CMB Conundrums

John Hartnett

I have previously reported[1] some of the problems associated with observations of the Cosmic Microwave Background (CMB) made by Boomerang, COBE (Cosmic Background Explorer) and WMAP (Wilkinson Microwave Anisotropy Probe). Russ Humphreys has also written on this in the past.[2] Now it seems it has come under fire again, this time by some of their own.[3–5] Further analysis has highlighted even more problems for the inflationary big bang theory.

The discussion revolves around the power spectral analysis of the CMB. Because the instrument used to look for the very fine variations (anisotropies) in the 2.725 K temperature is a differential microwave radiometer, one can only compare the temperature of one part of the sky with another. This means that those wonderful false coloured images of the temperature variations that you see published[6] have a certain degree of arbitrary indeterminism (figure 1). The analysis is carried out on an angular scale by sampling various angle sizes and a power spectrum of the result is determined as a function of reciprocal angle or beam size on the sky.

To analyze the result, the anisotropies are expanded in a series of spherical harmonic functions (or modes that describe how a sphere can vibrate) that when overlapped should form a random picture across the sky when projected onto a sphere[7] (figure 2).

The dipole term[8] is the result of the well-understood motion of the solar system through space. When we look toward the direction of our motion, we see a blueshift in those temperatures of the order of 10^{-3}, and when we look behind, we see an equivalent redshift. The magnitude of the effect is much (~40 times) larger than the fine variations of 70 μK that were ultimately discovered. So it must be subtracted. Then it is expected that higher order multipole expansion terms would have random alignments—they should not align with each other, or with any preferred direction in space.

In addition, the *inflation* stage originally added to the big bang model by Alan Guth,[9] and expanded upon and modified by others,[10,11] requires that the amplitudes of all of these modes are random with Gaussian distributions and that the power in each should be about the same. The idea is that this 'inflation' of space itself, faster than the speed of light, in the early stages after the big bang, smoothed out all of the early structure of the universe and now it all should be a featureless uniform scale. Each mode, on average, should have an amplitude of zero.

At low angular scales, it is found that when the intensities of the microwave energy are compared at various points on the sky they are correlated, but above 60 degrees, it is found that they are completely uncorrelated. This is in striking disagreement with inflationary theory.

Each multipole mode has been analysed to see where it falls on the sky and it was discovered that the octopole and quadrupole modes have axes that are very closely aligned (figure 2).[7] Their intensities are also much lower than expected from inflationary cold dark matter models.

Analyses by Starkman and Schwarz[3] and others[4,5] seem to indicate that these octopole and quadrupole modes are aligned in some fashion with the direction of the two points on the sky where the projection of Earth's equator onto the sky crosses the ecliptic. This lies very close to the direction the solar system moves through space.

All this seems to be telling us that at least a component on low angular scales is correlated with the solar system. Further evidence tells us that on some scales there exists a correlation with nearby extragalactic sources.[12] But the fact that there is poor correlation on large scales, even when corrections are taken into account, suggests that the cosmological contribution is very weak indeed. This then is very bad news for the standard big bang model. However, this is the evidence we would expect for a galactocentric universe,[13] with certain special features even attributed to the solar system.

In the creationist model[14] I proposed, the universe expanded[15] by a factor of about 3,000 or a volume expansion of about 10 orders of magnitude. This is understood to be associated with an original created 9,000K plasma that was adiabatically (i.e. no change in heat or entropy) cooled to the all-pervasive 2.725K background as the universe was stretched out. These features of the CMB are consistent with the local solar system frame as expected in this creationist model.

The special status of the solar system has been claimed too.[16] A Young Solar System (YSS) model was suggested that involved a supernaturally imposed time dilation event[17] near Earth. Local time dilation resulting from the actions of the Creator allowed Adam to see the stars the moment he opened his eyes. Those actions should leave some imprint on nature that we are left to explore. Therefore, we should expect, conversely to the Copernican principle, which states

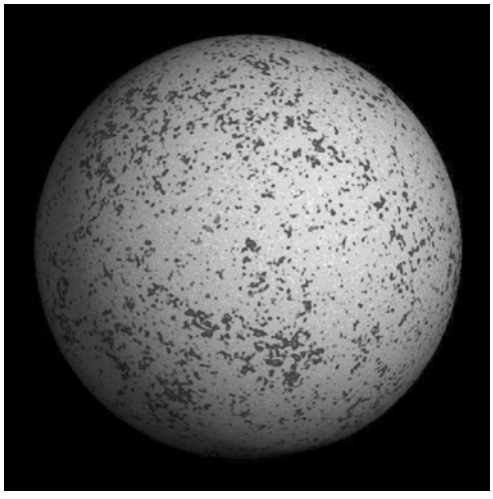

Figure 1. CMB anisotropies projected onto a sphere. False coloured spots indicate temperature variations from the 2.725 K background (NASA/WMAP Science Team).

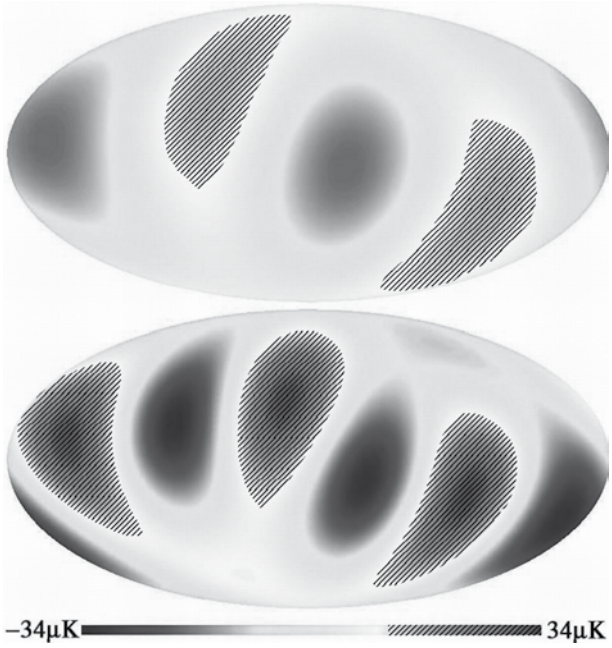

Figure 2. Calculated CMB quadrupole (above) and octopole (below) modes appear to be very closely aligned to the same spatial axis. (After Tegmark *et al.*)[7]

that there is nothing special about our solar system, features that actually are special to the solar system.

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