

NASA HELIOPHYSICS DIVISION RESEARCH PROGRAM
Heliophysics Technology and Instrument Development for Science Element
SUMMARY EVALUATION
SUBMITTED IN RESPONSE TO NRA: NNH13ZDA001N H-TIDeS

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Institution: Naval Research Laboratory

Proposal No.: HTIDS13-0018

Title: Waves and Magnetism in the Solar Atmosphere (WAMIS)

PROPOSAL SUMMARY

Science question

The objective of the WAMIS (Waves and Magnetism in the Solar Atmosphere) program is to obtain a breakthrough in the measurement of magnetic fields in the solar atmosphere and in the understanding of the interaction of these fields with space plasmas. In particular, WAMIS will address the following science questions:

1. What determines the magnetic structure of the corona? What is the interface between the slow and fast solar wind, and how do waves propagate in relation to the magnetic field
2. How are flux ropes formed, how do they evolve, and how are they related to CMEs?
3. Where do CME-associated shocks form?
4. How is energy stored and released by reconnection in coronal heating, flares and CMEs?

Methodology

WAMIS will measure coronal magnetic fields and coronal waves from a long duration high altitude balloon payload that consists of an internally occulted coronagraph and an IR spectro-polarimeter focal plane assembly. A long duration, Antarctic balloon flight will allow for a solar rotation's worth of observations with high sensitivity due to the freedom from atmospheric fluctuations and scatter.

PROPOSAL EVALUATION

Major strengths:

The proposed science has a strong potential of answering key questions about the magnetic structure of the solar atmosphere, and its coupling with the interplanetary space. The coronal magnetic field is currently not well observed, and is primarily deduced through extrapolation from the photosphere. Direct measurements will not only provide a better understanding of the coronal field itself, but also its coupling to the lower solar atmosphere.

WAMIS will observe magnetic fields in the corona with unprecedented sensitivity. The proposed instrument will be flown on a high altitude balloon platform, which essentially eliminates scatter and intensity fluctuations from the Earth's atmosphere. This vantage point not only provides the measurement capability of a much larger ground based instrument, but also

eliminates other sources of error and may allow the measurement of fainter structures than possible from the ground

WAMIS will obtain new coronal wave observations that complement the ones obtained in the EUV. It will potentially resolve differences between the EUV observations, and those obtained with earlier visible/IR coronagraphs from the ground and advance our understanding of the basic physical processes driving the corona.

The proposed Antarctic LDB flight will allow continuous observations that are not possible from any existing or proposed ground based facility.

The proposed instrument is technically feasible, and relatively low risk. It is a modest evolution of a successfully operating ground based coronal spectro-polarimeter (CoMP).

Major Weaknesses

None.

Minor strengths:

Coronal magnetic field observations from above the Earth's atmosphere will help us better understand the potential and limitations of future coronal field measurements with large instruments from the ground (ATST, COSMO).

Minor weaknesses:

Both the magnetic field measurements, and the wave measurements are made off the solar limb, along an extended line of sight. This has significant potential for confusion in the identification of the coronal structures.

The proposed plan is to use rotational tomography and other inversion techniques to disentangle coronal structures along the extended line-of-sight, including quasi-separatrix layers, flux ropes, etc. However, there are no details in the proposal on how this will be accomplished, whether this will involve coronal modeling and/or fitting of the observations to magnetic field extrapolations, the limitations of these techniques, and how they will reach closure on the science objectives.

EVALUATION SUMMARY

The proposed science has a strong potential of answering key questions about the magnetic structure of the solar atmosphere, and its coupling with the interplanetary space. WAMIS will observe magnetic fields in the corona with unprecedented sensitivity. It will also obtain new coronal wave observations that complement the ones obtained in the EUV. The proposed Antarctic LDB flight will allow continuous observations that are not possible from any existing or proposed ground based facility. The proposed instrument is technically feasible and relatively low risk. Therefore, the likelihood of success is very high.

OVERALL GRADE (mark panel overall score with “X”)

	Excellent	E/VG	Very Good	VG/ G	Good	G/F	Fair	F/P	Poor
'X': Overall grade.	X								

ADDITIONAL COMMENTS FOR PROPOSER.