

**EMWoG Luncheon**  
**Monday December 11, 2006, 12.00-14.00 pm PT**  
**Marriot Courtyard, San Francisco, CA**  
**Minutes and Action Items**

*Present:* Gary Egbert, Rob Evans, Shane Ingate, Dean Livelybrooks, Kevin Mickus, Adam Schultz, (quorum achieved).

*Guests:* Tim Ahern, Thor Bochenko, Randall Mackie

*Apologies:* Steve Park, Martyn Unsworth, Phil Wannamaker

**Action Item Status**

- **Action Item (from 4/11/06)** Schultz to contact Narod if NIMS could be toggled between 1 and 8 Hz, enabling interchangeability of systems.
- **Resolution: Outstanding.** Schultz has provided 1-Hz code to Narod that is now being inserted into the NIMS firmware.
  
- **Action Item:** Should ES MT data products be developed by PIs, or should it be more of a task for MT data processing staff?
- **Resolution: Resolved (see later in minutes).** Ingate has approached Ahern of the DMC and the inclusion of MT data products using the cyber-infrastructure tool SPADE. Ahern reports that this should take \_ day to set up; most of the work will be in defining and completing the meta-data.
  
- **Action Item (from 4/11/06):** Ingate will request that the data from recent Quantec testing of the Billingsly cores at Battle Mountain, NV, will be made available to EMWoG for analysis.
- **Resolution: Outstanding.** Ingate has contacted Reftek but has received no response.

**Data Products**

Egbert and Park indicated that they will continue to provide data QC, SEED-conversion for th DMC, and data products when their existing EarthScope award expires. Funding will be provided under EarthScope MT O&M funds.

Ahern provided a description of SPADE (Searchable Product Archive and Discovery Engine) developed by the IRIS DMC, and the process by which data products could be provided.

Group discussion indicated that the following are a list of data products that should be provided:

- Single-site impedance functions (Level 2). Egbert does not provide impedance functions in EID format, which will be provided by Park.
- Tipper functions (Parkinson vectors, level 2)
- Field notes comprising site history notes provided by contractors installing and maintaining the transportable stations (Level 2)
- Inter-station MT transfer functions (Level 3)

- 2-D and 3-D inversions (Level 4)

**Action Item:** Egbert to wrap his single-site impedance and tipper functions in XML-code required by SPADE. The Oregon data products should be complete by January 2007. Egbert will also provide to the DMC a simple mini-SEED to ASCII converter that could be used by EM users. Egbert will also provide a metadata to system response converter, as well as XML log notes file.

### **Offshore Cascade Deployment**

There was continuing discussion on how to accomplish the offshore analog of the Cascade transportable experiment. Funding from NSF CD, Margins or Mantle Dynamics programs were listed as possible sources, with tie-ins to ORION/OOI, as well as additional funding from the Europeans and Japanese.

**Action Item:** Evans and Schultz will continue to explore and make contacts.

### **Backbone**

GSY-USA announce that M. Kitchens has 80 acres in WI that could be used for the Backbone site.

**Action Item:** Schultz to contact Kitchens to discuss likelihood

### **Oregon Pilot Project Debrief (14:00 – 17:00)**

Group met to discuss lessons learnt from the Oregon Project, and how best to translate these experiences to the next project. GSY-USA provided a list of recommendations (attached), and discussed in detail. In no particular order, Group discussed the following lessons:

**Data Products:** Park and Egbert indicated that they wish to continue work on MT data processing when their current NSF-funded award expires (currently into a no-cost extension). Group discussed with Ahern the concept of EarthScope data products, and how they may be best served by SPADE. The following MT data products were identified:

- Impedance functions - Level 2
- Tipper functions (Parkinson vectors) – Level 2
- Station log notes – Level 2
- Inter-station transfer functions – Level 3
- 2-D and 3-D inversions – Level 4

It was noted that Park formats impedance functions in EDI format, whereas Egbert does not.

**Action Item:** Egbert will wrap Level 2 data products in XML and submit to SPADE. Egbert will also provide a mini-SEED to ASCII converter. Finally, Egbert will convert the meta-data to system response data.

**Command-and-Control:** In the early days of the experiment, it was noted that there was no clear authority running the experiment, with Ingate, Livelybrooks and Park contributing on an as-needed basis. Mackie indicated that a single oversight person, perhaps rotating on a weekly basis, needs to be available 7/24 via cell phone. Mackie also requests greater autonomy in deciding whether a station looks good, and time to remove the station. Mackie requests more tools, such as dedicated Linux and Windows machines so that the field computers are not being continuously rebooted into alternating operating systems.

**Spares:** Mackie indicates that this is a vital necessity for running the experiment. Need complete MT systems as spares, as well as a spare field computer per crew.

**Siting and Permitting:** Group suggested the following recommendations: For the next experiment, site selection and permitting needs to start at least 2 months in advance of construction. Siting and permitting would be considerably easier if the TA seismic array shared its land-owner information. Working with private land owners is very-much easier than working with public land owners. Finally, it is recommended that the construction vendor have signing authority for the sites.

**Shipping:** Group recommends more extensive use of palletizing and truck transport, not FedEx which is very expensive. Also need to organize a shipping depot located near the center of the array. Equipment should be shipped to this depot will in advance of the start of the experiment.

**Field Computers:** GSY-USA were not complimentary towards the software tools provided to communicate with the NIMS, and view data in the field. Their recommendation is to use a dedicated laptop (not the HP 200LX) running Matlab, and mobile power supplies that will run from a 12V car battery.

**Action Item:** Egbert to provide Matlab routines for plotting the data.

**Electrodes:** Both GSY-USA and Evans recommend using the “Hungarian” electrodes, which are sealed PbCl held in a solid matrix. Dealing with hazardous liquids in the field, and with disposing of the liquid waste is an unnecessary complexity. Furthermore, the short Hungarian electrodes are easier to bury than Park/Booker electrodes.

GSY-USA indicated that Park/Booker electrodes were highly polarized, ~300 ohms. EMWoG states that this is acceptable. Mackie points out that the NIMS does not test for contact resistivity, but that it is possible to use noise levels to determine electrolyte deterioration.

Animal damage was as large factor in station reliability. GSY-USA recommends that experiments be conducted to compare the effectiveness of armored cable and flexible conduit in mitigating animal damage.

**Action Item:** Group suggests conducting a test, perhaps at Soap Creek, comparing the Hungarian with Park/Booker electrodes, and also to test armored cables and flexible conduit as methods to mitigate animal damage.

**Time-of-Year:** Given that farming cycles (planting, cutting, etc) does have an impact on permitting success, GSY-USA requests that they be given as broad a time-period as possible to conduct the next experiment. Group recommends that this period span Mar-Oct 2007.

**Action Item:** Ingate to work with Busby (TA) and EMWoG to determine station count and nominal locations for the completion of the Cascades.

**Data Delivery:** The current data delivery schedule of weekly shipments works fine. However, it was recommended that data be ftp'd rather than shipped. It was also recommended that all field data be backed-up to a large hard disk in the evenings. Group indicated that there was some mismatch between the meta-data of Egbert and GSY-USA that needs to be resolved.

**Action Item:** Egbert and GSY-USA to agree on a format for meta-data collected in the field.

**Recon Reports:** Group agreed that the recon reports were too much information and additional work for the field crew. At a minimum, the recon report should include:

- GPS track with map
- 4 directional photos
- Description of environment (geology, vegetation, hazards, proximity to electrical lines), etc.

GSY-USA will provide more photos for outreach purposes.

**Costs:** GSY-USA estimate their costs for Oregon to be ~\$6,200/station. With 20 systems available in the next experiment, this cost could drop to \$4,200/station.

**Yellowstone Plan:** Group agreed that the campaign durations and set-out plan for the Oregon Project worked well, perhaps because of increased solar activity. The plan is to use all 20 systems in the field (note added 12/14/06 – EMSOC have indicated a willingness to provide EarthScope with up to 10 systems for the Yellowstone experiment, which will be used as spares). Deployments will still be for 20-21 days. GSY-USA requested that they have authority to pull the systems after 10 days of operation of good data are returned. Some members of EMWoG stated that this methodology is acceptable for obtaining good transfer functions, but does place at risk serendipitous research such as recording EM signals generated by earthquakes, etc.

**O&M:** Group agreed that it is highly worthwhile to send 2 GSY-USA engineers (e.g., Bochenko and Kitchens) to Narod Geophysics Inc. for training.

Debriefing group broke at 5 pm.

## **Calendar**

- EMSOC Annual Meeting 13 Dec 1300-1700 PT
- AGU Poster session 14 Dec
- EarthScope Town Hall Meetings, 14 Dec 1830-1930 (ES), 1930-2030 (GS)
- EMWoG telecon 9 Jan, 2007 1400-1500 ET
- EarthScope National Meeting Abstract deadline 26 Jan, 2007
- EarthScope National Meeting Registration deadline 16 Feb, 2007
- EarthScope National Meeting 27-30 Mar, 2007
- Western Geoswath Workshop 26-29 Apr, 2007 (see EOS, 2006,87, 221/224)

## **Problems and recommended changes (provided by T. Bochenko, GSY-USA, 12/11/06)**

**Permitting;** earlier start on both the desktop and field. Field permitter will need gps, compass, computer (with MS office and internet capable), camera, printer, and scanner. Get BLM sites identified and permit requests filed asap

**E-lines;** there were problems with rodents chewing the pot wires and e-lines where the conduit pulled apart, coyotes digging up the wires and around the pot pulling the wire portion of the pot out so it was no longer in the electrolyte solution, chewing through wire. We also had problems with the wire breaking at the bends in the conduit when they are folded, leaving a little slack at each bend and securing each bundle as close to the ends as possible to keep the ends from separating, and putting stress on the wire, when bouncing around in the back of the truck. Padding at the bottom edge of the conduit to keep the wires from being rubbed against the truck bed will help reduce breakage.

Armored wire or flexible conduit (no joints) will eliminate some problems but there are concerns with both. If the armored wire is too thin cows may pick it up while grazing and chew on a lot of it. This will cause a lot of strain in the wire and the connections as well. How does the flexibility of the conduit change with temperature? Flexible conduit is more expensive \$.60 per foot

We found that cayenne pepper helped to reduce the digging and chewing of rodents and coyotes. Mark tried some bitter compounds spray that also seemed to work.

Better information on the functioning of the NIMS, possible field tests, pinouts (voltages and impedances), extra grounding for protection, what the status codes mean. Have enough 256m cards for each unit.

Better tools for viewing time series.

Need additional PC's that will work with NIMS. Likely will need 3 + 1 spare

Chewed GPS antennas; the garden hose seems to have eliminated this problem. A few spare antennas would still be a good idea. Some better strain relief at the connector: end a couple of the antennas pulled apart there during the burial, recovery process.

Back up and archiving; what site info should be backed up with the data and in what format for best use with processing (an info document format). Should recon/install report be saved with the data?

A shorter fatter (same or increased volume) electrode would be nice. Digging a wider hole is usually easier than deeper (thin soil cover over rock) It could also get the rubber stopper at the top of the pot deeper might make it a little less likely to be dug up. A screw cap that holds the rubber stopper in place instead of the electrical tape could be more secure and less wasteful.

Batteries, from talking with Barry Narod and the evidence in the field 2 120AmpHours are huge overkill. A 40Ah should be plenty, as the NIMS draw  $\sim 1.25A$  it needs  $\sim 3Ah$  per day. If a 2 battery setup is wanted something in the 20-30Ah range would be good.

**Management of Project:**

- 1) We need to have 1 person at all times who can be reached (by cell phone or email) to make decisions as necessary, even on weekends.
- 2) It would be better to give GSY-USA more autonomy rather than having to have a consensus reached on every decision.
- 3) A better approach is needed for deciding acceptance of station data.