

Overview document explaining the request: ASP Summer Colloquium

For this educational project, the present document serves a similar purpose to the "Science Proposal" that is normally submitted along a facilities request.

Introduction:

Each year the NCAR Advanced Study Program (ASP) solicits proposals from NCAR science units to host one or two annual Summer Colloquia, each of 2-weeks duration. The colloquia are targeted at the graduate student level, and ASP funds about 25 students participation in each colloquium (travel, lodging and per diem). In addition ASP funds about 10 lecturers (travel, lodging and per diem) to attend a colloquium as part of the course staff.

The last two formal involvements of EOL (previously ATD) staff in hosting a summer colloquium was in 1998 when MMM and ATD jointly organized the "Hurricanes at Landfall" colloquium, and in the early nineties when ATD organized the "Measurement Uncertainty" colloquium. EOL has not organized a summer colloquium in the 11 years since then. During the same period there has been a gradual shift in many university departments towards a greater emphasis in teaching numerical modeling aspects of atmospheric science and meteorology. This has progressed to a stage where many atmospheric sciences university departments no longer teach classes focused on instruments and observational techniques.

In the same time period NSF's support for observational science through the LAOF facilities has led to very significant improvement in the ability to observe the atmosphere. In the fall of 2008 a group of scientists and faculty from EOL, Colorado State University (CSU) and University of Wyoming (UWyo) decided to explore the possibility of hosting a summer colloquium focusing on observational science. After some introductory meetings involving up to 15 participants from the above organizations, from the University of Colorado and from the Desert Research institute, it was decided submit a formal proposal to ASP to host one of the 2009 ASP Summer Colloquia. A key aspect of the proposal is for the graduate students to organize a mini-field experiment using LAOF facilities in the Front Range of the Rocky Mountains. Both the ASP call for proposals and the submitted proposal "Exploring the Atmosphere using Observational Instruments and Techniques" are attached. The proposal was submitted on 15 October 2008 and ASP awarded the summer colloquium in mid November 2008.

We, the colloquium organizers, think that this is a fantastic opportunity to help educate the next generation of science leaders in observing the atmosphere.

Organization:

ASP helps with the practical organization of the colloquium, but EOL/CSU/UWyo staff will organize the lectures, practical exercises, field deployments, analysis of collected data and science presentations by the course participants.

The colloquium has a Steering Committee with membership of

Wen-Chau Lee, Jorgen Jensen, Steve Oncley (EOL)
Steven Rutledge (CSU)
Al Rodi (UWyo)
Maureen Donovan, Briesa St. Martin (EOL finance and logistics)
Santiago Newberry (EOL software)
Jose Meitin (EOL field project coordination)

In addition a larger group of organizers will be members of five committees focusing on:

1. Computer/system/software
2. Lecture, tools and mentorship (Three groups: Remote Sensing, Aircraft and Surface/Sounding)
3. Colloquium logistics
4. Field experiment logistics
5. Weather briefing

The group of lecturers has not been finalized but it is expected to include staff from EOL, CSU, UWyo as well as other universities and research institutions.

Schedule:

Due to limited availability of rooms within NCAR and dormitories at CU, the colloquium dates are fixed to be 1 – 12 June 2009. A 2-week period implies a very intensive program, with a rough allocation as follows:

Science lectures (0.5 days)
Remote sensing, aircraft and surface/sounding instruments and tools (1.5 days, lecture format)
Remote sensing, aircraft and surface/sounding instruments and tools (1.5 days, laboratory exercises using existing data)
Planning for a field deployment (0.5 days)
Field deployment (2 days)
Analysis of collected data (3 days)
Miscellaneous (0.5 days)
Student presentation of results (1.5 days)

Student work:

The first part of the colloquium will by necessity have to be based on lectures in order to convey basic information about the science that can be approached observationally and the tools and techniques to do this. This will also include formal measurement uncertainty lectures.

The lectures will be backed up by laboratory exercises during which the participants will work in smaller groups of 2-4 students on analysis of existing data. A very important part of this is to get hands-on experience with the different tools that are used to extract and analyze data. Mentorship by a large group of course organizers will constitute a very important part of these laboratory exercises. These tools will also be used for analysis in the second part of the colloquium.

We believe that the best way for the students to understand observational research is for them to be involved in all aspects of a deployment; that is the planning phase, weather forecasting, field sampling, quality control of data and subsequent analysis of the data. Thus the students will need to define small research projects that are both feasible and with as much science questions as can be accomplished over a short period. Again, mentors will help guide the student groups in this process and the mentors will have some suggested subjects available, should it be necessary.

It is the intent of the organizers to have each student group use at least two types of measurements (e.g. surface measurements and airborne measurements, or ground-based remote sensing and airborne sampling) in order to give them as wide an exposure as possible.

The most critical part of the colloquium is the two days of field deployment during which the students will use the aircraft, radars and ground-based instruments to conduct actual sampling. Adverse weather may force us to cancel a given objective, in which case the students or mentors should be ready to focus on other research objectives, or the scheduling of the two sampling days may have to be shifted slightly. During the two days the participants are expected to work on a minimum of two facility groups. The expectation is that sampling may be targeted at about 8 different objectives, each of which is pursued and led by a small group of students.

Facility staff must process the collected data into data sets of "preliminary field quality" on Sunday 7 June in order for the students to start their analysis at the beginning of the second week. The students will work on their analysis in the same small groups, and at the end of the course each participant is expected to give an individual (not group) presentation on part of the groups analysis.

Participant selection:

ASP's intent is for the course to focus on graduate students. It is obvious that the participants should be students of very high academic and research standing and/or potential. The organizers have discussed the target audience, and the likely "ideal" participant is a student early in their graduate career with a minimum of one year of completed coursework. The reason for this is that the graduate students will gain experiences that can help them in the remainder of their graduate career as well as on a longer time scale.

Although the colloquium will be squarely focused at observational science, we do not intend to exclusively select students who are set on an observational career; the need for modelers to understand the value of observations and what they can add to their work is also an important part of the colloquium. Thus there may also participants who aim for a modeling or theoretically based career.

Finally, the organizers wish to encourage and accept students from a diverse background of universities, not just those traditionally strong in observational science. The desire for diversification also extends to women and minority students.

ASP will fund 25 graduate students. All in all we expect to include a diverse group of participants, not just the narrowly define "ideal" student as defined above.

Facilities requested and availability:

The Summer Colloquium organizers request the use of the NSF/NCAR C-130, The UWyo King Air, CSU-CHILL, SPOL, MISS and ISFS. The justifications for each of these are as follows:

C-130

The C-130 is requested for 8 flight hours, expected to be two 4-hour flights. On each of the flights we expect to accomplish 3-4 different objectives. This will not allow for extended sampling to build up a large statistical base, but the purpose is intended to be to plan, deploy, sample and analyze data; all of which can be accomplished with a limited amount of sampling time. The C-130 will be instrumented with RAF's standard thermodynamic, wind, radiation, aerosol and cloud/precipitation particles. In addition the aircraft will have a basic suite of trace gas instruments to allow for tracer studies. The aircraft is expected have room for about 10 course participants and a couple of mentors on each flight. The primary advantage of the C-130 are its ability to have many sensors, including chemical trace gases, and its ability to have a large group of students on board during the sampling.

The C-130 is about to undergo a major maintenance and the duration of this is by its very nature somewhat uncertain. The plan calls for re-installing the science infrastructure and instruments prior to the Colloquium flights; on the off chance that the C-130 will not be ready, then we will ask for a shifting on some of the C-130 funds to the King Air to boost the King Air flight time, see below.

King Air

The King Air is requested for two 4-hour flights. The King Air will be equipped with standard thermodynamic, winds and cloud physics sensors. The particular advantage of this aircraft is its ability to carry the combined Wyoming Cloud Radar (WCR) and Wyoming Cloud lidar (WCL). A total of 1-2 students are expected on each flight.

As explained above, if the C-130 is not available, then we will ask to have the King Air allocation doubled to four flights over two days. This will require double-crewing of the aircraft, a change which UWyo states is feasible.

CSU-CHILL

CSU-CHILL will be operated over the two sampling days to collect any and all radar echoes. The colloquium participants will devise the sampling strategy and coordinate with aircraft in real time using satellite communication for chat clients. CHILL will be used to examine convective initiation, the dynamics of storm systems as well as the microphysical characteristics of storms. CHILL will also provide an important capability by being linked other radars in dual-doppler mode, principally CSU-Pawnee and S-pol.

SPOL

SPOL is currently undergoing a major upgrade, and RSF/EOL has every expectation that SPOL will be ready in time for the colloquium. SPOL will be located at the Marshall field site, and its capabilities are similar to CHILL in terms of utility for studies of convective initiation, storm structure and microphysical characteristics.

MISS

The Mobile ISS will have just come back from EDUCT and PLOWS prior to the colloquium. If there are no major service issues, it will be used (probably at either NCAR's Marshall Field Site or NOAA's Platteville Profiler) for both days of the field operations. Otherwise, a fixed ISS system parked at NCAR's Foothills Lab will be used. This request is for 8 radiosondes to be launched from this ISS system.

ISFS

This request is for two ISFS stations. One would be deployed at Marshall and the other at Platteville. Both would have basic meteorology and complete surface energy balance measurements, including eddy-covariance fluxes of heat and moisture, 4-component radiation, and soil heat storage. In addition, the Marshall site would have a 5-level vertical profile of flux sensors and a fast-response CO₂ analyzer. The Marshall site would be visited by all of the participants and would have the ISFS base trailer. The Platteville site is in a location that would be easier to overfly with the aircraft and is in the middle of dual-Doppler coverage by S-Pol and CHILL.

EOL User's Workshop

The bi-annual EOL User's workshop will take place in the week following the end of the ASP colloquium. It is EOL's hope that most of the students will also participate in the User's Workshop. In fact, a large part of the workshop is focused on guiding new users through the application process for LAOF facilities.

Budget Explanation:

Separate budgets are attached for NCAR/EOL (C-130, S-Pol, ISFS, MISS), CSU (CHILL), and UWyo (King Air). Major costs are for 10 flight hours (including 2 for testing) for the C-130, 10 flight hours (including 2 for ferry) for the King Air, and 10 radiosondes (including 2 spares) launched by MISS. The total cost for this scenario is \$92,973

As mentioned above, the King Air research flight hours would be doubled in the case that the C-130 is not available in time for the Colloquium. A second budget from the University of Wyoming for this contingency also is attached. Total costs for the scenario is \$42,675