

MEA 511 – Introduction to Meteorological Remote Sensing

Section 001

SPRING semester

3 Credit Hours

Course Description

The course covers several types of meteorological remote sensing data used in operational forecast and research applications. Emphasis is on understanding the strengths and weaknesses of the different types of observational data so that the student can judge adequacy of purpose for their applications. This course fulfills the American Meteorological Society undergraduate curriculum guideline for 3 hours in measurements and remote sensing and the US National Weather Service requirement of at least 2 hours in measurements and remote sensing. This course is designed for senior atmospheric sciences majors and atmospheric sciences graduate students.

Learning Outcomes

MEA 511 prepares you to use several types of remote sensing data in operational forecast and research applications. Emphasis is on understanding the strengths and weaknesses of the different types of observational data so that the student can judge adequacy of purpose for their applications.

Instrumentation: Explain the basic physical principles behind radar, wind profilers, lidar, and passive microwave remote sensing. Explain the purposes of commonly used NWS WSR-88D weather radar products.

Applied Meteorology-Radar: Evaluate the strengths and weaknesses of weather radar including dual polarization variables for observing different types of storm structures and surface precipitation. Identify precipitation and wind patterns such as tornados, gust fronts, and microbursts. Identify probable non-meteorological echo in radar data.

Applied Meteorology-Profilers: Interpret cloud and storm structures within time-height plots. Identify probable non-meteorological artifacts in profiler data.

Applied Meteorology-Satellite: Optimize tradeoffs in placement of satellites in low-earth vs. geosynchronous orbit. Identify water vapor, cloud, precipitation, and aerosol patterns from satellite data.

Computation: Use provided programs in Matlab programming language to plot geometry of sensor beams, time series and scatter plots of measured and derived variables. Use interactive radar display to determine precipitating storm characteristics.

Teamwork: Work effectively in problem-solving teams, and carry out meaningful performance assessments of individual team members.

Team Project: Design and justify a radar observing system consistent with meteorological conditions for a specific location and season. Milestones during the semester include an outline of radar climatology results, informal group report, and a conference format abstract. Project culminates in a poster presentation which is judged by faculty and National Weather Service personnel.