

DYNAMO Project

Field Phase Interim Progress Report 7 November 2012

The purpose of this report is to update EOL staff with data collection now underway in the DYNAMO Project. The project has been underway for more than a month, though the official start date was 1 October. We continue in the Intensive Observing Period that lasts until 15 January 2012. Some facilities will continue observations through the end of March 2012.

We recommend that you visit the DYNAMO Field Catalog at: <http://catalog1.eol.ucar.edu/cgi-bin/dynamo/report/index>. There is much more detailed information from all of the facilities, including reports, special products and science summaries in the catalog.

The general weather pattern went through a transition from a rather benign dry period to a much more active wet period. Heavy showers and stratiform rains were reported at Addu Atoll, Diego Garcia and on the ships. In fact, the *Revelle* reported some 190 mm (7.5 inches) in 8 hours at the ship station on the equator on 28-29 October. By the end of the first week of November, conditions are again suppressed with only light tropical showers in the area but interesting structure in the boundary layer.

The project opening ceremony was held on 10 October. It was attended by 80-90 local officials, the public, press and the DYNAMO scientific and technical staff present on Addu Atoll at the time. The Mayor of Addu City provided some opening remarks and some plaques were presented to local officials who have helped with support on Addu over the past 2+ years.



Figure 1. DYNAMO and MMS staff at DYNAMO Opening Ceremony on Addu Atoll

RV *Revelle* and RV *Mirai* Ship Operations

The R/V *Revelle* has completed the first 2 legs of this long DYNAMO deployment.

Leg 1 began in Darwin, Australia on 29 Aug and concluded on 22 Sept on Phuket, Thailand. A total of five pairs of DYNAMO surface and sub surface moorings were deployed and are transmitting data. Transmission can be intermittent due to IRIDIUM satellite data issues. Leg 2 began on 29 Sept and concluded on 30 October back in Phuket. The major measurement components aboard ship include surface fluxes, atmospheric soundings (see ISS update below), Ocean soundings (CTDs), aerosols, a NOAA high-resolution Doppler wind lidar, TOGA 5-cm Doppler weather radar, ocean optics and ocean mixing.



Figure 2. Science crew from R/V Revelle cruise 1-2

R/V Mirai departed Singapore on 25 Sept to begin the DYNAMO cruise. Leg 1 continued until 21 September with a port call to Colombo Sri Lanka. Continuous measurements include sea surface meteorology, C-band scanning Doppler radar. Vertical pointing cloud radar and lidar. Six and then three hourly radiosondes are being taken and regular CTD casts are made from the ship. A sub-surface ADCP mooring with passive acoustic listener (PAL) was positioned near the Equator and an Argo float has been deployed. All of the above measurements plus a microstructure profiler (16 casts per day) began active sampling on 1 October along with skin-SST radiometer and floating thermistor. Cruise leg 2 began on 28 October from Colombo and measurements as described above were resumed.



Figure 3. Various data collection activities underway from the R/V Mirai

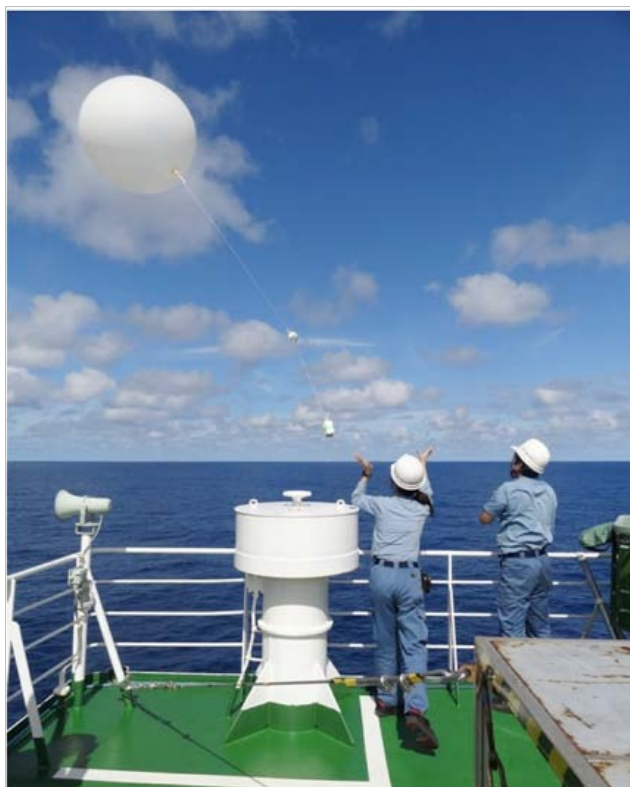


Figure 4. Rawinsonde Balloon launch from R/V Mirai

EOL/RSF and Texas A&M Research Doppler Radar Support

The S-PolKa and SMART-R radars continued to collect data throughout the last month. Both radars are running well. The Ka band did fail during the last week of October. Repairs were completed and the radar is operational at the present time. There is a very complete set of Addu Atoll science summaries prepared by the University of Washington group (e.g. Houze, Rasmussen, Brodzik and Powell) and available on the DYNAMO Field Catalog at: <http://catalog1.eol.ucar.edu/cgi-bin/dynamo/report/index> In addition, there are a number of other products, reports from facilities participating in the field campaign and weather forecasts that can be found on the site.

RSF staff deployed to Addu Atoll during the month of October and early November include Jeff Bobka, Jose Rivas, Scott Ellis, Mike Dixon, Maureen Donovan, Tammy Kepple, Eric Loew, Joe VanAndel, Bob Rilling, Al Phinney, Vivek, Paloma Gutierrez, Rich Erickson, Pei Tsai, Bryan Gales, Joe Vinson, Chris Burghart and Tammy Weckwerth. Many of these folks will make a return trip to the Maldives as operations continue into December and January.

The 17th SAARC Summit starts 10 Nov. This is a meeting of the leaders of 8 south Asian countries. This is the first time it has been on Addu Atoll so it is huge for the region. They have been enhancing their infrastructure (new harbor, road paving, conference center construction, etc.) and are now practicing their motorcades, security checkpoints and other disruptive behavior. Police are stationed at most intersections. We are frequently stopped at security checkpoints. Since the Equator Village requires all of their rooms for the summit, tomorrow we will all move out. Many people have worked hard to find us alternative lodging in local homes. There are four alternate housing locations for the EOL, U Miami and UW staff including 3 houses and one room behind a store. The single room behind the store is occupied by a familiar radar PI.



Figure 5. Maldives Addu Conference Center, site of the SAARC Conference

Education and Outreach Activities

The Project has taken an active role in trying to inform the Maldives about our project and reach out to the community and local schools about our deployment. Alison Rockwell has taken the lead by preparing and/or providing S-PolKa information brochures and signage, press packets, general information on UCAR/NCAR/EOL. The Maldives Meteorological Service was very instrumental in arranging the school visits for the DYNAMO outreach efforts that took place from October 1 - October 14, 2011.

In all, 5 school presentations were given by Alison, including a workshop for high school science teachers. The other events were given to students in 8th-12th grades, some of their teachers, and parents. 2 of the schools were on Addu Atoll, while the other 2 were located in the capital city of Malé. We reached over 215 students, while 20 teachers attended the workshop. The school presentations were given by Alison Rockwell of EOL, Eric DeWeaver of NSF, and Courtney Schumacher of Texas A&M University. Alison also gave the teachers workshop presentation.

Overall impressions were that the level of attention given to education in the Maldives is quite high. The students were well-versed in Earth science topics, which could be detected by the level and range of questions they were asking. We met with many of the school principals prior to the presentations, and they were all very appreciative of our efforts and willingness to come to their school. Brochures and other educational materials were highly sought after by both students and teachers, as all of the material was taken by them.

The most rewarding aspects of each talk came after the formal presentations were over and the students had a chance to come up to us in small groups and ask us questions. All of the groups were very shy to ask questions when asked in the large groups after the presentation. However, once the presentation was over and they were able to approach us in small, mostly segregated by gender, groups, the questions were plentiful and very inquisitive. It was clear that our message was heard and that they are interested in current science issues that not only affect their country, but the entire world.



Figure 6. Eric DeWeaver with students from Male Secondary school



Figure 7. Alison Rockwell at local school on Addu Atoll describing the DYNAMO Project



Figure 8. Seminar for teachers on DYNAMO Project and UCAR/NCAR activities

EOL/ISF Integrated Sounding System Support

EOL is operating two ISS sites for DYNAMO: on the R/V Revelle (a Scripps Institution of Oceanography vessel) and on the island of Diego Garcia at a Naval Support Facility (NSF!) and U.S. Air Force site. Both sites are established and operational launching radiosonde soundings every 3 hours, as well as running wind profilers and other surface meteorological equipment. Over 1400 soundings will be launched over the next 3 months from the two ISS sites alone.

The Revelle system was setup in Darwin, Australia in August and sailed from there to the Cocos Islands (NNW of Australia), then on to a research area east of the Maldives (along 80° East), followed by a port call in Pluket, Thailand, and is now back out in the research area. Seas have been a little rougher underway in transit than expected, making sounding balloon launches challenging, however in the milder seas of the research area conditions have calmed down.

The system on Diego Garcia was setup in September and is now in it's second week of operation. The site has been experiencing some days of heavy rain (one day had over 6 inches), also challenging conditions to launch soundings. Some soundings have experienced icing as they go up through the very moist melting layer, weighing the balloons down, however creative solutions involving smearing cooking oil over the balloons has alleviated some of these problems.

Both sites are being operated by EOL staff and 14 students from CSU and other universities. From EOL, currently Jen Standridge and Kurt Knudson are on board the Revelle, previously Bill Brown and then Brad Lindseth were on. Sailing next are Lou Verstraete and Tim Lim, to be followed by Laura Tudor and then by Chris Golubieski. On Diego Garcia, currently it's Bill and John Militzer, to be followed by Heather McIntyre, Steve Cohn, and Jen Standridge. Set-up crews were these folks, and Gary Granger, Steve Semmer, & Charlie Martin; at tear-down we will be joined by Patti Kidd.

EOL/CDS Support

CDS provided extensive support in the planning and implementation of communications on Addu Atoll as well as the DYNAMO Field Catalog. Mike Paxton was on Addu for 3 weeks to coordinate the set up of wide bandwidth

communications for the S-PolKa, SMART-R and ARM sites. By all accounts the network is working well and provides for the real time exchange of radar and other meteorological data among the sites as well as improved Internet connectivity from the Maldives to the rest of the world.

Greg Stossmeister, Susan Stringer, Dennis Flanagan, Scot Loehrer, Jose Meitin and John Allison all contributed their considerable talents to customizing the Field Catalog system for this project and continue to support the system as it grows ever larger. This is a complex implementation with mirrored catalogs running in Boulder and on Addu Atoll because of the bandwidth constraints. In addition, CDS has provided a "low bandwidth" version of the catalog that will help allow those aboard ship and on Diego Garcia to see important products and reports that may be useful keeping up to date with project activities. We are seeing an unprecedented amount of special reports and products from the research facilities at this time. We believe the catalog will be a long term resource for the documentation of this 6 month long field deployment. The field catalog database is approaching 40 Gb in size.

The acquisition and relay of project research soundings to the GTS has taken considerable time and effort to coordinate, implement and monitor. Steve Williams and Scot Loehrer have taken the primary task of coordinating with Colorado State University and nearly a dozen operational centers around the globe to make sure the research soundings are arriving at the numerical weather centers (e.g. NCEP, JMA, ECMWF) so that they might be assimilated into the operational global models. In addition, Steve has worked out a formal agreement with ECMWF to receive a special product stream from their operational models that are housed on the DYNAMO Field Catalog.



Figure 9. EOL DYNAMO Field Catalog front page. <http://catalog1.eol.ucar.edu/dynamo/>

DYNAMO Sounding Network

Dick Johnson and Paul Ciesielski from Colorado State University have provided expert planning and followed through with the implementation of the DYNAMO high resolution sounding network. Overall performance of network is quite good with launch success rate between 95-100% at all sites in the Indian Ocean region. The launch site at Manus Island in the western Pacific Ocean has a launch success rate around 90%. All nine enhanced research and operational sites in the enhanced network reported sonde data on the GTS at same time for the first time at 1200 UTC 29 October. The CSU group prepares several preliminary products that can be accessed via the Field Catalog. Figure 10 shows all sounding

sites in the DYNAMO domain. The large red dots show the inner array with 4-8 per/day launches during most of the IOP. The EOL sites are the ones at Diego Garcia and at the SE Ship location. CSU is operating the launch site at Male. The soundings at Gan and Manus Island (right edge of the image) are operated by the ARM/AMIE Project. An enhanced launch schedule at the Seychelles and Colombo, Sri Lanka are also underway.

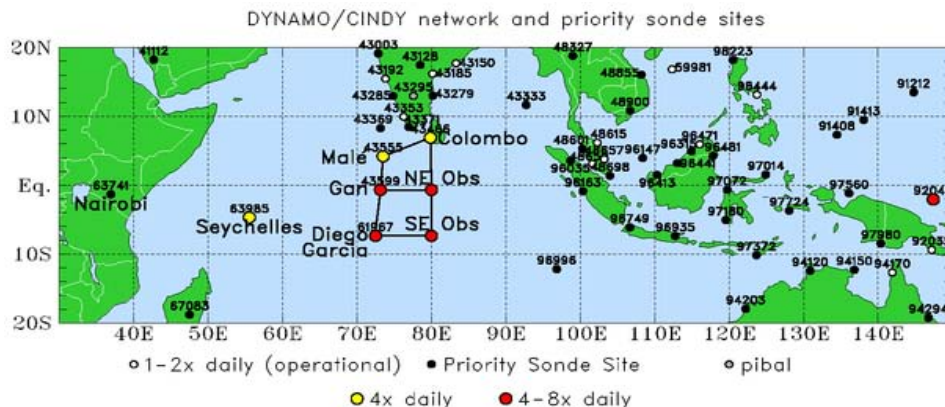


Figure 10. DYNAMO/CINDY Sounding network. There are special higher resolution operational and research sites shown in the larger yellow and red dots.

Special Modeling and Forecast Support

NCEP is providing a weekly presentation of MJO forecast products and other analysis as part of a Wednesday conference call among all available DYNAMO participants. All of the products and a written forecast summary are available in the reports and model section of the DYNAMO Field Catalog.

This information is very useful in a better understanding of the current regime and what might be anticipated over the next two weeks in the Indian Ocean area. There are also special model forecast of the Field Catalog.