

CEES 5020: Remote Sensing Hydrology

Lecture Time: 2009 Spring Friday 1:30-4:00

Location: National Weather Center Lecture Room 1350

Instructor: Dr. Yang Hong, School of Civil Engineering and Environmental Sciences

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Pre-requisites: Understanding of basics of remote sensing and hydrology, good senior and graduate standing, or permission of the instructor. This course is also one of the required courses for the Hydrology **Minor**.

Purpose: Remote sensing has held a great deal of promise for hydrology, mainly because of the potential to observe entire river basins and even globe rather than merely points. Most of the advances in using remote sensing for hydrology have come from new areas where existing methods were unsatisfactory or limiting and areas where sufficient data were sparse or nonexistent. In spite of this promise, higher education in applied or engineering hydrology has been slow to embrace remote sensing. This course aims to provide students a fundamental yet practical tool to understand the basics of space-borne remote sensing hydrology, to make use of existing remote sensing data for hydrology and water resources, and to be familiar with the current and future hydrometeorological-relevant satellite missions and instruments.

Course Description: Space-based Measuring hydrological variables and processes represents one of the most challenging research problems in Earth science. This course overviews various orbital satellite platforms/sensors and introduces advances in remote sensing hydrology from space-borne observations, state-of-the-art retrieval algorithms for hydrological variables, and ground validation strategies. The various applications of remote sensing to hydrology are treated as they are used to measure the different hydrologic variables or processes related to the water and energy cycle (e.g. Precipitation, Soil Moisture, ET, Runoff, Snow/Ice, Wetland, Flood, Drought, Land Drainage basin...). Each of these hydrologic variables or processes are discussed individually with the emphasis on how remote sensing is being used and on what/where the data are available for use, and not on the technology as far as sensor details and specific instruments are concerned. Particular emphasis is also placed on science and techniques used for space-borne estimation, validation, and application in hydrometeorology.

Topical Knowledge Expectations (Subject to minor change as new technology evolves):

1. Satellite orbits, sensors, and theoretic basis of remote sensing
2. Remote sensing precipitation estimation, validation and application (GOES/SSMI/TRMM etc)
3. Current Water Cycle Remote Sensing
 - NASA Shuttle Radar Topography Mission (SRTM) and HydroSHEDS (Global Watersheds)
 - NASA MODIS Global Vegetation Classification and Land Cover Types
 - NASA AMSR-E and TMI Soil Moisture (Theory, Sensor, Product, and applications)
 - Space-borne Discharge/Runoff Estimation
 - Space-based Flood Monitoring and Inundation Mapping
 - Surface Water Elevation Recovery: Altimeter
 - Groundwater-GRACE Mission (Theory, Data and Applications)
4. Future Satellite Missions
 - NASA Global Precipitation Measurement Mission (<http://gpm.gsfc.nasa.gov>)
 - Surface Water Ocean Topography (<http://bprc.osu.edu/water/>)
 - NASA Soil Moisture Active Passive Mission (<http://smap.jpl.nasa.gov/>)

Textbook: No Textbook required, but many journal papers, handouts, and lecture notes

Academic Misconduct: Academic misconduct will not be tolerated and could lead to your dismissal. You must do your own work. Please visit the following link for information on your rights to appeal and responsibilities should there be evidence of academic misconduct. See the following links concerning academic integrity and rights: <http://www.ou.edu/provost/integrity-rights/>; <http://www.ou.edu/studentcode/>

Reasonable Accommodation: The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173.

Date	Lecture Topics (subject to minor change)	Assignment	Date Due
Jan 23	Introduction History of Space Sciences		
Jan 30	Basics of Remote Sensing I		
Feb 6	Basics of Remote Sensing II	HW1	Feb 13
Feb 13	Satellite Orbits/Platform/Sensors		
Feb 20	Satellite QPE: IR/VIS Precipitation Estimation (GPI)	HW2	Feb 27
Feb 27	Satellite QPE: Pixel/Window/Patch-based Algorithms		
Mar 6	Satellite QPE: Histogram Matching/ANN/Morph	HW3	Mar 13
Mar 13	Multi-sensor Multi-platform Satellite Rain Products Validation Metrics and Applications in Hydrology	Exam 1	
Mar 20	Spring Break		
Mar 27	NASA Shuttle Radar Topography Mission (SRTM) and HydroSHEDS (Global Hydrological Network/Watersheds)		
Apr 3	NASA MODIS Global Vegetation Classification and Land Cover Types/FAO Global Soil Database	HW 4	Apr 10
Apr 10	NASA AMSR-E and TMI Soil Moisture (Theory, Sensor, Product, and applications)		
Apr 17	Space-borne Discharge/Runoff Estimation Space-based Flood Monitoring and Inundation Mapping	HW5	Apr 24
Apr 24	Surface Water Elevation Recovery: Altimeter Groundwater-GRACE (Theory, Data and Applications)		
May 1	NASA Future Missions: GPM; Surface Water Ocean Topography; NASA Soil Moisture Active Passive Mission	HW6	May 8
May 8	Last day of Class		
May 15	Final		
May 22	Final Grade Due		