SNOWPACK FIELD MEASUREMENTS FOR PRACTITIONERS AND MODELERS
Fraser Experimental Forest, Fraser Colorado
January 7-9, 2014

Course concept

As our ability to characterize and model the hydrologic regime in snow-dominated ecosystems continues to improve, there is a parallel need to make meaningful and accurate measurements of snowpack properties to drive and validate our results. Snowpack properties are needed for hydrological models, ground truth for remotely sensed data, ecological models, avalanche forecasting, and a wide variety of other applications. There are two important user groups that are dependent on both high-quality measurements and an understanding of what those measurements actually mean and represent in the real world. Practitioners often collect and use field data for their own purposes. Modelers and remote sensers often obtain the snowpack data from field practitioners or other researchers, but have little knowledge of meaning or richness of the data they are using beyond the basics (e.g. snow depth, mean density, etc.). This course is aimed at teaching skills to practitioners and modelers to increase the quality of the results for all snow data users.

Eligibility

This course is open to anyone involved in university or agency research related to the cryosphere, where snow measurements are made as part of a research program, or where an understanding of snow pack properties and measurements will increase his/her ability to effectively move cryospheric science forward. This course is not aimed at people who are already well versed in snowpack measurements.

Selection

Selection will be based on application content and space availability. An attempt will be made to include as many institutions as possible. This means single applicants from multiple institutions will be given precedence over multiple applications from single institutions. Selection will not be based on race, religion, sex, etc.

Location

Lab and dorm facilities are located at the Fraser Experimental Forest Headquarters, near Fraser, Colorado. The primary field site will also be at the Fraser Experimental Forest, with alternate field sites at Berthoud Pass, and North Park.

Schedule

The course is designed for three field days, with a day for travel on each end. The dates are chosen to provide greatest flexibility for university students during the winter holiday.
January 6, Monday – Travel, arrive at FEF in evening, check into dorm
January 7, Tuesday – Course intro, field day
January 8, Wednesday – Field day
January 9, Thursday – Field day, course wrap-up
January 10, Friday – Check out of dorm, travel

NASA Snow School – Field Section

Instructors
Kelly Elder, PhD, Research Hydrologist, RMRS, US Forest Service
Banning Starr, MS, Ecologist and Site Manager, Fraser Experimental Forest
Christopher Hiemstra, PhD, US Army, Cold Regions Research and Engineering Laboratory
One or two other leading scientists in snow science – individuals TBD

Content to be covered in the field:
Snow pit excavation and preparation
Density measurements and profiles
Snow temperature profiles, surface and air temperatures
Stratigraphy and layering
Grain type identification and characterization
Grain size
Hand hardness test
Basic stratigraphic profile photo documentation
Snow surface roughness
Soil moisture
Federal sampler use
Snow board water equivalent sampler for new snow
Sampling snow depth with conventional probes
Sampling snow depth with Magnaprobes
Special problems in snowpack measurements
    Characterizing abnormalities in the snowpack: crusts, ice lenses, flow fingers, debris
    Deep snowpacks: 2.5+ m
    Shallow snowpacks: alpine tundra and prairie environment
    Liquid water

Cost
There will be no tuition charge for the course. If funded, costs incurred for participants are supported by a grant funded by NASA. Funds for course participation are competitive and will be awarded to successful applicants through the application process. Transportation during the course will be provided, including transportation to and from the course.

Accommodations
The Fraser Experimental Forest has a year-round dorm facility that houses 12 people in private rooms, provides cooking facilities with a full kitchen, and has individual bathrooms and shower facilities. All bathrooms are unisex and the dorm is coed. Hotel rooms are available in nearby Fraser, but transportation to and from FEF will not be provided.

Communication/Questions
Questions about the course and logistics should be addressed to Dr. Kelly Elder at wintersnowschool@gmail.com

Detailed Schedule

Day 1, Tuesday, January 7
 0800 – 1000 Lab – Introduction to snow depth tools
  Manual probes
  Magnaprobes
  Designing a survey
   Bias
   Sample size
   Anisotropy
   Correlation length
   Error and uncertainty
 1000 – 1030 Break – Dress for field
 1030 – 1200 Field - Snow depth – Transects near lab
    Problems and solutions
     Ground cover
     Stratigraphic and basal ice lens and crusts
     Over- and under-measurement
 1200 – 1300 Lunch in dorm
 1300 – 1500 Field – Magnaprobe
 1500 – 1600 Manual probe and Magnaprobe comparison
 1600 – 1730 Lab – Dump Magnaprobe data
    Enter manual probe data into Excel
    Compare data and discussion
 1800 Dorm - Dinner

Day 2, Wednesday, January 8
 0800 – 1000 Lab – Introduction to snow density and other snowpit tools
 1000 – 1200 Field – Snowpits – practice using tools without recording any data
 1200 – 1300 Lunch in dorm
 1300 – 1730 Field - Snowpit data collection and recording
 1800 – 1900 Dorm – dinner
 1900 – 2100 Lab – Plot snowpit data

Day 3, Thursday, January 9
 0800 – 1000 Lab - Shallow snowpack measurements – special problems
 1000 – 1200 Field – measurements
 1200 – 1300 Lunch in the field
 1300 – 1500 Field – measurements continued
 1500 – 1730 Lab - Plot snowpit data
 1800 – 1900 Dorm – Dinner
 1900 – 2100 Course wrap up and evaluation