) will be covered through The following list provides an overview of topics likely to be covered in each COMAP Course through the selection of case studies, or through occasional lectures, and seminars.

●REVIEW

A.Overview of Q-G Theory and Q Vectors, and their applications to operational forecasting.

B.Overview of NWP Models, Convective Parameterization and Guidance.

●MESOSCALE OBSERVING SYSTEMS AND DATA SETS

A.Ground-based profiling of winds, temperature and moisture

B.New Automated Surface Observing Systems (ASOS, AWOS)

C.GOES-NEXT Observing Capabilities

D.Doppler radar signals from weather targets

E.Information Content and Interpretation of Integrated Data Sets

F.Meteorological Workstations/Training on COMET Workstation

• MESOSCALE PROCESSES

A. Overview of Mesoscale Meteorology

1. Mesoscale Atmospheric Motions (spatial and temporal definitions)

2. Forced Mesoscale Circulations

3. Mesoscale Instabilities

4. Role of the Mesoscale in Energy Transfers and Conversions

• THE FORECASTING PROCESS

A. A Methodology for Short-Range Weather Forecasting

1. Control by the Larger Scales

2. The Role of Diagnosis in Forecasting

a. Diagnosis for NWP (Objective Analysis and Initialization)

b. Diagnosis for the Human-based Forecast Process
(How did the Atmosphere Attain its Current State?)

(1) Application of Pattern Recognition

(2) Application of Physical/Conceptual Models and Theoretical Concepts

(3) Quality of Data Input to Forecast

3. Estimating the Trend of the Dependent Variables

a. Application of Numerical Weather Prediction

b. Producing a Trend Using the Human-based Forecast Process

4.Inferring Weather Elements from Future Fields of the Dependent Variables

a.Application of Numerical/Statistical (MOS) Methods

b.Determining Weather Elements Using the Human-based Forecast Process (Physical Model Theory, Climatology and Experience)

5.Nowcasting

a.Frequent Observations Required with Linear Extrapolations Providing the Trend

b.Valid Nowcasting Period Relation to Life Cycle of Weather Element or Weather System

c.Weather Element or Weather System Must Exist to Nowcast

6.COMET Module 4 "The Forecast Process"

- FORECASTING SEVERE CONVECTION

A.Diagnose the General Circulation and Planetary Wave Evolution

1.Use of Northern Hemisphere NWP Guidance

B.Diagnose the Synoptic Scale Environment

1.Check NMC Model Initialization and NWP Guidance

2.Q-G Guidance and Q Vector Considerations

3.Sounding Analysis

a.Convectively Available Potential Energy (CAPE)

b.Vertical Wind shear (Hodographs of Winds and Storm Relative Winds)

c.Richardson Number

d.Moisture Profile

4.Prognostic Soundings

a.Heating, Mixing and Boundary Layer Evolution

b.Mixing and Momentum Exchange

c.Differential Temperature Advection

d.Effect of Lifting and Stretching on Lapse Rate

e.Effect of Moisture Changes on CAPE

C.Diagnose Mesoscale Environment and Features

1.Re-analysis of Upper Air Charts

a.Mesoalpha Waves

b.Moist and Dry Tongues

c.Thermal Ridges and No-Change Lines

d.Low Level Jets

e.High Level Jets and Jetstreaks

2.Mesoscale Surface Analysis

a.Fronts (Type and Location)

b.Gust Fronts and Outflow Boundaries

c.Orographic Induced Circulations and convergence Zones

d.Dry Lines

e.Land-Water Circulations and Convergence Zones

f.Convectively Generated Mesohigh and Mesolow Pressure Systems

D.Convection Initiation

1.Capping Inversions and Lid Removal

2.Role of Boundary Layer Convergence Zones

3.Orographic Influences

a.Differential Heating of the Terrain

b.Forced Horizontal and Vertical Circulations

[move to pg.9]~~c.Froude Number/Critical Dividing Streamline Height~~

4.Application of Doppler Radar to Thunderstorm Initiation

5.Application of Satellite Observations to Thunderstorm Initiation

6.~~CBL~~ COMET Module 2 on Convection Initiation

E.Thunderstorm Type and Structure

1.Relationship of Thunderstorm Type to CAPE, Vertical Wind Shear and Richardson Number

a.Results of Modeling Experiments

b.Storm Observations

2.Supercell versus Multicell Thunderstorms

a.Doppler Radar Observations of Supercell and Multicell Thunderstorms

b.Satellite Observations of Supercell and Multicell Thunderstorms

c.Attendant Weather versus Thunderstorm Type

F.Organization of Convection and Development of MCSs

1.Synoptic Environment of Squall Lines

2.Squall Line Structure, Life Cycle and Attendant Weather

a.Rear Inflow Jet, Bow Echoes, Plough Winds

b.Stratiform Rain Development and Evolution

3.Synoptic Environment of MCCs

4.MCC Structure, Life Cycle and Attendant Weather

a.Development and Evolution of the Mid-Level Warm Core Vortex

b.Development and Evolution of the High-Level Anticyclonic Outflow

c.Development and Evolution of Jetstreaks

d.Stratiform Rain Development and Evolution

5.Convectively Generated Mesohigh and Mesolow Pressure Systems

G.Storm Motion

1.Cell Motion and the Pressure-Weighted Vector Mean Wind

2.Continuous and Discrete Propagation

3.Movement of Supercell Thunderstorms

a.Storm Splitting

b.Helicity, Non-Hydrostatic Pressure Gradients and Transverse Propagation

4.Movement of Multicell Thunderstorms

5.Squall Line Motion

6.Motion of MCCs

H.Phenomena Attending Thunderstorms

1.Detecting and Nowcasting Tornadoes with Doppler Radar

2.Detecting and Nowcasting High Winds (Microbursts, Gust Fonts, Plough Winds and Derechos)

3.Detecting and Nowcasting Hail Storms

4.Lightning Detection and Nowcasting

5.Hazards to Aviation

~~I.Forecasting Southwest Monsoon Weather~~

~~1 Climatology of the Southwest Monsoon Circulation~~

~~2.Structure and Dynamics of the Monsoon Boundary~~

~~3.Instabilities and the Growth of Disturbances along the Monsoon Boundary~~

~~4Important Weather Attending Southwest Monsoon Convection~~

~~a.Severe Local Storms~~

~~b.Flash Floods~~

- FORECASTING FLASH FLOODS

A.Temporal and Spatial Spectra of Floods

B.Definition and Types of Flash Floods

C.Synoptic Scale Environments Associated with Excessive Rains

D.Mesoscale, Cloud-Scale and Microphysical Aspects of Flash Floods

E.Radar and Satellite Patterns Associated with Flash Floods

F.A Methodology for Short-Term Forecasting of Excessive Rains

G.Hydrological Aspects of Flash Floods

1.Antecedent Basin Conditions

2.Rainfall-Runoff Relationships

3.Hydrographs and Unitgraphs

4.WSR88D Based Precipitation Estimates

H.COMET Module 3 "Heavy Precipitation and Flash Flooding"

[Move to page 4 under Forecasting Severe Convection]

- FORECASTING SOUTHWEST MONSOON WEATHER

A. Climatology of the Southwest Monsoon Circulation

B.Structure and Dynamics of the Monsoon Boundary

C.Instabilities and the Growth of Disturbances along the Monsoon Boundary

D.Important Weather Attending Southwest Monsoon Convection

1.Severe Local Storms

2.Flash Floods

- FORECASTING WINTER STORMS AND ATTENDANT WEATHER

A.Cyclone Development

1.Production of Low-Level Cyclonic Vorticity

2.Baroclinic Instability

3.Energy Transformations and Diabatic Processes

4.Rapid Cyclogenesis/Bomb Development

B.Cyclogenetic Regions and Cyclone Tracks Affecting the U.S.

C.Cold Stratiform Cloud and Precipitation Processes

1.Factors Controlling Ice Crystal Concentrations

2.Growth of Precipitation Particles

3.Supercooled Liquid Cloud Water and Aircraft Icing

4.Precipitation Efficiency

D.Mesoscale Precipitation Systems in Winter Storms

1.Wintertime Outbreaks of Convection and Severe Storms

2.Super Gravity Waves

3.Slantwise Convection in Winter Storms

4.Diagnosis of Conditional Symmetric Instability

5.Frontal Bands

6.Orographic Modulation of Precipitation (Cold Air Damming/Barrier Jets)

7.Lake-Effect Snow Storms

8.Forecasting/Nowcasting Precipitation Type: Rain, Freezing Rain, Sleet or Snow

9.Heavy Snow and Blizzard Conditions

- APPLIED WEATHER RESEARCH

A.The Process of Conducting Applied Research

B.Defining Relationships between Weather and Observed/Forecast Data (Statistical Relations and Conceptual Models)

C.Forecast Techniques and Algorithm Development

• INSTRUCTIONAL METHODS

A. Role of the Science Operations Officer at the WFO

B. Application of Education Psychology in an Operational Environment

C. Learning Situations and Instructional Models

D. Foundations in Learning Principles

E. Use of Computer-Based Learning

III. INSTRUCTORS

The course is taught by two instructors: one from a research background and generally serving on the faculty of a university, and a second with operational experience and generally a NWS employee. It is expected that each university/researcher co-instructor will spend a semester at the COMET Center in Boulder. The person will spend approximately three months actively preparing and leading the course, and possibly another two months conducting research as a UCAR COMET visiting scientist. In addition, there will be periodic meetings during the preceding year that will be required to prepare for the course, select visiting experts, etc. In general the university co-instructor is the person who directs the discussion and analysis of research results in the course. For the Spring 1993 COMAP course, Prof. Gregory Forbes will serve as the university instructor.

The operational co-instructor has a similar but slightly different role. They are responsible for seeing that the research results under discussion have an appropriate operational focus. They are responsible ~~for seeing~~ for insuring that the appropriate questions are asked and answered about how to recognize in real-time, and then forecast the mesoscale phenomena being described and analyzed by the mesoscale researchers. During each week, time has been set aside for the operational instructor to discuss the operational ~~and organizational~~ implications of what is being learned. To accomplish these roles in the course, the operational co-instructor needs to be a person who is comfortable with the research process, has kept current with mesoscale research, and has actually been an operational forecaster in the recent past. For the Spring 1993 COMAP course, Dr. Kenneth Crawford will serve as the operational co-instructor.

IV.DATA AND TEACHING LABORATORY

A very important component of the COMAP course is the Residence Program teaching laboratory. A Memorandum of Understanding has been signed by the NWS and the Forecast Systems Laboratory to provide COMET with a PC-based version of the DARE II software. An initial version was delivered to COMET on November 15, 1990, a revised version on April 15, 1991, and a final version on October 1, 1992.

The laboratory of workstations is designed to include the following:

a.~~Seven~~ Nine Unix based 386 or 486 Personal Computer with 600 mb hard drive, math-processor, Omni-Comp graphic boards, and high resolution monitors. This should provide one workstation for every two students

b.A network to distribute case studies to each workstation and provide some central processing capability for computationally intensive operations such as radar plate stacks. The network will also be used to distribute real-time data. The network utilizes a stand alone file server.

In addition, a networked workstation and video projector are in the lecture classroom for teaching purposes. An additional station has been purchased for the COMET staff and is used for development activities and as backup for the teaching lab during course periods.

The ~~first~~ COMAP course is being taught ~~at the COMET leased facilities at 2555 55th Street, Boulder, Colorado. Both lectures and lab exercises are held in the same room using the computer tables as work areas. Future courses will be taught at the new NCAR Foothills Laboratory in a larger facility~~ in the Teaching Laboratory at the NCAR Foothills Laboratory in Building 2.

V.COURSE SCHEDULE OVERVIEW

Week #1

During the first week, the following will be presented:

1.Course overview, and course objectives

2.Training in how to use the instructional laboratory

3.Overview of new observing systems

4.Overview of mesoscale systems, including synoptic/mesoscale interactions

5.Forecasting Process

6.Overview of quasi-geostropic theory: applications to diagnosis and forecasting

~~7.Overview of NWP products for the mesoscale~~

7.Introduction to research collaborators

8.Overview of the Applied Research Process

Week #2 to #7

The inner weeks of the course will follow a routine. During each week, the following are included:

1.Every week has a major case which is the focus of 10 hours of instruction, mostly a combination of lab and supervision or lecture.

~~2.Some weeks have a second shorter version of the major case subject area.~~

2.Every week has a case study which is run in displaced real-time (DRT) and often contains some new wrinkle. For example, the winter storm DRT case might have lake effects which are not in the major case.

3.Every week has one seminar on an additional topic of interest.

4.Every week has one hour set aside to discuss specifically the operational aspects of what is being presented in the major case. This discussion typically would be lead by the operational co-instructor.

5.Every week has weather briefings ~~done by a different team~~; each team will do three briefings during the course.

6.Every week has two hours for distance learning - either to introduce new modules or to discuss instructional techniques.

7.Every week has ~~four to eight~~ seven hours of self study where students can work with Boulder scientists on a research topic of interest to their forecast area. This period will alternate between Thursday afternoon and Friday morning.

Week #8

During the last week, the following will be presented:

1.Two "graduation" DRT exercises that each least a 1/2 day with discussion afterwards.

~~2.Discussion of the applied research process~~.

2.NWS training on the SOO role in the NWS WFO.

3.Short conference paper presentations to the class by each student summarizing their research project results and future plans.

4.Evaluation of the course by the students.

5.Discussion of verification statistics.

6.Graduation Ceremonies.

A detailed Course Schedule is presented in Appendix A.

VI.Orientation Manual

Three months before the start of the course, a ring-binder will be mailed to each student. Each notebook will contain the following:

COMET Overview
Course Description
Instructor Biographies
Course Detailed Schedule
Recommended Reading List
Copies of Reading List Papers
Description of Mentor Program
Mathematics Review
Summary of Student Comments in COMAP I to Future Students

The recommended reading list is as follows:

LIST OF COMAP PREPARATORY READING

General Application to Weather Forecasting

1.Browning, K.A., 1986: Conceptual models of precipitation systems. Weather and Forecasting, **1**, 23-41.

2.Carr, Fred, Overview of NWP, Univeristy of Oklahoma.

3.Durran, D.R. and L.W. Snellman, 1987: The diagnosis of synoptic-scale vertical motion in an operation environment. Weather and Forecasting, **2**, 17-31.

4.McGinley, J., 1986,: Nowcasting mesoscale phenomena. Mesoscale Meteorology and Forecasting, Editor P.S. Ray, A.M.S., Chapter 28, pp 657-688.

~~4.Peterson, R.A. and J.D. Stackpole, 1989: Overview of the NMC Production Suite. Weather and Forecasting, **4**, 313-322.~~

5.Hoke, J.E. et al., 1989: The regional analysis and forecast system of the National Meteorological Center. Weather and Forecasting, **4**, 323-334.

6.Quasi-Geostrophic Theory (Chapter 5), Synoptic-Dynamic Meteorology in Mid-Latitudes, pp. [to be determined later].

Convection, Severe Local Storms and Flash Floods

1.Burgess, D.W. and L.R. Lemon, 1990: Severe thunderstorm detection by radar. Radar in Meteorology, Editor D. Atlas, A.M.S., Chapter 30a, Section 3.2, pp 632-638.

2.Maddox, R.A., K.W. Howard, D.L. Bartels and D.M. Rodgers, 1986: Mesoscale convective complexes in the middle latitudes. Mesoscale Meteorology and Forecasting, Editor P.S. Ray, A.M.S., Chapter 17, pp 390-413.

3.Maddox, R.A., C.F. Chappell and L.R. Hoxit, 1979: Synoptic and mesoscale aspects of flash flood events. Bull. Amer. Meteor. Soc., **60**, 115-123.

4.Weisman, M.L. and J.B. Klemp, 1984: Characteristics of isolated convective storms. Mesoscale Meteorology and Forecasting, Editor P.S. Ray, A.M.S., Chapter 15, pp 331-358.

Winter Storms and Precipitation

1.Carlson, T.N., 1980: Airflow through mid-latitude cyclones and the comma cloud pattern, Monthly Weather Review, **108**, 1498-1509.

2.Uccellini, L.W. and P.J. Kocin, 1987: The interaction of jet streak circulations during heavy snow events along the east coast of the United States. Weather and Forecasting, **2**, 289-308.

3.Bosart, L.F., 1981: The President's Day snowstorm of 18-19 February 1979; A subsynoptic scale event. Monthly Weather Review, **109**, 1542-1566.

4.Houze, R.A. Jr. and P.V. Hobbs, 1982: Organization and structure of precipitating cloud systems. Advances in Geophysics, **Vol. 32**, 222-315.

VII.Mentor Program

One of the important experiences each comap student will have is the opportunity to work on a research or forecast topic of interest, and have that work conducted in collaboration with a Boulder area researcher as their mentor. Each course attendee will be asked to select several topics they would like to work on while in Boulder. COMET will then match them with a potential mentor and arrange for the two individuals to talk about the topic and their interests. If they agree to work together, COMET will facilitate the interaction in the following ways:

1.COMET will ask the mentor for some suggested reading materials and then send those materials to the comap student.

2.COMET will talk with the mentor about their work schedules and pass along to the student suggestions on when they can get together during the course.

3.COMET will host a meeting of mentors before the course to discuss procedures and expectations.

4.The mentor and student will be asked to generate an abstract of the work to be accomplished, and send it to COMET before the course begins.

5.COMET will host a reception the first week to make sure that mentors and students meet each other and establish contact.

6.During the course, COMET will check periodically to see that the arrangement is proceeding satisfactorily. If time is or personalities are a problem, we will arrange an alternate so that the entire eight weeks is not lost.

7.At the end of the course, each student will present a brief conference like paper on what they have accomplished and plans for the future.

A list of mentors from 1991 is presented in Table XX along with known changes. Each will be contacted in late fall as well as other potential mentors who we can add to the list.

PROSPECTIVE LIST OF RESEARCH MENTORS

NameArea of Expertise

Donald Beran, NOAA/FSLProfiler

William Bonner, UCAR/COMETNWP, Low-level Jet

Charles Chappell, UCAR/COMETHydro-Meteorology, Mesoscale Meteorology

Robert Gall, NCAR/MMMMesoscale Meteorology

Cecilia Griffith, NOAA/FSLTropical Precipitation

Phil Haagenson, NCAR/MMMMesoscale Models/
Boundary-layer Transport

Brian Heckman, UCAR/COMETNowcasting

Ron Holle, NSSL-WestLightning

Susan Jesuroga, UCAR/COMETMeteorological Data Processing

Lynn Johnson, Univ. of Colorado/DenverHydrology

Vickie Johnson, UCAR/COMETAir Quality Meteorology

Joe Klemp, NCAR/MMMNWP, Mesoscale Modeling

*Michael Kraus, NOAA/FSLAdvanced Aviation Systems

Joe Lamos, UCAR/COMETInstructional Techniques

Alexander Macdonald, NOAA/FSL (Director)Systems, Modeling, Mesoscale

Bill Mahoney, NCAR/RAPAviation Meteorology/Nowcasting

John McCarthy, NCAR/RAPAviation Meteorology

John McGinley, NOAA/FSLMesoscale Instrumentation/ Nowcasting

Cindy Mueller, NCAR/RAPConvection Initiation

Marcia Politovich, NCAR/RAPIcing/Weather Models/
Precipitation Processes,
Women in Meteorology

Rita Roberts, NCAR/RAPNowcasting/Microbursts/Non- Supercell Tornados

Wayne Sands, NCAR/RAPAviation Meteorology

Robert Serafin, NCAR (Director)Radar Meteorology

Mel Shapiro, NOAA/WPLSynoptics/Frontal Structure/ Cyclones

Tim Spangler, UCAR/COMETMicrometeorology/Coastal Zone/ Air Quality

Noreen Stewart, NWS/COMETHydrometeorology

Ed Szoke, NCAR/MMMShort-range Forecasting/
Severe Storm/Tornado Development
Mesoscale Aspects of Snowstorms

*Rich Wagoner, NOAA/FSLAviation Meteorology

Morris Weisman, NCAR/MMMForecasting Observations in Numerical Modeling/
Severe Convective Storms/MCS

*** Work as a Mentor Team**

VIII.Course Evaluation

The course will be evaluated in a number of ways. The goals of the evaluation activities are:

1.As a motivational technique for participants

2.To provide timely feedback to instructors

3.To provide longer term feedback for the design of future courses

There will be four types of evaluation used during the course:

1.Weekly quizzes will be administered to provide feedback to the instructors;

2.DRT spontaneous discussions, and decision points will be used to motivate the students during DRT cases, and provide feedback to instructors;

3.Graduation DRT exercises in week eight will be used to evaluate how the class has integrated the knowledge presented during the course. The instructors will utilize some written questions during the exercise and provide an assessment of the written questions after the course is over. This will replace the final examination administered during the first COMAP course.

4.Questionnaires will be administered every week during the course. An example questionnaire is presented in Appendix C.

APPENDIX A

Weekly Goals

and

Schedule

Week 1

Dates March 9-12

Forecast Process Len Snellman

Q-G Theory & Lab Greg Forbes

Software Orientation Susan Jesuroga

Mesoscale Observing Systems ?

Weather Briefing Orientation Ken Crawford

Applied Research Process ?

Theme: Overview of Mesoscale Meteorology

Goals Forecaster will learn how to apply Q-G Theory to the evaluation of moel output, and the importance of scale interaction in a logical and consistent forecast process.

Practice Case 23 June 1985
Special Recommended Reading:
Review Articles in Orientation Notebook and Mathematics Review
Quasi-Geostrophic Theory (Chapter 5) Synoptic-Dynamic Meteorology in Mid-latitudes, by Howard Bluestein. (pages to be determined)

Responsibility for Weekly Notes:

Team 1Wednesday and Thursday
Team 2Friday

Week 2

Dates March 15-19

Major Case Leader Greg Forbes

DRT Case Leader Ken Crawford

DRT Case Visitor Steve Zubrick (SOO, WSFO Sterling)

Seminar Speakers ~~Louis Uccelini or~~ Mel Shapiro

Special Guests

Theme: NWP Interpretation and Large-Scale Winter Storms

Goals: Forecasters will apply Q-G Theory, and accquire and practice new techniques for evaluation of model output, and learn to recognize the importance of scales in large-scale winter storms. Emphasis will be on understanding processes on both synoptic-scale and mesoscale that combine to produce heavy precipitation, in large-scale winter storms.

Major Case 24-27 December 1987 [Colorado Blizzard, Oklahoma Ice Storm] [Special Q-vector Case

DRT Case 14-15 February 1986 [East Coast, GALE Project]

Special Recommended Reading (before the case):

1) Diagnosis of Synoptic-Scale Vertical Motion in an Operational Environment (Durran & Snellman, 1987, *Weather and Forecasting*, Vol. 2, pp.17-31.) 2) AirFlow Through Mid-Latitude Cyclones and the Common Cloud Pattern, *Monthly Weather Review*, Volume 108, pp. 1498-1509. 3) Review Q-G Lectures from Week 1

Responsibility for Weekly Notes:

Team 3

Week 3

Dates March 22-26

Major Case Leader Greg Forbes

DRT Case Leader Brad Colman

DRT Case Visitor Larry Dunn [or Jim Doyle]

Seminar Speakers Lance Bosart

Special Guests

Theme: Mesoscale Features in Larger-Scale Winter Storms

Goals: Forecasters will learn to a) identify wintertime mesoscale phenomena and precipitation mechanisms, b) identify the associated synoptic-scale environment for each mechanism phenomena, and c) forecast their evolution of the mesoscale precipitation mechanism, using operationally available data.

Major Case 25 January 1986 [East Coast, GALE Project]

DRT Case 5-7 March 1990 [Colorado Storm, WISP Project]

Special Recommended Reading:
Examination of the Mesoscale Features of the GALE Coastal Front of 24-25 January 1986 (Riordan, 1990, *Monthly Weather Review*, Vol. 118, pp. 258-282.) The Interaction of Jet Streak Circulations During Heavy Snow Events Along the East Coast of the United States, *Weather and Forecasting*, Volume 2, pp. 289-308. The President's Day Storm of 18-19 February 1979: A Sub-Syunoptic Event, *Monthly Weather Review*, Volume 109, pp. 1542-1566.

Responsibility for Weekly Notes:

Team 4

Week 4

Dates March 29-April 2

Major Case Leader Fred Carr

DRT Case Leader Ken Crawford

DRT Case Visitor Eric Thaler (SOO, WSFO Denver) Larry Ruthi (SOO, WSFO Norman)
Seminar Speakers Louis Uccellini

Special Guests

Theme: Mesoscale Features in Cool Season Storms

Goals: Forecasters will learn to a) identify mesoscale precipitation mechanisms phenomena, b) identify their associated synoptic-scale environment for each mechanism, c) identify potential for heavy rainfall, and d) forecast the evolution of the mesoscale precipitation mechanism, using operationally available data.

Major Case 15-16 November 1987 [Colorado/Oklahoma Large-Scale Storm]

DRT Case 16-17 November 1987 [Heavy Precipitation Event in Louisiana]

Special Recommended Reading:
1) Weather Systems Aloft. Part 1: 'Observations', Fritsch and Chappell, *Journal of Applied Meteorology*, 1981.
2) Synoptic and Mesoscale Aspects of Flash Flood Events, Maddos, Chappell, and Hoxit, 1979, *Bulletin for the American Meteorological Society*, Volume 60, pp. 115-123.

Responsibility for Weekly Notes:

Team 5

Week 5

Dates April 12-16

Major Case Leader Greg Forbes

DRT Case Leader Ken Crawford

DRT Case Visitor ~~Larry Ruthi or~~ Bob Johns

Seminar Speakers Morris Weisman.

Special Guests

Theme: Severe Convective Storms

Goals: Forecasters will learn a) to identify large-scale ~~features (factors?)~~ environment conducive to the formation of severe convection, b) to understand the relationship between the large-scale ~~features~~ environment and the formation of mesoscale severe convection, and c) how to predict the evolution of severe convection using operationally available data.

Major Case 26 April 1984
DRT Case 26 April 1991 ~~[Kansas, WSR 88D Data]~~ [Andover Kansas, WSR88D Data]

Special Recommended Reading:
1) Characteristics of Isolated Convective Storms, Weismann, and Klemp, 1984, *Mesoscale Meteorology and Forecasting*, Edited by P.S. Ray, AMS Chapter 15, pp. 331-358.

Responsibility for Weekly Notes:

Team 6

Week 6

Dates April 19-23

Major Case Leader Howie Bluestein

DRT Case Leader Ken Crawford

DRT Case Visitor ~~Larry Ruthi or~~ Ron Przybylinski

Seminar Speakers ~~Fred Sanders or~~ Bob Maddox

Special Guests

Theme: Organized Severe Convective Systems

Goals: Forecasters will learn to a) identify large-scale environment that will lead to organized severe convection, b) understand the relationship between large-scale environment and organized severe convection, c) understand how organized severe convection can in turn affect the larger-scale, and d) predict the evolution of organized severe convection using operationally available data.

Major Case 10 June 1985 [Kansas Pre-Storm MCS]
DRT Case 1-2 June 1991 [Western Oklahoma]
Special Recommended Reading:
1) The Oklahoma-Kansas Mesoscale Convective System at 10-11 June 1985: Precipitation Structure and Single Doppler Analysis Rutledge and Matejka, 1988, *Monthly Weather Review*, Vol. 116, pp. 1409-1430.
2) Mesoscale Convective Complexes in the Middle Latitutes, Maddox, Howard, Bartels and Rodgers, 1986, *Mesoscale Meteorology and Forecasting*, Editor P.S. Ray, AMS Chapter 17, pp. 390-413.

Responsibility for Weekly Notes:

Team 7

Week 7

Dates April 26-30

Major Case Leader Ken Crawford

DRT Case Leader Ken Crawford/Noreen Stewart

DRT Case Visitor Charlie Chappell

Seminar Speakers [Will be chosen from Hydromet I]

Special Guests

Theme: ~~Severe Convection and Hydrometeorology~~
Heavy Convective Precipitation

Goals: Forecasters will learn to a) identify large-scale features that lead to organized severe convection, b) identify when conditions are conducive to heavy precipitation, c) predict the evolution of organized severe convection and the potential for flash flooding, and d) predict the occurence and severity of flash flooding using operationally available data.

Major Case 26-28 May 1987 [Southern Oklahoma]
DRT Case 27-28 May 1987
Special Recommended Reading:
[Will be chosen from Hydromet I Reading List]

Responsibility for Weekly Notes:

Team 8

Week 8

Dates May 3-5

Verification Statistics Chris Hill

DRT Case #1 Leader Ken Crawford/Chris Hill

DRT Case #2 Leader Greg Forbes/Chris Hill

Development of Training Plans Chris Hill/Rich Wagoner

Theme: Tools and Plans for the SOO

Goals: Forecasters will have an opportunity to discuss and formulate ideas for on-station training. Forecasters will learn the use of verification statistics in the WFO, and will have an opportunity to inte

DRT Case #1 26-27 May 1984 [NSSL Case] or 12-13 May 1987 [Pre-Storm]
DRT Case #2 8-10 March 1992 [Stormfest, Propsed by Charlie]
Special Recommended Reading:

Notes:Team 9

APPENDIX B

Summary of Instructors'

June Planning Meeting

APPENDIX C

Sample Questionnaire

APPENDIX D

Summary of Significant Changes to COMAP Course
Fall 1992

1.Condense Weeks One and Eight to allow travel on work days. This involved the cancellation of tours during the week.

2.Maintain a consistent weekly schedule.

3.Provide a one week break in the middle.

4.Each week, a team will be assigned the task of taking notes, cleaning them up, and providing them for distribution to the class the following Monday. The graduate student will be responsible for coordinating this effort.

5.Subject mix will be 3 weeks winter, 3 weeks convection.

6.Instructor office hours will be protected and more time for research has been built into the course.

7.The final examination has been eliminated and replaced with a modified Graduation DRT procedure.

8.Instructors will provide frequent feedback on goals for the course, the week, and occasionally the day.

9.Several SOO graduates of COMAP I will be asked back as DRT visitors.

10.There will be fewer visitors and fewer seminars.

11.Gempak and several student PC's have been added to the student reading/computer room for student use.

12.Efforts will be made to link Mentors and Students earlier.

13.The math review has been edited and improved.

14.The FSL software has been revised and a new more stable operating system installed in every FSL PC workstation.

15. Some geographic diversity in case studies has been added and one WSR-88D case included (the Andover Tornado Case).

16. The Southwest Monsoon week has been dropped.

17. A new and improved hydrometeorology case has been added for week 7. This is the same case developed for the Hydrometeorology course (24-28 May 1987). Noreen Stewart will add valuable information on hydro-processing using the IBM 6000.