NASA TR&T contract NNH05CC75C
"Resolving the 180 degree Azimuthal Ambiguity in Solar Vector Magnetic Field Measurements"
K. D. Leka, Principal Investigator

- Work began in 2005 due to a delay in securing this contract
- The investigators (Leka, Barnes and Metcalf) participated with NCAR in organizing (rescheduling due to weather) and hosting a workshop in 2005. The focus of the workshop was investigating extant algorithms for solving the 180° ambiguity in vector magnetic field observations.
- As part of the workshop, test data ("hares") were developed to be subjected to the different algorithms ("hounds"). Metrics were devised by the investigators by which to measure the success of the algorithms.
- A manuscript describing the algorithms tested and their performance is in preparation (Metcalf, Leka, Barnes, Lites, and many co-authors). An example figure and summary metrics table is shown here.

Table 2 Results for Ambiguity Resolution Algorithms.

Solution	Fluxtube and Arcade				Multi-Pole at $\mu \neq 1.0$			
	$\mathcal{M}_{\rm area}$	$\mathcal{M}_{\rm flux}$	$\mathcal{M}_{B_h(s)}$	$\mathcal{M}_{J_z}$	$\mathcal{M}_{\rm area}$	$\mathcal{M}_{\rm flux}$	$\mathcal{M}_{B_h(s)}$	$\mathcal{M}_{J_z}$
Acute Angle (potential, FFT)								
NJP (Ju Jing)	0.67	0.48	0.92	-0.07	0.76	0.86	0.88	0.10
YLP (Y. Liu)	0.64	0.53	0.90	-0.08	0.82	0.86	0.88	0.08
KLP (K. Leka)	0.67	0.48	0.92	-0.07	0.64	0.92	0.73	0.20
Acute Angle (potential, Greens Func.)								
BBP (V. Yurchyshyn)	0.72	0.65	0.92	0.04	0.78	0.88	0.90	0.25
JLP (Jing Li)	0.70	0.64	0.90	-0.01	0.71	0.82	0.83	0.13
Acute Angle (LFFF)								
HSO (H. N. Wang)	0.87	0.69	0.99	0.68	0.85	0.95	0.94	0.60
Large Scale Potential								
LSPM (A. Pevtsov)	0.69	0.52	0.89	-0.84	0.69	0.90	0.74	-0.38
Uniform Shear Method								
USM (J. Jing)	0.69	0.59	0.68	-0.87	0.30	0.36	0.26	-1.17
Dissipation of Magnetic Pressure								
DMP (J. Li)	0.74	0.93	0.85	-0.77	0.67	0.80	0.76	-0.41
Minimum Structure								
MS (M. Georgoulis)	0.22	0.14	0.23	0.19	0.36	0.70	0.58	-0.30
Nonpotential Magnetic Field Calculation								
NPFC (M. Georgoulis, original)	0.70	0.62	0.92	0.02	0.70	0.92	0.83	-0.01
NPFC2 (M. Georgoulis, revised)	0.90	0.76	1.00	0.81	0.99	0.99	0.99	0.98
Pseudo-Current								
PCM (A. Gary)	0.78	0.47	0.98	0.55	0.77	0.82	0.82	0.41
UH Iterative								
UHIM (K. Leka)	0.98	0.94	0.95	0.95	0.99	1.00	1.00	0.99
Minimum Energy								
ME1 (T. Metcalf, original)	0.98	0.96	1.00	0.93	1.00	1.00	1.00	0.99
ME2 (T. Metcalf, non-linear)	1.00	0.99	1.00	0.97	1.00	1.00	1.00	0.99
AZAM								
AZAM (B. Lites)	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00
Acute Angle (conducting walls, FFT)								
TMC (T. Metcalf)	0.83	0.95	0.91	0.39	–	–	–	–

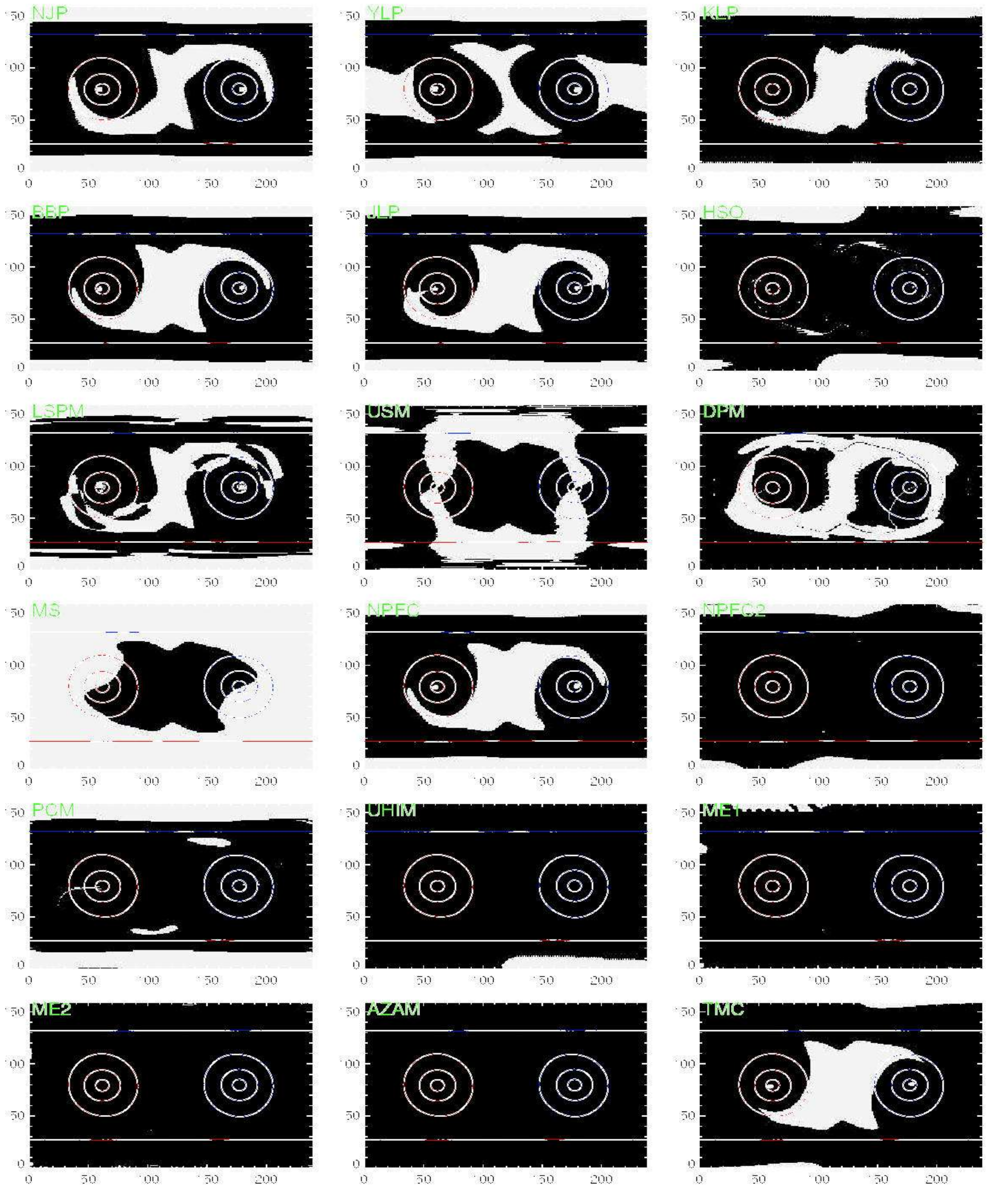

Fig. 3 Results for Case # 1, the emerging fluxrope simulation of Fan and Gibson [12], at timestep 56. Contours are the same as Fig. 1 for reference. Areas with the correct ambiguity resolution are black, incorrect areas are white. Figures are in the order that the descriptions appear in the text, and labeled with an acronym (see Table 2) to help identification.

In 2006 we will develop new test data to more rigorously challenge the most promising algorithms, including noise and non-constant-α fields. The best aspects of the most promising algorithms will be incorporated into new code, and with luck, the chromospheric Na D-line data will be ready to incorporate as described in our original proposal.