THE IMPORTANCE OF CONTINUITY OF PRODUCTIVE RESEARCH AND THE ASSURANCE OF UNINTERRUPTED FLOW OF ESSENTIAL DATA. J. D. Kelly[1] and A.van Eyken[2], [1]Independent contractor, consultant to UCF, john.kelly@ucf.edu [2]SRI International, anthony.vaneyken@sri.com

Introduction: Most areas of large-scale geophysics System Science are only possible with continuing access to quality, distributed observations and many require expansion (in both space and time) of such data in the future. The proposed white paper will highlight both the need for continuity in productive facility and instrumentation operations and the disruption in data acquisition caused by uncertain funding. We suggest a new awareness that will enable agencies to react and respond to critical data requirements.

Multi-decadal requirement to sustain continuity of productive research and data: Geospace scientific understanding is inherently transdisciplinary. It demands an understanding of related disciplines such as solar physics, plasma dynamics, space and upper atmospheric science, mathematical modeling, electrical engineering, and data science. These specialties require data -- a steady stream of reliable, pertinent, multipoint data. Some. including climate change, require data sets that span solar cycles and are used to identify long-term trends (100s of years in some cases).

Geospace system science requires reliable and continuing high quality observational data both to provide critical tests of theories and to drive effective modelling and forecasting. While many existing and planned facilities contribute data to managed archives, there are still no truly effective, transparent processes for data discovery or data collection/assimilation nor is there any guarantee that critical data sets will continue to be augmented, maintained, validated, and readily accessible.

A number of proposed facilities are critical to the expansion of available observations and should be planned to ensure effective and timely data availability and archiving.

Scientific imperatives: We highlight the need to achieve closure on understanding of multi-scale energy transport in the atmosphere and we call attention to the still unfulfilled goals to properly understand the differences in the northern and southern high-latitude responses to the same solar wind drivers.

Upcoming NASA missions, like LWS's Geospace Dynamic Constellation, and myriad past missions have defined their baseline and threshold mission measurement requirements based on space measurements alone, even though it is clear that measurements from the ground would clearly enable closure of several science questions. Unfortunately, today, the science community cannot take the availability of data for granted. Reviewers typically must consider a NASA mission proposal that indicates the importance of data derived from NSF ground-based instruments, to have a critical weakness if the needed data cannot be guaranteed to be available at the time of the on-orbit operations, particularly because of uncertain NSF funding. Mission teams are forced into this situation because of the uncertainty in continued funding for ground-based instrumentation.

Space physics, and other ground-based efforts need the certainty that ground-based measurements will be there for long-term studies and for availability of space missions that will focus more and more on system coupling from the interior of the Earth all the way to outer space.

Consequent actions: We encourage a new awareness at the NSF that allows elevating the status of data continuity within the NSF Division or at the Directorate level.so that there is a commitment to funding on-going productive instruments and facility O&M budgets at appropriate levels. Leveraging prior investments, that have enabled productive facilities and instruments including spacecraft, is an attractive option, needing only incremental operations funding to continue key data continuity. Establishing Space Science instrumentation capable of unprecedented temporal and vertical coverage of the Antarctic atmosphere and simultaneous measurements of convection, auroral precipitation, and plasma state, independent of conditions and without spatial/temporal ambiguities addresses the need of adopting a systems approach to achieve appropriately balanced progress in understanding an interconnected solar-heliospheric-terrestrial and planetary system