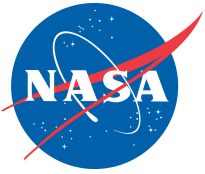


NASA LWS institute: GIC Working group & connection to CCMC

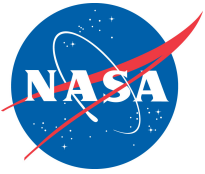
Antti Pulkkinen

NASA Goddard Space Flight Center



NASA LWS Institute concept

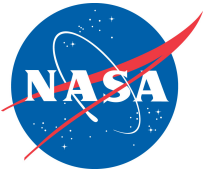
- You can read the program's version at <http://www.vsp.ucar.edu/Heliophysics/science-LWS.shtml>.
- PI's interpretation:
 - Space weather version of the International Space Science Institute (ISSI).
 - Interdisciplinary, international.
 - End-user focus, which is really good → basic scientific research feeding into applications addressing the hazard.



GIC group goals

- Identify, advance, and address the open scientific, engineering, applications etc questions pertaining to GIC.
- Advance predictive modeling of GIC.

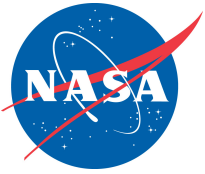
Establish new personal connections and collaborations!



The team

Core members

A. Pulkkinen (PI)	NASA Goddard Space Flight Center
E. Bernabeu (Co-lead)	PJM
A. Viljanen	Finnish Meteorological Institute
R. Pirjola	Finnish Meteorological Institute and Natural Resources Canada
D. Boteler	Natural Resources Canada
J. Eichner	Munich-Re, Germany
A. Thomson (Co-lead)	British Geological Survey
P. Cilliers	South African National Space Agency
D. Welling	University of Michigan
N. Savani	George Mason University and Naval Research Laboratory
R. Weigel	George Mason University
J.J. Love	US Geological Survey
C. Balch	NOAA Space Weather Prediction Center
C. Ngwira	The Catholic University of America
G. Crowley	Atmospheric & Space Technology Research Associates, LLC
A. Schultz	Oregon State University
R. Kataoka	National Institute of Polar Research, Japan
B. Anderson	Applied Physics Laboratory
D. Fugate	Electric Research & Management
J. Simpson	University of Utah



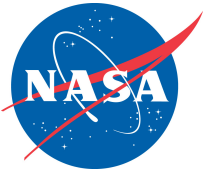
The team

Advisory members

M. MacAlester	Federal Emergency Management Agency
R. Waggel	Federal Energy Regulatory Commission
M. Olson	North American Electric Reliability Corporation
S. Mahmood	Department of Homeland Security
J. Ostrich	Department of Energy
R. Lordan	Electric Power Research Institute

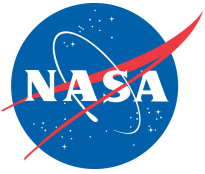
Observing members

C.T. Gaunt	University of Cape Town, South Africa
C. Felton	Civil Contingencies Secretariat, UK



The team





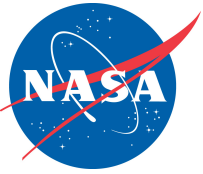
Deliverables

- The group's work will lead to:

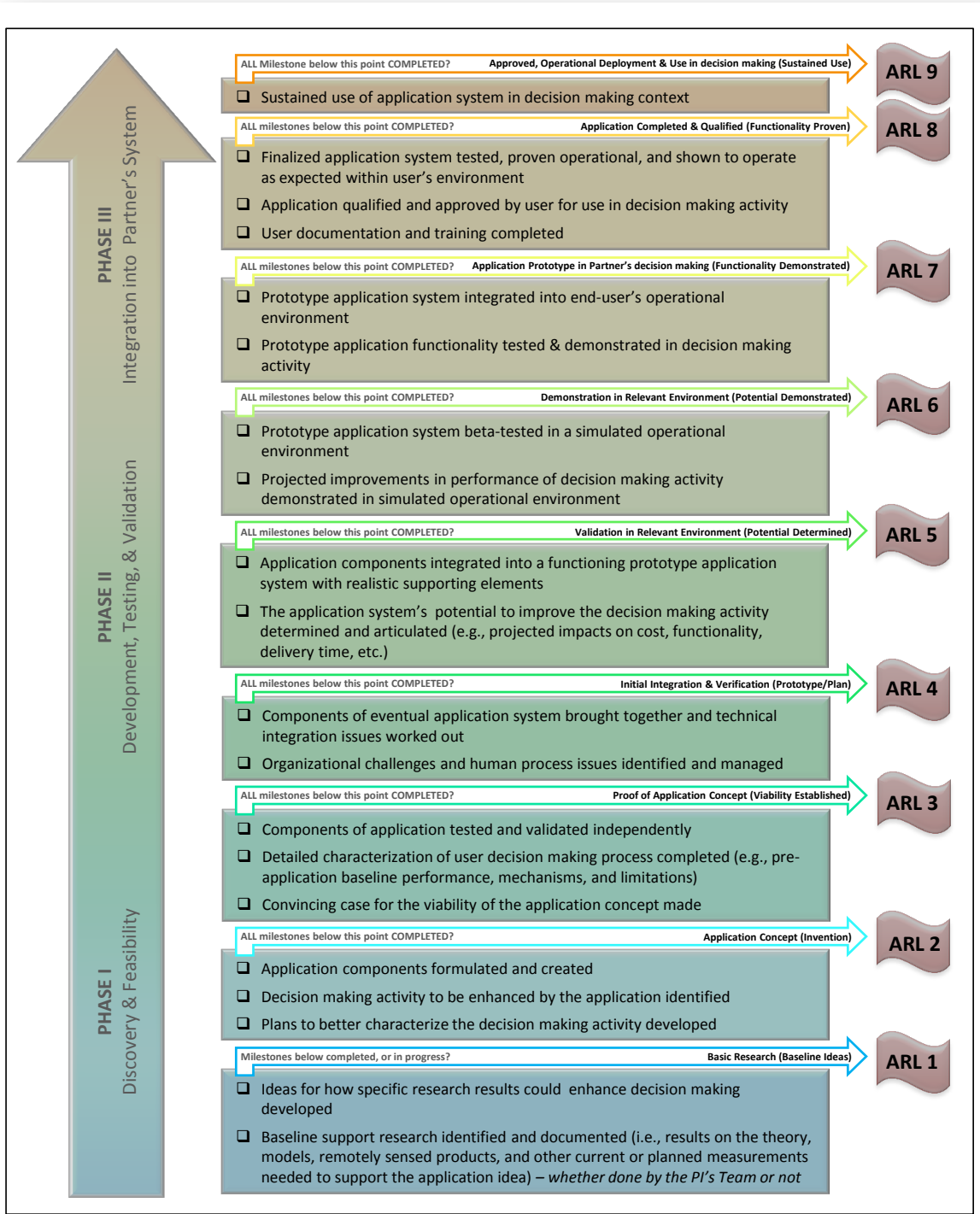
i. A peer-reviewed paper providing a review of the field of and the status of the field. The publication will also address the key issues that need to be solved for improvements in models and predictions.

+ technical articles addressing the identified issues
→ Articles to appear in the AGU Space Weather LWS Institute Special Collection

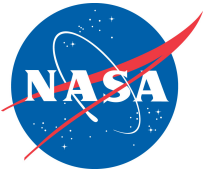
ii. A working group report informing the LWS community about the work performed during the workshops. The report will include a roadmap for the future directions of the Working Group.



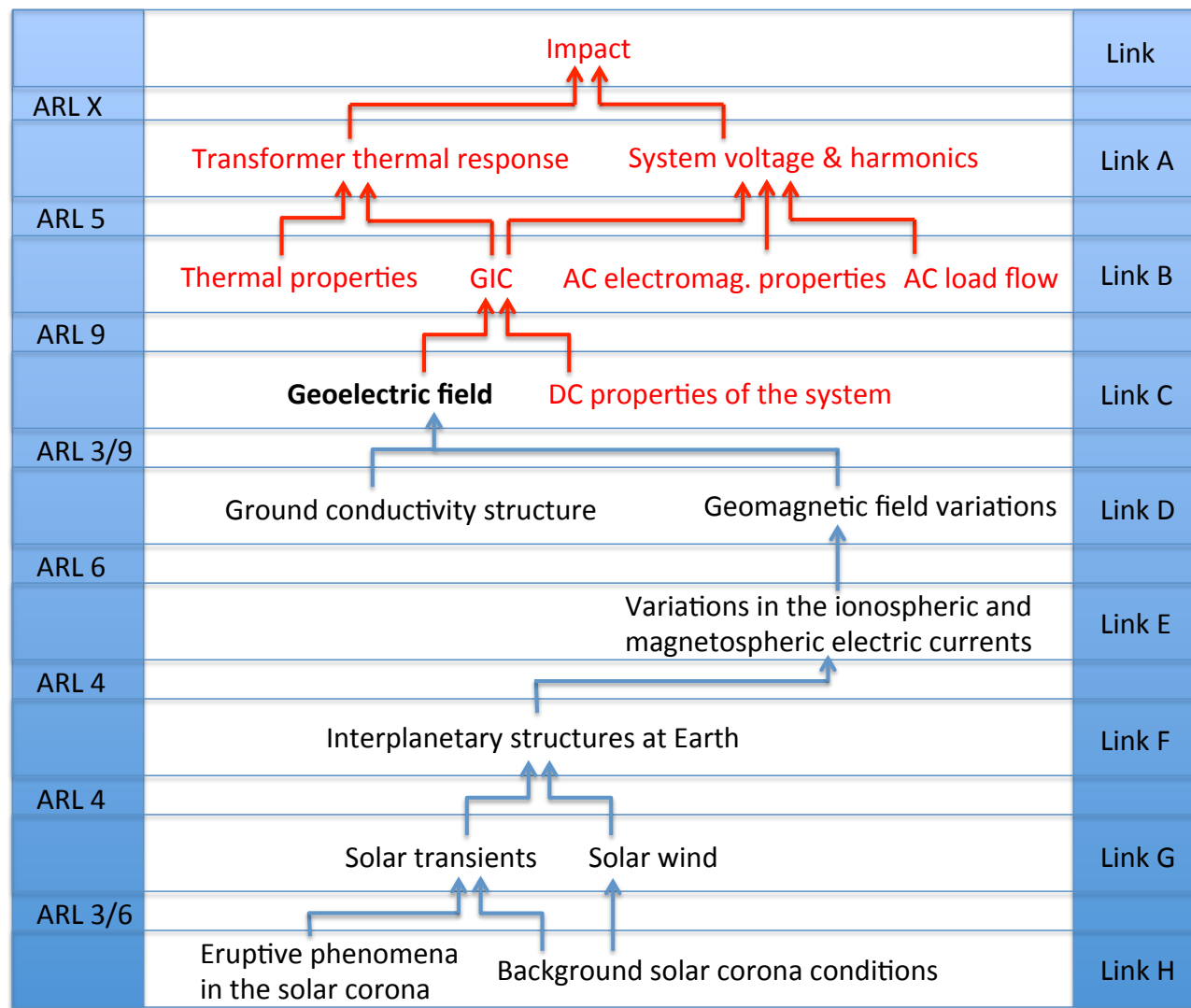
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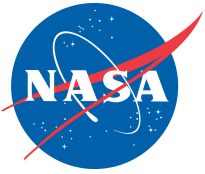


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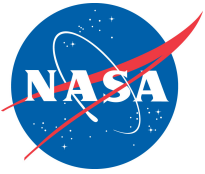


The systems science





Backup

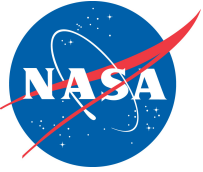


Key open questions

- 1) 1D, 2D, 3D modeling of the geomagnetic induction and GIC.
 - How much our GIC modeling improves by moving from 1D to 2D and 3D modeling of the geomagnetic induction?
 - Under what conditions 1D approach becomes insufficient?

- 2) How can we improve the work on extreme GIC event scenarios?
 - Improved statistics?
 - Improved modeling, improved understanding of the physics of extremes?
 - What are the theoretical upper bounds for the extreme GIC events?

- 3) What is the optimal number and distribution of B-field measurements for GIC modeling purposes?
 - Can we build and utilize “representative grid” in the analyses?



Key open questions

4) “GIC-index’ development.

- What could be a good new indicators for GIC activity?
- How can we package B-field information into data products that are useful for the end-users?

5) Model validation.

- How can we study and characterize key model (interplanetary transient, geospace, induction, ground model) accuracy for GIC applications?
- How can we build realistic error bars for our end-products?
- Localized geoelectric field enhancements? Can our models reproduce those?

6) How to improve predictive GIC modeling?

- How can we improve lead-time and accuracy?
- Should we focus on specific transient features and geospace processes?