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Development of a power and communications system for remote autonomous polar observations

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The National Science Foundation has awarded a Major Research Initiative (MRI) grant to UNAVCO and the Incorporated Research Institutions for Seismology (IRIS) to develop a power and communications system that will improve remote autonomous geophysical observations in the polar environments. To date, each OPP- funded PI must develop their own support infrastructure for their experiments to provide power, communications, and environmental controls as necessary, for their particular transducers. There is currently no forum to exchange ideas on successful designs, nor means to avoid pitfalls discovered by others. While some groups have had good success in completing their experiments, those successes are not necessarily available to the broader community to take best advantage. Our goal is to provide a standardized approach to scaling infrastructure support designs to the seismological and geodetic community's particular experimental designs. Through testing in each facility's cold chambers and through field trials at test-beds located locally and in Antarctica, the MRI project will investigate optimal battery designs (both rechargeable and non-rechargeable), power systems (solar, wind), environmental conditioning, and telemetry systems appropriate for these extreme conditions. The aim of this collaborative project is to not only take best advantage of the field engineering experiences of the two consortia, but to also create a means of incorporating expert design contributions and exchanging ideas, designs and experiences with the entire polar research community.

The first deployment of the MRI occurred this past Austral Summer (Jan/Feb 2007) and field test beds were established at McMurdo Station and the Amundsen-Scott South Pole Station. These test beds include benchmark stations as currently deployed

along side newly developed equipment for portable deployments including solar and wind power systems, sealed-vacuum insulated panel environmental enclosures and new designs for structural and anchoring components. Data from these test beds flow in real time to the data centers of IRIS and UNAVCO.

In conjunction with the MRI funding, IRIS and UNAVCO are developing a new joint advisory committee made up from scientists working in the polar-regions with representation from the IRIS and UNAVCO facilities, which will allow for the exchange of information on infrastructure design for these experiments between the facilities and the research community. Although the startup of this advisory committee is tied to the MRI funding, it is hoped that this committee will continue to function beyond the MRI window to ensure formal representation of scientists working in these extreme environments.

In addition, we will also build and distribute beta-test versions at mid-points along the funding profile that will allow actual field trials of the intermediate designs in actual OPP-funded experiments, thus allowing both highly controlled testing scenarios as well as realistic, in-field applications. This will engage the scientific community as an able partner in the success of the MRI while providing valuable data on actual field deployments to the facilities before the final designs are determined. Data from each of these experiments will be put into a final product of a scalable design for remote autonomous support.