FAST MOVING FRONTS - 2009

March 2009

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Chao-Lin Kuo talks with *ScienceWatch.com* and answers a few questions about this month's Fast Moving Front in the field of Space Science. The author has also sent along an image of his work.

Article: High-resolution observations of the cosmic microwave background power spectrum with ACBAR
Authors: Kuo, CL;Ade, PAR;Bock, JJ;Cantalupo, C;Daub, MD;Goldstein, J;Holzapfel, WL;Lange, AE;Lueker, M;Newcomb, M;Peterson, JB;Ruhl, J;Runyan, MC;Torbet, E
Journal: ASTROPHYS J, 600 (1): 32-51 Part 1 JAN 1 2004
Addresses: Univ Calif Berkeley, Dept Phys, 366 LeConte Hall 730, Berkeley, CA 94720 USA.
Univ Calif Berkeley, Dept Phys, Berkeley, CA 94720 USA.
Univ Calif Berkeley, Dept Astron, Berkeley, CA 94720 USA.
Cardiff Univ, Dept Phys & Astron, Cardiff CF24 3YB, S Glam, Wales.
(addresses have been truncated)

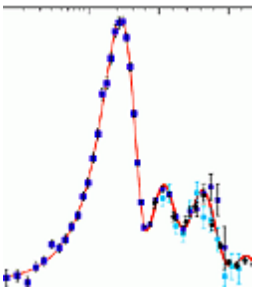
SW: Why do you think your paper is highly cited?

The cosmic microwave background (CMB) is the most ancient light in the Universe. By measuring the structures in the CMB, we are studying the Universe shortly after the Big Bang. Using the CMB as the backlight, we can also learn important facts about the global properties, such as the geometry of space, the amount of dark matter, and so on. The Arcminute Cosmology Bolometer Array Receiver (ACBAR) results are frequently used by theoretical cosmologists and phenomenologists to test new ideas in fundamental physics.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

High resolution measurements of ACBAR nicely complement results from the WMAP satellite. This 2004 first result paper, and the subsequent two papers with improved results, provide the best CMB anisotropy measurements on arcminute scales. The final ACBAR results were described in Reichardt C, *et al.*, "High resolution CMB power spectrum from the complete ACBAR data set," *Astrophysical Journal*, submitted, preprint astro-ph/0801-1491. See figure 1.

Figure 1:



+ View larger image & details

SW: Would you summarize the significance of your paper in layman's terms?

The most significant conclusion is that the now standard ingredients in cosmology—dark matter, dark energy, and flat geometry—are here to stay. Just 10 years ago, people were still highly skeptical. ACBAR results exquisitely showed that the current understanding of the Universe is

correct.

SW: How did you become involved in this research and were any particular problems encountered along the way?

ACBAR was my Ph.D. thesis project at the University of California, Berkeley. We built the microwave receiver, took it to a two-meter telescope at the South Pole, and spent four years for data collection and analysis. Lots of hard work was involved, but the results made it worthwhile.

SW: Where do you see your research leading in the future?

I will continue to study the CMB, especially its polarization properties. This could provide information on the process of "inflation," which is essentially the "Bang" of the Big Bang. Among other things, this process might have given rise to the flat geometry we have observed.

SW: Do you foresee any social or political implications for your research?

It is important to know our surroundings. Cosmology is simply that, on the largest scales possible in space-time.

Chao-Lin Kuo, Ph.D.
Assistant Professor
Department of Physics and SLAC
Stanford University
Stanford, CA, USA
Web

Figure 1:

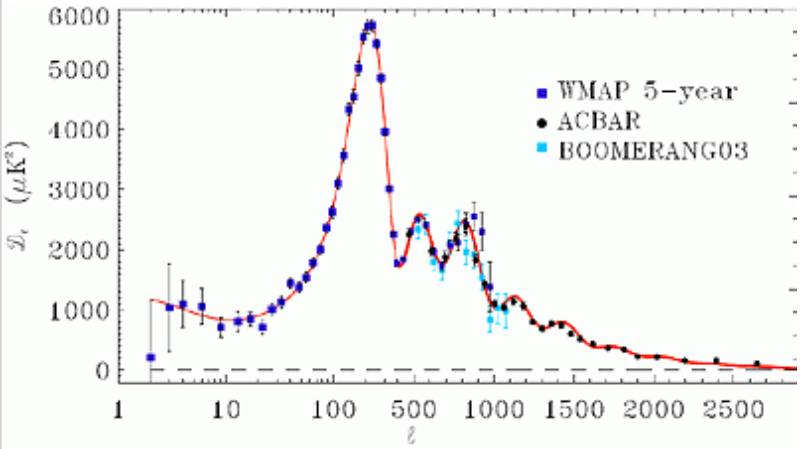


Figure 1:

The latest ACBAR results on the CMB structures, plotted along with results from WMAP satellite and the Boomerang experiment. The smooth curve is the theoretical prediction..

KEYWORDS: ANGULAR SCALE INTERFEROMETER; COSMOLOGICAL PARAMETERS; DAMPING TAIL; SOUTH-POLE; ANISOTROPY; RADIATION; SUBMILLIMETER; FLUCTUATIONS; BOOMERANG; IMAGER.

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