

## Report of the Science Advisory Committee Meeting – August 11, 2013

- **Results from the Science Review of the GLOBE Teachers Guide**

The Committee initially met with the Education Advisory Committee during which Jim Washburne summarized the results of the science review of the existing GLOBE Teachers Guide. It was indicated that the revision and modernization of the Guide will be a major effort requiring significant time to accomplish and likely will be the subject of a separate funding opportunity in the future. Tony Murphy indicated that some minor changes and corrections may be implemented in the near future.

- **Guidelines for Proposing New GLOBE Protocols**

Following this joint meeting, the Committee began its review of the draft *Guidelines for Proposing New GLOBE Protocols* by asking Dixon Butler about the current status of science in GLOBE. He responded by stating that without funding committed to scientist/educator teams to support individual groups of GLOBE protocols, the ability to change protocols is limited. GLOBE has initiated a GLOBE International Scientist Network (GISN) and is nearing completion of an on-line e-training style video to introduce scientists to GLOBE. There is also a set of descriptions for how GISN members can be involved in GLOBE with the lowest level being an inspirational visit to a GLOBE classroom, preferably after having become familiar with GLOBE implementation by viewing the on-line module. Four levels of involvement are envisioned with funding and time commitments increasing as these levels go up. The highest level of commitment would be taking responsibility for one or more GLOBE protocols and advising GLOBE on science questions relating to the protocol, its instrumentation, data visualization, and supporting educational and training materials; arranging for scientist review of all submitted data, and communicating with the GLOBE community in support of the protocol.

In response to a further question, Dixon Butler indicated that decision making ultimately rests with the GLOBE sponsors – currently NASA and NSF – because funding is usually required to support accommodation of protocol additions and changes within the GLOBE systems and infrastructure. The Science Advisory Committee – to be reconstituted as the Science Working Group – would be a primary channel for community review and advice on any protocol changes prior to any decision making by the sponsors.

A question arose as to the reason a policy on new protocols is being considered at this time. Dixon Butler and Ming-Ying Wei indicated that there is no great push for adding protocols to GLOBE, but there are a number of protocols, such as mosquitos, total carbon content of land cover sites, and frost tubes already in use by some program participants. These protocols are largely the result of the Earth System Science Projects (ESSP) activities, which were funded by NSF. Protocol modifications and perhaps some new measurements may be required as part of establishing partnerships with scientific spaceflight and other missions or adopting new instruments and technologies to accomplish existing GLOBE measurements.

- **Recommendations from the Committee:**

The Committee recommended that both the *Guidelines for Proposing New GLOBE Protocols* and the *Guidelines for Proposing GLOBE Student Research Campaigns* be expanded to make clear that proposers should work with GLOBE from the formulation of their initial idea throughout the development of their proposal, to outline the process in more detail, to more clearly delineate

what GLOBE will do if a proposal is accepted, to be more explicit on the elements dealing with the educational value and testing of the proposed activities or protocol additions, and to cite examples if possible. Dixon Butler stated that the proposed guidelines will be improved and resubmitted for the Committee's review.

The Committee pointed out that in addition to one or two year campaigns, GLOBE should have some prepackaged campaign materials ready for rapid response to event-triggered observing opportunities, such as volcanic eruptions. These would need to be based on existing protocols and be consistent with the ability of schools to respond quickly.

- **Update on the Ozone Measurement Instrumentation**

Jessica Taylor presented a review of work on ozone measurement instrumentation, an effort largely conducted by Margaret Pippin for over a decade. In summary, test strips for Zikua instruments are costing roughly \$3 a piece and on top of the instrument price of \$200 can make the ozone measurement expensive. Ozone test strips may be made in high school chemistry laboratories. An alternative Aeroqual instrument exists at a cost of about \$800 that takes research quality ozone measurements without prolonged exposure and is capable of working with a data logger for up to 4 hours, which is the life of the rechargeable batteries. Questions were raised about the possibility for recharging this instrument with solar panels.

- **Potential partnership between GLOBE and NASA SMAP (Soil Moisture Active and Passive) mission**

Dixon Butler presented information about the potential partnership between GLOBE and the NASA Soil Moisture Active and Passive (SMAP) mission. Mission scientists are particularly interested in clusters of GLOBE schools taking frequent measurements of near surface soil moisture using the Gravimetric Soil Moisture Protocol. At a minimum, a partnership with GLOBE would require the addition of an alternative sampling approach to the existing GLOBE protocol. The mission is scheduled for launch October 31, 2014 with continuing operations until at least 2018. A partnership with GLOBE would be more along the lines of GLOBE's relationship with the CloudSat Mission rather than being a one or two year campaign. Plans are underway aimed at concluding a partnership agreement by November 2013. Committee discussion brought out that there are a number of technical questions to be resolved, particularly in regard to the different spatial scales of the satellite vs. *in situ* measurements.

- **Update on Aerosol Measurement Instrumentation**

Lin Chambers reviewed the situation with instruments for aerosol measurements. The existing instrument, developed by David Brooks and Forrest Mims, remains a good choice as it costs less than \$200 and produces data that are in excellent agreement with Aeronet measurements. Three new instruments are in development. Lin's group at NASA Langley Research Center has tested on copy of an instrument provided by a group in Mexico. The instrument is projected to have a cost of \$500 and needs refinement to produce better measurements. France will have an instrument in the \$400 range ready for testing in October and will provide a copy to Lin for testing. Mark Schoeberl presented a third alternative that uses a cell phone camera as a detector that produces aerosol optical thickness for both large and small particles. The device also offers the possibility of taking all sky pictures of clouds and detecting subvisible cirrus layers. The camera need not have a data plan as pictures can be downloaded to a computer and emailed for analysis. The initial device cost is about \$350 with the potential for price reductions if there is considerable demand; this price does not include the smart phone.

One conclusion of the Committee discussion of aerosol instruments is that efforts should be made to identify the schools that have copies of the existing instrument and get these schools to take data or make their instruments available to GLOBE schools who are interested in putting them to use.

- **Comparison of smart phone GPS apps and Traditional GPS receivers**

Todd Ensign presented the results of his literature review of the comparison of smart phone GPS apps and stand-alone GPS receivers currently used in GLOBE. In some settings, such as urban areas with many cell phone towers, the use of auxiliary signals information may result in GPS readings from some smart phone apps that are more accurate than those from GPS receivers receiving signals that are reflected off buildings. In general, though, dedicated GPS receivers are superior and clearly meet GLOBE's established accuracy standards. A question for further consideration in GLOBE is how accurate do locations need to be and is the requirement uniform for all GLOBE measurement sites. The Committee raised questions about the accuracy of position determination using Google maps zoomed in on a location where data are being taken. Todd recommended that those using tablet computers or phones in the field in connection with GLOBE measurements purchase dedicated GPS receiver units that connect with tablets and cell phones and are available at costs comparable to those of GPS receivers.